VALIDATING THE IS-IMPACT MODEL IN THE MALAYSIAN PUBLIC SECTOR

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formative model validation, hierarchical construct, IS-Impact, IS Success, Malaysia, public sector organisation, replication study, instrument translation

In loving memory of my father, Elias Mohd. Hanafiah, my idol, an inspiration and the best friend I've ever had.

And

To my mom, whose loves, care and understanding has made me who I am today.

Extended Abstract

This research is one of several ongoing studies conducted within the IT Professional Services (ITPS) research programme at Queensland University of Technology (QUT). In 2003, ITPS introduced the IS-Impact model, a measurement model for measuring information systems success from the viewpoint of multiple stakeholders. The model, along with its instrument, is robust, simple, yet generalisable, and yields results that are comparable across time, stakeholders, different systems and system contexts. The IS-Impact model is defined as “a measure at a point in time, of the stream of net benefits from the Information System (IS), to date and anticipated, as perceived by all key-user-groups”. The model represents four dimensions, which are ‘Individual Impact’, ‘Organizational Impact’, ‘Information Quality’ and ‘System Quality’. The two Impact dimensions measure the up-to-date impact of the evaluated system, while the remaining two Quality dimensions act as proxies for probable future impacts (Gable, Sedera & Chan, 2008).

To fulfil the goal of ITPS, “to develop the most widely employed model” this research re-validates and extends the IS-Impact model in a new context. This method/context-extension research aims to test the generalisability of the model by addressing known limitations of the model. One of the limitations of the model relates to the extent of external validity of the model. In order to gain wide acceptance, a model should be consistent and work well in different contexts. The IS-Impact model, however, was only validated in the Australian context, and packaged software was chosen as the IS understudy. Thus, this study is concerned with whether the model can be applied in another different context. Aiming for a robust and standardised measurement model that can be used across different contexts, this

research re-validates and extends the IS-Impact model and its instrument to public sector organisations in Malaysia. The overarching research question (managerial question) of this research is **"How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively?"**

With two main objectives, the managerial question is broken down into two specific research questions. The first research question addresses the applicability (relevance) of the dimensions and measures of the IS-Impact model in the Malaysian context. Moreover, this research question addresses the completeness of the model in the new context. Initially, this research assumes that the dimensions and measures of the IS-Impact model are sufficient for the new context. However, some IS researchers suggest that the selection of measures needs to be done purposely for different contextual settings (DeLone & McLean, 1992, Rai, Lang & Welker, 2002). Thus, the first research question is as follows, *"Is the IS-Impact model complete for measuring the impact of IS in Malaysian public sector organisations?"* [RQ1].

The IS-Impact model is a multidimensional model that consists of four dimensions or constructs. Each dimension is represented by formative measures or indicators. Formative measures are known as composite variables because these measures make up or form the construct, or, in this case, the dimension in the IS-Impact model. These formative measures define different aspects of the dimension, thus, a measurement model of this kind needs to be tested not just on the structural relationship between the constructs but also the validity of each measure. In a previous study, the IS-Impact model was validated using formative validation techniques, as proposed in the literature (i.e., Diamantopoulos and Winklhofer, 2001, Diamantopoulos and Siguaw, 2006, Petter, Straub and Rai, 2007). However, there is potential for improving the validation testing of the model by adding more criterion or dependent variables. This includes identifying a consequence of the IS-Impact construct for the purpose of validation. Moreover, a different approach is employed in this research, whereby the validity of the model is tested using the Partial Least Squares (PLS) method, a component-based structural equation modelling (SEM) technique. Thus, the second research question addresses the construct validation of the IS-Impact model; *"Is the IS-Impact model valid as a multidimensional formative construct?"* [RQ2].

This study employs two rounds of surveys, each having a different and specific aim. The first is qualitative and exploratory, aiming to investigate the applicability and sufficiency of the IS-Impact dimensions and measures in the new context. This survey was conducted in a state government in Malaysia. A total of 77 valid responses were received, yielding 278 impact statements. The results from the qualitative analysis demonstrate the applicability of most of the IS-Impact measures. The analysis also shows a significant new measure having emerged from the context. This new measure was added as one of the System Quality measures.

The second survey is a quantitative survey that aims to operationalise the measures identified from the qualitative analysis and rigorously validate the model. This survey was conducted in four state governments (including the state government that was involved in the first survey). A total of 254 valid responses were used in the data analysis. Data was analysed using structural equation modelling techniques, following the guidelines for formative construct validation, to test the validity and reliability of the constructs in the model.

This study is the first research that extends the complete IS-Impact model in a new context that is different in terms of nationality, language and the type of information system (IS). The main contribution of this research is to present a comprehensive, up-to-date IS-Impact model, which has been validated in the new context. The study has accomplished its purpose of testing the generalisability of the IS-Impact model and continuing the IS evaluation research by extending it in the Malaysian context. A further contribution is a validated Malaysian language IS-Impact measurement instrument. It is hoped that the validated Malaysian IS-Impact instrument will encourage related IS research in Malaysia, and that the demonstrated model validity and generalisability will encourage a cumulative tradition of research previously not possible.

The study entailed several methodological improvements on prior work, including: (1) new criterion measures for the overall IS-Impact construct employed in 'identification through measurement relations'; (2) a stronger, multi-item 'Satisfaction' construct, employed in 'identification through structural relations'; (3) an alternative version of the main survey instrument in which items are randomized (rather than blocked) for comparison with the main survey data, in attention to possible common method variance (no significant differences between these two survey instruments were observed); (4) demonstrates a validation process of formative indexes of a multidimensional, second-order construct (existing examples mostly involved unidimensional constructs); (5) testing the presence of suppressor effects that influence the significance of some measures and dimensions in the model; and (6) demonstrates the effect of an imbalanced number of measures within a construct to the contribution power of each dimension in a multidimensional model.

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:

Date: 6 October 2011

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Chapter 1 : Introduction to the Research

1.1 CHAPTER INTRODUCTION

Information Systems (IS) success has been a popular stream of research for the last two and a half decades, continuing to gain attention from both practitioners and researchers seeking to help organisations evaluate their IS investment (DeLone & McLean, 1992, Myers, Kappelman, & Prybutok, 1997, Urbach, Smolnik, & Riempp, 2009). IS researchers have introduced a wide selection of both perceptual and objective measures that organisations can use for measuring their IS (DeLone & McLean, 1992, Ifinedo, 2006). However, mostly, different IS researchers address different aspects of IS success, thus, making it difficult to understand how studies are interrelated (Rai, Lang, & Welker, 2002) and findings across studies are difficult to compare (Gable, Sedera & Chan, 2003). A number of models have been proposed to provide a comprehensive IS success evaluation approach or tools that can help organisations in evaluating the success of IS in their organisations systematically (i.e., DeLone and McLean (1992) IS Success model, and Gable, Sedera and Chan (2008) IS-Impact Model).

The IS success model introduced by DeLone and McLean in 1992, is the highly adopted IS success model in IS success studies. Many IS researchers attempt to empirically validate the model (DeLone & McLean, 2003). However, most validation effort has focused on causal relationships between IS success constructs (i.e., Rai et al., 2002, Sabherwal, Jeyaraj, and Chowa, 2006, Seddon and Kiew, 1994). Less attention has been given to developing a standard measurement model providing rationale in the selection of measures (Gable et al., 2008) and testing the relationship between the measures and the constructs (Jarvis, MacKenzie, &

Podsakoff, 2003, Petter, Straub, & Rai, 2007). Furthermore, not many researchers focus on the external validity of the model, that is, to investigate the extent to which a theory or model can be generalized beyond the parameters of the particular research (Berthon, Pitt, Michael, & Carr, 2002, Brown, Kelley, & Schwarz, 2006, Lucas, 2003).

The purpose of this chapter is to provide an overview of this study that re-validates an existing measurement model in a new context that is different in terms of the choice of IS, the language and nationality from the original work. This chapter begins with the description of the research background, followed by the research objectives and the research questions that are presented in a "top-down" hierarchical structure. Next, the chapter discussions move on to the research strategy and method employed in this research. This is followed by a discussion on the research context, the organisations involved in this research and the unit of analysis. At the end of this chapter, the anticipated research contributions and the thesis structure are presented.

1.2 RESEARCH BACKGROUND AND MOTIVATION

This study adopts the IS-Impact model as the commencing theoretical foundation. The IS-Impact model was developed by Gable, Sedera and Chan (2008) because of the lack of a standardized, validated and reliable measurement model to measure enterprise system success. Their study also addressed many IS success issues found in the literature (Gable et al., 2008, Sedera & Gable, 2004). The IS-Impact model represents four dimensions, which are Individual Impact, Organizational Impact, Information Quality and System Quality. Individual Impact is a measure of the extent to which the IS has influenced the capabilities and effectiveness, on behalf of the organisation, of key-users. Organizational Impact is a measure of the extent to which the IS has promoted an improvement in organisational results and capabilities. Information Quality is a measure of the quality of the IS output: namely, the quality of the information the system produces in reports and on-screen. System Quality is a measure of the performance of the IS from a technical and design perspective (Gable et al., 2008, p.389). The two impact dimensions are an assessment of benefits that have or have not followed from the system while the two quality dimensions act as proxy measures of probable future impact. The additivity of these four dimensions reflects a comprehensive, overarching measure of IS-Impact (Gable et al., 2008).

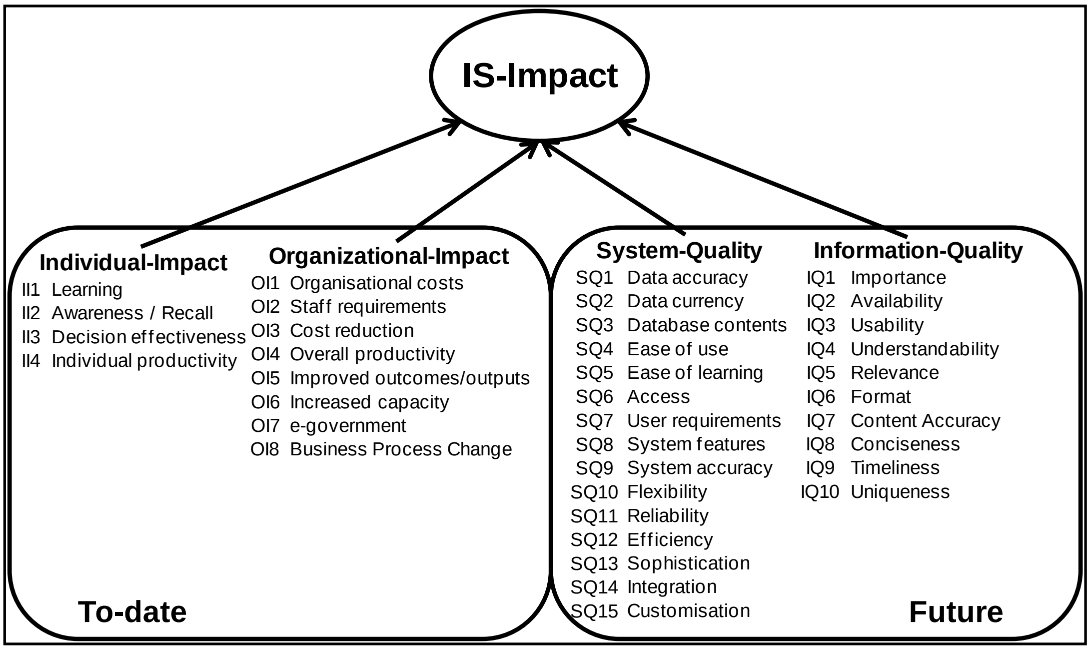

Figure 1.1. The IS-Impact measurement model.

Figure 1.1 presents the IS-Impact model as a second-order construct with multiple dimensions. Each dimension is measured by a number of measures: 4 measures for measuring Individual Impact, 8 measures for measuring Organizational Impact, 15 measures for measuring System Quality and 10 measures for measuring Information Quality. Each of these measures represents a unique aspect of the dimension that it intends to measure.

The model was empirically tested and found valid for evaluating the impact of two financial systems developed by SAP and Oracle. Although the study context was Enterprise Systems (ES), the aim is to develop a measurement model for evaluating not just ES, but also contemporary IS (meaning not necessary an organisation-wide package application but an IS with integrated modules used by some departments within an organisation) that is simple, robust and generalisable and which yields results that are comparable across time, across stakeholders, and across differing systems and system contexts.

Nevertheless, there are some limitations identified that require further validation of the model. Thus, this study re-validates the IS-Impact model by extending it to a new context. This context-extension research aims to test the generalisability of the model by addressing known limitations of the model. This study will address the issue of the external validity of the model, and at the same time identify relevant new measures for an up-to-date model. Moreover, this study will improve the model validation test by employing new dependent variables and test the validity of the model following the guidelines of formative construct validation. Besides the model itself, a lack of studies published on IS success in Malaysia provides an opportunity for this research to understand how organisations in Malaysia evaluate their IT investment. These issues are discussed in the following sub-sections.

1.2.1 External validity

External validity addresses the ability to generalize findings from a study to a different research setting. External validity according to Lucas (2003), "...refers to the generalisability of research findings beyond the parameters of a particular research" (p. 237). Lucas then explained that in the context of social sciences, generalisability is about, “a concern on how measurements will behave similarly across contexts (i.e., time, settings or groups of people)” (p.237). Outcomes from a particular research are bounded by the limitations imposed by the methodology used by the researchers. In order to overcome the limitation, researchers often try to generalise their research findings to increase the confidence of their results with the goal of producing general knowledge, hence, testing the external validity of the current findings.

IS researchers have relied on subjective measures to understand phenomena that are impossible to measure directly. For these researchers, the research goal is to construct measures that closely reflect the phenomena of interest (Lucas, 2003). IS researchers are advised to use available and validated instruments, not only because it is practical, and efficient, but because it would give researchers, their peers, and society as a whole a high degree of confidence that the method and instrument being selected is useful in the quest of scientific truth (Boudreau, Gefen, & Straub, 2001, Straub, 1989). Moreover, using a validated instrument will allow researchers to accumulate knowledge and the results are comparable (DeVellis, 2003).

In relation to the IS-Impact model, the model was developed and only validated in the Australian public sector. Gable et al. (2008) acknowledge the fact that this limitation may affect the generalisability of the measurement model. This limitation has caused concern as to whether the measurement model is consistent or works well in different contexts. Any limitation of the model can be identified through replication work (Lucas, 2003, Samaddar & Kadiyala, 2006). Re-visiting previous findings through replication research is important, and this effort can increase the confidence of one’s propositions (i.e., theory, knowledge, measurement model) (DeVellis, 2003).

Addressing the external validity of the IS-Impact model will also improve the comprehensiveness of the measures through identification of relevant new measures in a new context. DeLone and McLean (1992) suggest that a model must be both complete and parsimonious. Although the IS-Impact model has demonstrated completeness, the dimensions and measures were selected from and mapped into a universal pool of measures collected from literature published up to the year 2003. It is possible that new measures that have emerged since 2003, either from the current literature or derived from a new context. Moreover, the IS-Impact model was conceptualised as a formative measurement model. In a formative model, the construct comprises a composite of measures or indicators (Diamantopoulos & Winklhofer, 2001). Each of these measures or indicators carries specific facets of the construct. Therefore, for a formative model to be complete, a census of measures is required. Further investigation of completeness is essential for the IS-Impact model to present a comprehensive, up-to-date model and yet a simple one for measuring IS success.

1.2.2 Improvement in the model validation test

The IS-Impact model when it was first introduced was validated using the reflective validation technique (Gable et al., 2003), however, the authors have since viewed the model and its dimensions as formative (Gable et al., 2008). Their initial misspecification was due to the lack of proper guidelines and examples of formative measurement in the IS literature, which is not unique in IS research. Petter et al. (2007) have found a significant number of IS studies that have misspecified formative constructs. This misspecification of formative or reflective measures can cause measurement error and affects the validity of the model (Jarvis et al., 2003).

A number of reasons have been identified that contribute to this problem. First, lack of knowledge in identifying formative measures has caused many researchers to misconceptualise their model construct(s) as reflective, when actually the construct is formative. Second, even though a researcher can identify formative constructs within the measurement model, the researcher may not have the knowledge to analyse and assess the measurement model (Jarvis et al., 2003, Petter et al., 2007). Furthermore, guidelines in assessing the validity of formative constructs are difficult to find (Diamantopoulos & Winklholfer, 2001), unlike the validation procedures and statistical tests for reflective constructs, which are well established (Straub, Boudreau & Gefen, 2004). This becomes more complicated when it involves a hierarchical model, such as the IS-Impact model, which is conceptualized as a second-order with multidimensional formative constructs (Wetzels, Odekerken-Schröder & Oppen, 2009). Additionally, tools that only support co-variances among the measures (e.g., LISREL) are problematic for validating formative constructs (Chin, 1998). This is because tools such as LISREL only provide goodness of fit measures, and, therefore, assume that all measures are reflective. According to Chin (1998), the fit measure does not relate to how well the latent variables or items are predicted but only relates to the ability of the model to account for sample co-variances. Petter et al. (2007) provided guidelines in specifying formative constructs, however, they further encouraged IS researchers to address some of the limitations discovered by them in order to develop more rigorous guidelines.

With the recent attention given to formative construct validation, Gable et al. (2008) revisited their data and validated the IS-Impact model using the technique proposed in the literature (i.e., Diamantopoulos and Winklhofer, 2001, Diamantopoulos and Siguaw, 2006, Petter et al., 2007) and further validate the IS-

Impact model as a formative measurement model. However, they recognized the potential for improving the validation by adding more criterion measures and reflective measures (these measures are used as a part of the validity test and not as some measures in the IS-Impact model) in future work.

1.2.3 The paucity of IS evaluation study in Malaysia

Looking into the context of the study, there is only a small number of published studies regarding IT evaluation in Malaysia. It is believed that this paucity of IS success study in Malaysia may be because of two factors. First, a limited electronic archive of local publications in Malaysia has caused articles to be inaccessible through the Internet. Second, although IT/IS has been present in Malaysia since the early 60s, IT/IS evaluation has only focused on implementation issues; thus, papers that discuss IT/IS adoption and acceptance are mostly available on the Internet. This is also attributed to the fact that most Malaysian IT services are at a relatively early stage of customer sales-support, IT support and application development.

The IS-Impact model, albeit a measurement model, can be a framework to help in exploring and understanding IS success in Malaysia. Employing a deductive approach, the model can identify how organisations in Malaysia perceive IS success. Additionally, this study will try to understand IS success from the perspective of multiple users, and not just one specific type of user.

1.3 THE RESEARCH OBJECTIVES

The main goal of this research is to generalise the IS-Impact model, instrument and approach to Malaysian public sector organisations. In order to achieve this goal, several objectives have been outlined as follows:

1. To further test the validity and robustness of the IS-Impact model in Malaysian public sector organisations to yield a standardised measurement model.
2. To identify relevant new dimensions and measures of IS impact in the Malaysian context. This will look at the completeness of the IS-Impact model.
3. To derive a local version of the instrument by translating the instrument to the Bahasa Malaysia language (the national language of Malaysia). This is to allow more Malaysian organisations across different types of sector and different levels of user to use the instrument.
4. To measure the impact of the specific IS that is involved in this research and provide a descriptive report for the organisation to describe the state of their IS.

1.4 THE RESEARCH QUESTIONS

The research questions of this proposed research are designed following the Cooper and Emory's top-down approach (Cooper & Emory, 1995), which comprises four levels of questions. The hierarchy consists of: (1) management level, (2) research level, (3) investigative level, and (4) measurement level.

The first level, management level, describes the key research question, or an overarching problem of this research. The key research question for this research is:

"How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively?"

The IS-Impact model is a validated measurement model. It is expected that the model can help public sector organisations in Malaysia to evaluate the impact of information systems systematically and effectively. However, because the model was only validated in the Australian context, the focus of this research is centrally on the applicability and the validity of the IS-Impact model in the Malaysian context. In order to meet the research goal and objectives, the management question is broken down into more specific research questions to provide a general purpose for conducting this study. This level of question is also congruent with the research objectives. From the management question mentioned above, two research questions are derived. Next, each of these research questions is further broken down into the third level of abstraction, which is the investigative level. In this investigative level, more specific questions are derived that will help in addressing the research question more directly and clearly. Gable (1991, p.2) stated that investigative questions "fractionated out of the research question and guide the details of the research effort, including the development of concepts, operational definitions and measurement devices". The research and investigative questions of this research are:

Research question 1: *"Is the IS-Impact model complete for measuring the impact of IS in Malaysian public sector organisations?"*

This research question seeks to investigate whether all the dimensions and measures in the IS-Impact model are applicable to the Malaysian context. In addition, this research question will address the completeness of the IS-Impact model by identifying relevant new measures that are appropriate to be included in the model, thus, addressing the content validity of the model. Two specific questions are derived to help in the investigation:

Investigative Q1.1: Are all existing IS-Impact dimensions and measures applicable?

Investigative Q1.2: Are any new dimensions or measures required?

Research question 2: *"Is the IS-Impact model valid as a multidimensional formative construct?"*

This research question refers to the construct validity of the IS-Impact model. The model will be tested following the guidelines for formative construct validation recommended in the literature. In addition, this research replicates the same procedures used in a previous study by employing ‘Satisfaction’ as an immediate consequence of IS-Impact for nomological net validity. Several additional ‘Satisfaction’ measures were derived from the literature. Furthermore, this research will more rigorously validate IS-Impact as a second-order multidimensional construct by employing new and more appropriate global criterion measures (global items) that summarise IS-Impact at the highest-order (rather than at the dimension level). The model will be tested in SmartPLS. More specific questions are:

Investigative Q2.1: Are all existing IS-Impact measures significant?

Investigative Q2.2: Is the relationship between IS-Impact and Satisfaction (as consequence of IS-Impact) significant and positive?

The final level of research questions in the hierarchy, the measurement level, relates to measurement questions designed for the survey. The design of these measurement questions will be discussed in Chapter 3: The Research Design, which presents the methods used in this research; Chapter 4: The Identification Survey, which discusses the design of the first survey to address research question 1; and Chapter 5: The Confirmation Survey, which discusses the design of the final survey to address research question 2. Table 1.1 presents a summary of the research questions hierarchy discussed above.

Table 1.1

Research Questions Hierarchy

Management Question	
"*How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively?*"	
Research Question	
Research Q1: *Is the IS-Impact model complete for measuring the impact of IS in Malaysian public sector organisations?*	
Investigative Q1.1	Are all existing IS-Impact dimensions and measures applicable?
Investigative Q1.2	Are any new dimensions or measures required?
Research Q2: *Is the IS-Impact model valid as a multidimensional formative construct?*	
Investigative Q2.1	Are all existing IS-Impact measures significant?
Investigative Q2.2	Is the relationship between IS-Impact and Satisfaction (as consequence of IS-Impact) significant and positive?

1.5 RESEARCH STRATEGY

This research involves several research strategies. First, with the focus on testing the generalisability of the IS-Impact model, this research adapts the 'method/context-extension' research strategy introduced by Berthon, Pitt, Michael, and Carr (2002). According to Berthon et al. (2002), extension research refers to research that replicates a previous study, in which one or more research parameters are changed.

Replication research is widely accepted by researchers in revisiting previously proposed theory to compare findings and to encourage confidence in the internal validity (Bedeian, Mossholder, Kemery, & Armenakis, 1992) as well as external validity (Brady, Knight, Cronin, Tomas, Hult, & Keillor, 2005). By replicating previous work, it can help the researcher to observe, investigate or experiment with previous theory for existing gaps and to expand knowledge (Berthon et al., 2002, Samaddar & Kadiyala, 2006). It can also strengthen the theory by confirming the existing findings in a new context (Brown et al., 2006, Lindsay & Ehrenberg, 1993, Samaddar & Kadiyala, 2006).

In this particular study, the method that was used in a previous study is replicated, in which two surveys (qualitative and quantitative surveys) were again employed in this research. Moreover, the type of the IS application as the unit-of-analysis (a financial system) and the type of organisation (public sector organisations) chosen in this research are similar to those in the previous study.

The difference between this study and previous study is the study context, in which data was collected for certain public sector organisations in Malaysia. Referring to Berthon et al.'s (2002) research strategy, this refers to 'context-extension' work. Moreover, this study has employed different criterion measures and additional 'Satisfaction' measures for testing the validity of the model through the Structural Equation Modelling technique. This refers to 'method-extension' work. Table 1.2 illustrates the similarities and differences between the original research (the target study) with this research (the focal study) based on the framework 'Research Space[1]' that was introduced by Berthon et al. (2002).

In order to maximize accessibility to respondents in Malaysia, this research employed a second strategy by conducting the survey in the national language, Bahasa Malaysia. For re-validating the IS-Impact model and addressing the generalisability of the model, this research adopted the same survey instruments that were used in a previous study.

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[1] According to Berthon et al. (2002, p.421),"...research is an epistemological process that occupies a conceptual space defined by four primary parameters, or dimensions: problem or phenomenon, theory, method and context."

[2] Higher-order order construct also refers to hierarchical construct or multidimensional construct which can be defined as a construct involving more than one dimension (Jarvis et al., 2003, Petter et

Table 1.2

The Similarities and Differences Between the Original Research and Proposed Research

Research parameter	Target research (previous work)	Focal research (current study)
Problem	How to economically measure ES Success? (Derive a measurement model based on existing measures and also additional new measures, for a new context (ES))	How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively? (Test existing model in new context with a number of changes in the research parameters)
Theory	IS Success model	IS-Impact model
Methodology	**Data collection**: Survey method **Data analysis**: Qualitative (deductive approach), Quantitative (formative construct validation and used LISREL)	**Data collection**: Survey method (localised instrument) **Data analysis**: Qualitative (deductive approach), Quantitative (formative construct validation, with new dependent variables and used PLS)
Context	**Where**: Queensland Government agencies and a university **What**: ES package (SAP Financials and Oracle Financials) **Who**: Direct users and indirect users **When**: Post-Implementation	**Where**: Malaysian State governments (public organisations) **What**: SPEKS (an integrated custom financial system) **Who**: Direct users and indirect users **When**: Post-Implementation (four years after SPEKS has fully implemented)

A single translation technique (employed in the first survey) and a combination of two translation techniques (employed in the second survey), 'back-translation' and 'decentering' (Behling & Law, 2000, Brislin, 1970, McGorry, 2000), were used to introduce rigour in the translation process. By using a combination of these translation techniques, the instrument was directly translated as well as modified to fit the current context. These translated survey instruments are helpful for those respondents who are not very conversant with English. Moreover, the IS-Impact instrument was translated to produce a local version of the IS-Impact instrument.

The third and final strategy is the data collection method. Following the previous work, this study employed two survey methods. The first survey, called The

Identification Survey, being qualitative and exploratory, aims to investigate the applicability of the IS-Impact dimensions and measures. Furthermore, this exploratory survey seeks to capture possible relevant new measures derived from the new context. This survey is interpretative and data driven, probing the applicability of the IS-Impact model in Malaysian organisations. The IS-Impact model will be modified when necessary, based on the qualitative analysis. The model will then be operationalised in the subsequent survey.

The second survey is quantitative. Based on the outcome of the qualitative survey, the instrument that was used in the previous study was modified and operationalised in the new context. Statistical analysis is used to test construct validity and reliability, employing structural equation modelling techniques for formative construct validation. The detailed research design will be discussed in Chapter 3: Research Design.

1.6 THE RESEARCH CONTEXT AND THE UNIT OF ANALYSIS

This research is conducted in Malaysian public organisations by measuring the impact of an integrated financial system that is currently being used across 11 state governments in Malaysia. The focus of this evaluation study is on the impact of the financial system on the organisation after the system has been running for at least several years (a post-implementation evaluation). The unit of analysis of this research is an IS application, and the targeted respondents are the users of the IS application who have direct involvement with the system or are only receiving its output (i.e., report that was derived from the system).

Four state governments in Malaysia are involved in this research. The first survey was conducted at the State Government of Melaka, one of the four state governments; 82 users responded to the survey. The second survey was conducted in four state governments and gathered empirical evidence from 310 respondents. In both surveys, the respondents are the users of a financial system called 'The State Government's Standard Computerised Accounting System (SPEKS)'. SPEKS is chosen for two reasons. First, SPEKS has a large number of users. This provides the advantage of acquiring a large sample size to validate the IS-Impact model. Second, again, surveying a financial system will create better conditions for comparing the research findings with the results from prior research, where the same type of system was chosen as the unit of the analysis. Furthermore, this is to limit the differences that exist between studies.

SPEKS is an integrated financial system that has been implemented across 11 states in Malaysia (Malaysia comprises 13 states and three (3) federal territories). SPEKS was first implemented in the year 2001 and fully completed in year 2005. The system contains eleven integrated modules (see *Figure 1.1* for the detail of the modules), that is used across several number of departments in a state government with at least 800 users at each state government. The system also provides access to users outside the state government (e.g. users from the Employees Provident Fund (EPF), and Inland Revenue Board (IRB)). SPEKS was developed by KJSB, a local software developer with 18 years of experience in the ICT industry. The system's copyright is owned by the Accountant General's (AG) Department, Ministry of Finance, Malaysia (Jabatan Akauntan Negara Malaysia, 2006).

SPEKS was developed for state governments in Malaysia with the following purposes: (1) to increase productivity and efficiency in Financial Management, (2) to prepare accurate Financial Statements on time, (3) to improve each State's financial administration, (4) to provide a Financial Information Source Centre, and (5) to prepare the state government for the Electronic Government era (Jabatan Akauntan Negara Malaysia (n.d)).

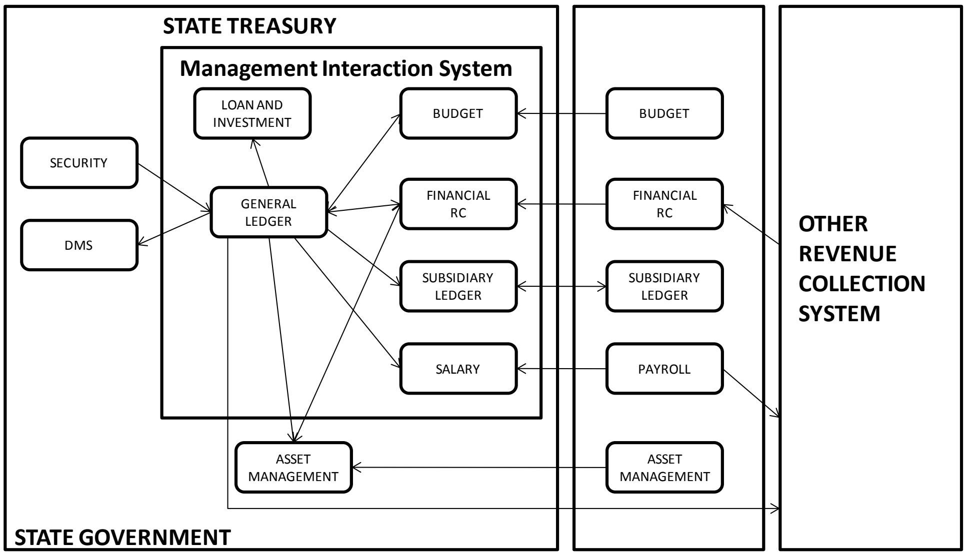


Figure 1.2. The SPEKS flowchart (adapted from AG Malaysia website).

1.7 ANTICIPATED RESEARCH CONTRIBUTIONS

This is the first study that attempts to re-validate the IS-Impact Model in a different context. The contributions of this study can be classified as contributions to knowledge and contributions to practice.

Contributions to knowledge are those that can be used by IS researchers to enhance existing knowledge and develop new theory. Among others the contributions of this study to knowledge include the following:

1. Presents a validated and up-to-date measurement model for measuring the impact of contemporary information systems (IS), that is relevant not just in Australia but also for the public sectors in Malaysia.

2. Demonstrates the necessity of the IS-Impact measures using a deductive approach, operationalises the model by conducting a quantitative survey and tests the validity of IS-Impact as a second-order construct with multiple dimensions and 38 formative indices following guidelines of formative construct validation in the literature.
3. Validates the IS-Impact model using new criterion measures and additional new measures of 'Satisfaction' (that have been hypothesised as a consequence of IS-Impact), following guidelines for formative construct validation.

Contributions to practice are those that can be applied directly by practitioners and organisations in evaluating their IS investment. This study has made several contributions to practice:

1. A validated measurement instrument, translated to the national language, that can be used widely by organisations in Malaysia to evaluate the impact of the IS and predict future impact that can help organisations in making plans for future IS investment.
2. By using this tool, organisations can evaluate their IS based on the feelings and perceptions of the users and not just rely on financial measures.
3. A complete yet simple, and easy to use instrument that in the long-term will be useful in making comparisons across versions/upgrades, systems, departments or agencies.
4. An instrument that can be used by different types of user and by combining scores from all types of user can provide an overall evaluation of the impact of the IS to the organisation.

This study has also made at least two contributions to the QUT IS-Impact research track by:

1. Confirming the validity of the IS-Impact model as a measurement model and instrument that can be used in multiple contexts.

2. Enhancing the status of the measurement model to gain wide acceptance by both researchers and practitioners in Malaysia or other Malay speaking countries, by translating the instrument to the national language.

1.8 CHAPTER CONCLUSION AND THESIS STRUCTURE

Earlier in this chapter, the background and motivation of this research were discussed. Next, the research questions were presented followed by a brief description of the research strategy. The chapter concluded with a summary of the proposed research contributions to knowledge and practice. The remainder of the thesis is structured as follows:

Chapter 2 – Literature Review: This chapter provides a review of prior research on IS success. This review provides an insight into IS success studies and at the same time identifies gaps, to position this research.

Chapter 3 – Research Design: The chapter begins with a discussion on the research strategy and method used in this research. This is followed by a description of the research design, entailing a two-phase approach: an exploratory phase (testing the applicability and sufficiency of the model) and a confirmatory phase (testing the validity of the model). Each phase contains specific research activities. A flow-chart is presented to illustrate activities that were carried out in this research.

Chapter 4 – The Identification Survey: This chapter describes the design of the survey instrument that was used to collect data to explore relevant new IS-Impact measures in the new context. Furthermore, the survey seeks to test the applicability of the dimensions and 37 IS-Impact measures. This chapter also includes a description of the data collection process, and a description of the organisation and sample involved in the study. The chapter concludes with the findings and discussion based on the qualitative analysis.

Chapter 5 – The Confirmation Survey: This chapter describes the design of the confirmation survey instrument that was used to operationalise the measures of the model based on the qualitative analysis. This chapter also includes the data collection process, and a description of the organisations and sample involved in the study. The chapter concludes with the descriptive findings from the survey.

Chapter 6 – Model Testing: This chapter describes various model testing procedures and outcomes for testing the construct validity and reliability of some of the measures. The chapter concludes with a discussion regarding the model validation.

Chapter 7 – Research Contributions and Future Works: This chapter summarizes the research, the contributions of this research, its limitations and suggests potential future work.

Chapter 2 : Literature Review

2.1 CHAPTER INTRODUCTION

Literature review is a process of reviewing what other researchers have done in areas similar to the planned study. The aim of a literature review is to describe theoretical perspectives and previous research findings related to the problem of the current study (Leedy & Ormrod, 2001). Moreover, literature review facilitates theory development and identifies areas where research is needed (Webster & Watson, 2002). Thus, in the context of this study, conducting a literature review can help the researcher: (1) to develop understanding in the area of Information Systems Success or Information System Impact; (2) to identify gaps for positioning this research; and (3) to explore potential research strategies and methodologies that can be applied in this research.

This literature review chapter is organised into five sections. First, this chapter provides an overview of IS/IT evaluation study, that includes issues that were facing by organisations in evaluating their IT/IS investment, and how IS researchers can help organisations in realising the value and contribution of their IS investment. This is followed by a detailed discussion of two IS success models, the DeLone and McLean model and the IS-Impact model. The IS-Impact model plays a significant role because this research is centrally focused on this measurement model. Therefore, it is essential for the researcher to understand the development and validation process of this model. Further, this review will help in identifying gaps from previous studies in IS evaluation. Next, a discussion about IT/IS evaluation in Malaysia is presented. The focus of this review is to explore the state of IS in Malaysia as well as the trend in IS evaluation studies in Malaysia. Concluding this chapter is a discussion on research gaps and limitations that will be addressed in this research.

2.2 IT/IS EVALUATION IN ORGANISATION

Organisations have relied on Information Systems (IS) to improve their performance, flexibility and to remain competitive (Irani, Love, & Zairi, 2000). Organisations spent tens or even hundreds of millions of dollar implementing contemporary IS such as Enterprise System (ES); for example, Disney spent US$400 million to implement SAP R/3 in 2002 (Seddon, 2005). With this large investment, an organisation is expecting positive impact from the IS on the organisation (Gable et al., 2008).

Organisations, however, are facing difficulty on how information systems investment can and should be effectively evaluated (Irani et al., 2000). According to Seddon, Graeser, & Willcocks (2002), some practitioners do not conduct rigorous evaluations of the IT investment. Ifinedo (2006) observed a similar case at some companies in Estonia and Finland, based on in-depth interviews with seven companies regarding Enterprise Resource Planning (ERP) system evaluation. He discovered that only three out of seven companies conducted IS evaluation on their ERP systems. He further claimed that lack of knowledge on what and how to evaluate the success of ES such as ERP is the reason why other companies did not evaluate their ERP systems (Ifinedo, 2006). With the increasing complexity of the IS (for example ERP), combined with unfulfilled expectations of the impact of the IS, IS evaluation has become an important issue in the management's agenda (Irani et al., 2000).

Many IS success studies have focused on the implementation issue, for example the work of Bingi, Sharma and Goodla (1999), Scott and Vessey (2000) and

Gargeya and Brady (2005) that have discussed on the implementation success of ES. The uneven record of ES implementation success has caused researchers to pay more attention to identifying factors for successful ES implementation (Peslak, 2006). However, a complex and expensive IS systems such as ES should also be evaluated post-implementation (Wu & Wang, 2007). Information systems need to be maintained and upgraded, which requires expenditure (Irani et al., 2000). Moreover, according to Gargeya and Brady (2005), IS will have impact on organisations after the implementation phase is completed. In fact, IS provides widespread benefits to an organisation when it is being used, as observed by Shang and Seddon (2000) through their ERP benefits framework. They further argue that different measures are needed at different stages in the system lifecycle (p. 1005).

2.3 THE QUEST OF IS SUCCESS MEASURE

Information Technology (IT) or Information System (IS) researchers have started showing great interest in IT/IS evaluation in the late 1970s based on a large number of articles published between the year 1981 and 1987(DeLone & McLean, 1992, Myer et al., 1997) to help organisations justify their IS investment. Most early attempts at IS evaluation have focused on system availability and performance (Myers et al., 1997). Since then, IS performance evaluation has been investigated from three perspectives, that are IS effectiveness or success, IS function evaluation and IS service quality (Chang & King, 2000). IS effectiveness or success being the focus of this research, will be discussed further.

According to Myers et al. (1997, p.7), IS effectiveness is “concerned about the impact of the information provided in helping users do their jobs”. Thong, Yap and Raman (1994, p. 214) further define IS effectiveness as “the extent to which an information system actually contributes to achieving organisational goals”. IS researchers have come up with variety of measures to help organisations in justifying the value and contribution of the IS investment to the productivity, quality and competitiveness of the organisations (DeLone & McLean 1992, Myers et al., 1997).

From the literature, the IS Success measures can be divided into two types (Ifinedo, 2006). The first type focuses on the use of perceptual, attitude or subjective measures, for example User Satisfaction, that was introduced by Bailey and Person (1983), and Perceived Usefulness, by Davis (1989). Using perceptual measures, the IS is evaluated based on the perception or feelings of the users towards the IS (Ballantine, Levy, Munro, & Powell, 2000). The second type focuses on financial or objective measures such as Return on Investment (ROI) and Cost Savings (Myers et al., 1997, Seddon et al., 2002). Many IS researchers argue that using financial or objective measures alone in measuring IS is often not enough to justify the IT investment (Ballantine et al., 2000, Wu & Wang, 2007). Making decision and plans for IS investment should not only rely on the technical aspect or be based on certain authority decisions (for example decisions that were made by certain level of cohorts). It should also consider the view from those who will be affected by the consequence of these decisions (Ballantine et al., 2000). Moreover, a contemporary IS such as ES is complex because of the integrated modules spanning an organisation (Gargeya & Brady, 2005, Peslak, 2006, Scott & Vessey, 2000) and involves a variety of users (Skok & Legge, 2001).

IS is capable of providing both tangible and intangible benefits. Tangible benefits include cost reduction, productivity improvement and revenue/profit increase. Intangible benefits include flexibility, responsiveness and reliability. These intangible benefits are difficult to quantify, making objective measure inappropriate (Brynjolfsson, 1993, Saarinen, 1996, Wu & Wang, 2007). According to Gargeya and

Brady (2005), the cost of IS is incurred in three areas: software, hardware and personnel (human resources). The human cost is the largest compared to software and hardware costs. However, it is the least considered by many practitioners. This is because the human cost is not easy to quantify (Davenport, 2000).

With a wide variety of measures, IS researchers face difficulty in choosing the best measures for IS success (Rai et al., 2002). Furthermore, large numbers of studies have focuses on various aspects of IS success and very few studies discussed their selection of measures for measuring IS success (DeLone & McLean, 1992). Moreover, some researchers used only a single construct, for example User Satisfaction, for measuring IS success. However, other researchers agree that using a single construct is not enough for measuring overall success of an IS because an IS is complex and its evaluation should not only focus on one aspect of IS success (DeLone & McLean, 1992, Myers et al., 1997, Rai et al., 2002, Wu & Wang, 2007). This prompts the need for an integrated, multi-construct measure of IS success for a more comprehensive view of IS success (DeLone & McLean, 1992, Rai et al., 2002).

2.4 IS SUCCESS MODEL AND FRAMEWORK

There are a number of IT/IS success models or frameworks identified from the literature, for example The Balanced Scorecard (Kaplan & Norton, 1992), ERP Benefits Framework (Shang & Seddon, 2000), IS Function Performance Evaluation Model (Saunders & Jones, 1992), Bancroft's nine critical success factors (Bancroft, Sep & Sprengel, 1998) and the widely cited and tested IS Success Model (DeLone & McLean, 1992, 2003). Recently, Gable, Sedera and Chan (2008) introduced a comprehensive validated model to measure the impact of a contemporary IS such as ES. This model was developed based on some weaknesses identified from previous models or frameworks (Gable et al., 2008). The following sub sections discuss two of these measurement models, the IS Success Model and the IS-Impact Model. These two models are closely related to this research; the former provides an understanding of the IS success phenomena while the latter is a comprehensive measurement model that is adopted as the theoretical foundation of this research.

2.4.1 The DeLone and McLean IS success model

The DeLone and McLean IS Success (1992) model is the most cited and referred to by researchers whose work is involved in evaluating or measuring the success of IS (Myers et al., 1997, Rai et al., 2002, Sedera & Gable, 2004). This model has contributed to IS success study by improving the understanding of information systems evaluation (Seddon, 1997).

DeLone and McLean reviewed empirical studies on IS success published in seven top IS publications between the years 1981 to 1987 (DeLone & McLean, 1992). Based on the review, they discovered that IS researchers produced many individual dependent measures to gauge IS success. In an attempt to reduce the number of measures, DeLone and McLean have used Shannon and Weaver communication research and Mason's information influence theory as a foundation for their research. They came up with a taxonomy and a model, famously known as the "D&M IS Success Model", as frameworks to provide a comprehensive view of IS success and for operationalizing IS success.

This model consists of six dimensions of success or six categories of success that are proposed to be interrelated and interdependent. These dimensions are 'System Quality', 'Information Quality', 'Use', 'User Satisfaction', 'Individual Impact' and 'Organizational Impact'. *Figure 2.1* presents the D&M IS success model. DeLone and McLean (1992) further encourage IS researchers to "systematically combine individual measures of IS success categories to create a comprehensive measurement instrument" (p. 87-88).

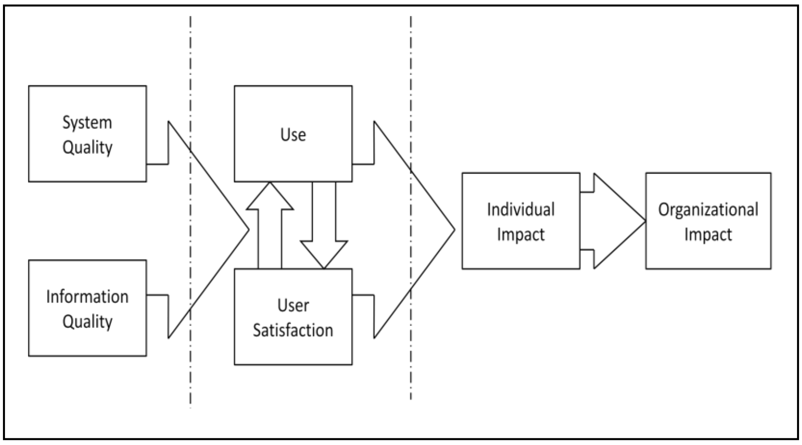


Figure 2.1. DeLone and McLean IS success model.
(adapted from DeLone and McLean, 1992)

2.4.2 The DeLone and McLean updated model

According to Seddon (1997) and Myers et al. (1997), DeLone and McLean's work makes a number of important contributions to the understanding of IS success. Firstly, it combines previous research. Secondly, it provides a scheme for classifying different measures of IS success identified from the literature into six dimensions. Thirdly, it suggests a model of temporal and causal interdependencies between the identified categories. Fourthly, it makes the first moves to identify different stakeholder groups in the process. Fifthly, it has been considered an appropriate base for further empirical and theoretical research. And, finally, it has met general acceptance in the IS community.

Since it was introduced in 1992, many researchers have implemented the model in real case studies. In fact, some studies have empirically tested the relationships among the dimensions (Rai et al., 2002) and found significant associations among all the links in the model. These studies have provided strong support for the causal interdependencies proposed by DeLone and McLean.

Although this model has provide the holistic view of IS measure and has been popular among researchers, it has also received many critical reviews and suggestions from several researchers (DeLone & McLean, 2003). Seddon (1997) was among the first to test the model, has criticized the model specifically on two issues: (1) confusion in combining both process and causal explanations of IS success, and (2) the ambiguity of the Use dimension. Seddon further introduced an extended model to overcome the confusion. The model has also received some further suggestions for modification. For example, Myers et al. (1997) introduced a Work Group dimensions. Pitt, Watson and Kavan (1995) suggest 'Service Quality' to be added as an additional dimension in the model. Others have suggested the inclusion of industry impacts, consumer impacts, and societal impacts (DeLone & McLean, 2003).

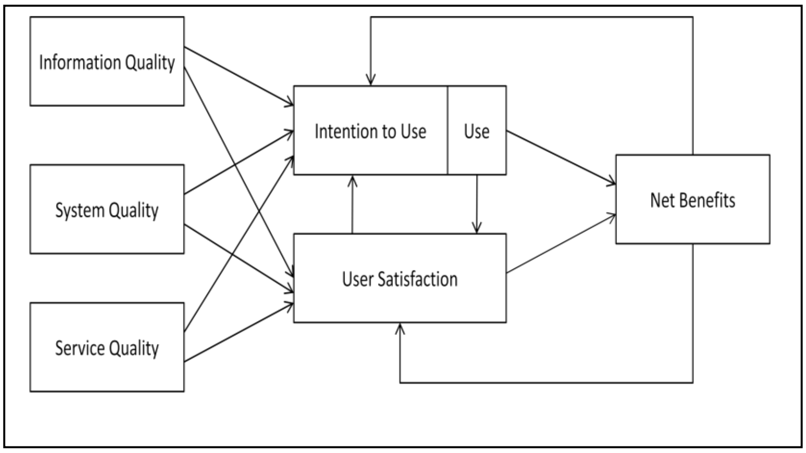


Figure 2.2. The updated DeLone and McLean IS success model.

There are a number of changes made to the D&M model (*Figure 2.2*). First, DeLone and McLean have added 'Service Quality' as the third dimensions of quality. Second, the 'Use' dimension is split into two with 'Intention to use' has direct causal links from the three quality dimensions in order to solve the ambiguity problem. Third, 'Net Benefits' is introduced as the impacts measure, replacing the 'Individual' and 'Organizational' impacts, perceiving that impacts on information systems are not constrained only to the organisation and the individual. The 'Net Benefits' will capture positive as well as negative impacts of IS to the stakeholders, or even industries, economies and societies. Fourth, there are feedback loops coming from the 'Net Benefits' to the 'Use' and 'User Satisfaction' dimensions. The feedback loops reflect that the continuation or discontinuation of use and user satisfaction of an information system is influence by the net benefits (for example the impact of the IS to the individual, organisation or society). Lastly, the arrows demonstrate associations among dimensions in a process sense, but do not show positive or negative signs for those associations in a causal sense.

2.4.3 The IS-Impact measurement model

In 2003, Gable, Sedera and Chan introduced a measurement model for benchmarking IS. This measurement model was developed in response to the lack of a standardized, validated and reliable measurement model for measuring contemporary IS such as enterprise system (ES) (Gable et al., 2008, Sedera & Gable, 2004). Furthermore, existing traditional measurement models, commonly used to measure financial criteria of a traditional IS, may not be suitable in measuring a complex system such as an enterprise system.

The development of the IS-Impact model was carried out in two phases: (1) the exploratory phase and (2) the confirmatory phase. In the exploratory phase, two surveys were conducted. Both surveys were conducted at 27 Queensland government agencies that had implemented SAP R/3 in the 1990s. The first survey, named as the identification survey, was conducted to identify important set of ES success measures. This survey has resulted in 485 impact citations that were then mapped into the DeLone and McLean's IS success model in order to develop the *a- priori* model. Before the mapping process, the DeLone and McLean's model and supplemented measures from Myers et al. (1997) IS assessment selection model, were first analysed to exclude overlapping and redundancy measures. Some overly financial or non-perceptual measures are excluded from the model. At the end of this exercise, 85 measures remained, and these were used as the reference model in the citation mapping activity. Further, in the mapping process, some measures were eliminated and some consolidated because of redundancy, and at arriving mutual exclusivity and parsimony measurement. New measures were also added when the citations did not map into any existing measure. At the end of this process, *a-priori* model containing four dimensions and 37 measures were derived. *Figure 2.3* shows the *a-priori* model.

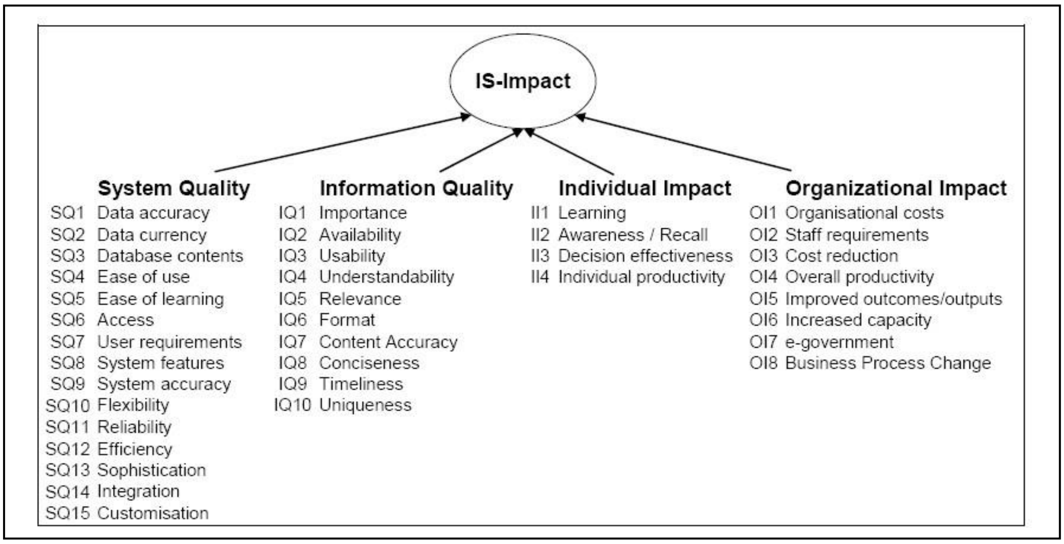


Figure 2.3. The 37 measures of the IS-Impact model (the *a-priori* model).
(adapted from Gable et al., 2008)

The second survey, a specification survey, was conducted to further specify the dimensions and measures of the *a-priori* model. From the statistical analysis, 10 measures were dropped, leaving 27 validated measures (Gable et al., 2003, 2008).

In the confirmatory phase, the IS-Impact model derived from the exploratory phase was tested for reliability and validity using new data set. A third survey, a confirmatory survey, was conducted at a large university that had implemented ORACLE Financials in the late 1990s (Gable et al., 2008). In this survey, the instrument containing 26 items (one item, 'e-Government' was excluded because it was considered irrelevant in this context) were measured on a seven point LIKERT scale. Results have confirmed the validity of the four dimensions and when combined represents a complete measure of information system success.

Figure 2.4 shows the IS-Impact model with four dimensions, which are Individual Impact, Organizational Impact, Information Quality and System Quality. Individual Impact is a measure of the extent to which the IS has influence the capabilities and effectiveness, on behalf of the organisation, of the key-users. Organizational Impact is a measure of the extent to which the IS has promoted improvement in organisational result and capabilities. Information Quality is a measure of the quality of the IS outputs: namely, the quality of the information the system produces in reports and on-screen. System Quality is a measure of the performance of the IS from a technical and design perspectives. The two impact dimensions are an assessment of benefits that have followed (or not) from the system. The quality dimensions act as proxy measures of probable future impacts. The additivity of these four dimensions reflects a comprehensive, overarching measure of IS-Impact.

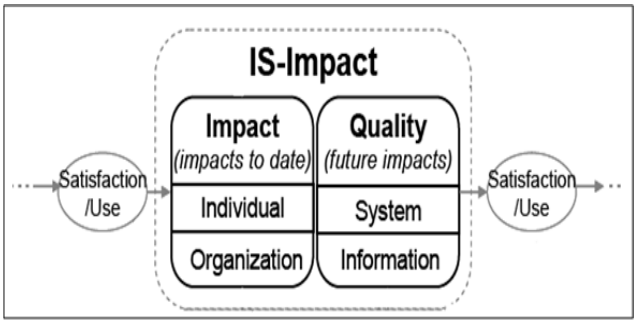


Figure 2.4. The IS-Impact measurement model.

According to Gable et al. (2003), the IS-Impact model deviates from the DeLone and McLean model in five ways. First, it does not present a causal or process model of success, but rather it is a multi-dimension measurement model. Second, the Use construct was excluded from the model because there were only 12 citations mapped into the construct in the analysis of the gathered data. Third, Satisfaction was conceptualized as an overarching measure of IS success rather than as a dimension in the IS-Impact model. Fourth, new measures were added to evaluate contemporary IS. And, finally, the model includes additional measures to explore a more holistic organisational impact dimension.

The model along with its instrument has a number of advantages. Although the study context was enterprise system, the aim is to develop a measurement model for evaluating not just ES, but also contemporary IS. The model can measure current impacts of IS and at the same time forecast potential future impact of the system. The model contains multiple dimensions and measures for evaluating total impact of IS. Although the model contains multiple dimensions and measures, it is simple and economical which make the model easy to use. The model measures the impact of IS across all relevant systems users in order to reach a holistic impact to the organisation. Furthermore, the model can be used as a benchmarking tool and track the performance of IS in use.

2.5 IT IN MALAYSIA

Malaysia is moving towards developed country status by the year 2020. Information and Communication Technology (ICT) has been recommended as being a catalyst for the development of the country (Kasimin & Ibrahim, 2009, Ng Choon Sim & Yong, n.d., SharifahM, 1995). The Malaysian government has taken a pro-active approach by providing many incentives and has introduced policies for the development of infrastructure and human capital (Abdullah & Ahmad, 2001). Several initiatives have been planned, for example, The National Information Technology Agenda (NITA) was formulated in 1996 to provide a framework for coordinating and integrating approach in developing three strategic elements, comprising human resource, info-structure and IT-based application. Under NITA a Demonstrator Application Programme was introduced to give opportunity for Malaysians to create software and contents that are indigenous in design, local in content and customised to the needs of the local community (Ng Choon Sim & Yong, n.d.).

More than a decade ago, the Multimedia Super Corridor (MSC) was launched to provide the catalyst for the expansion of IT and multimedia industries in Malaysia. The MSC is considered a long-term strategic initiative (1996 - 2020) which involves the Government and the private sector. Under MSC, seven key-projects has been established, i.e. e-government, national multipurpose card (MyKad), smart schools, telemedicine, e-business, worldwide manufacturing web and R&D cluster (Kakroo, 2007, Raman, Kaliannan & Yu, 2007). Conceptualized in 1996, MSC Malaysia has since grown into a thriving dynamic ICT hub, hosting more than 900 multinationals, and foreign-owned and home-grown Malaysian companies focused on multimedia and communications products, solutions, services and, research and development. Until March 2008, the Malaysian government had awarded MSC status to 2,006 companies, ranging from local to foreign businesses, to enjoy the benefits and privileges that were provided by Malaysian government to help these companies grow their businesses (Mohamed, Hussein, Ahlan & Hazza, 2009). As the MSC project enters its second decade, Business Monitor International forecasted that the total size of the IT market increased from US$2.9bn in 2005 to around US$4.8bn in 2010 (World Trade Executive, n.d.).

The IT services market in Malaysia is forecast to grow at the rate of 6.1% from 2006 through 2011. Basic e-business applications such as ERP and financial systems are gaining popularity with the business market (World Trade Executive, n.d.). From the Gartner report (Ng & Singh, 2007), IBM and HP are the leaders in the product support ESPs market in Malaysia, with revenues between 45 million (RM) and 300 million (RM). IBM has shown its strong presence in the financial services, government, telecommunications and manufacturing sectors. In the outsourcing market, Heitech Padu and IBM dominate the market. Heitech Padu is a local public listed company with close ties to the government and government-linked companies (GLC). Meanwhile, Accenture, followed closely by PricewaterhouseCoopers and Deloitte, leads the consulting market in Malaysia. Furthermore, Accenture continues to lead the system integration market, despite a slow growth in this market being reported by Gartner in 2006.

2.5.1 IT/IS in public sector in Malaysia

The public sector in Malaysia has been the major investor and user of information technology. The government bought the first computer, an IBM Sys/360 in 1965, to run a payroll system for National Electricity Board (Sharifa hM, 1995). In earlier years, during IT implementations in the public sector (from 1988 to 1992), 320 Government IT projects with total value of RM749.93 million were approved by the Malaysian Administrative Modernization and Management Planning (MAMPU). These IT projects include IT implementation at universities, Royal Malaysian Police, Royal Customs and Excise Department, and IT upgrading for Defence Ministry's financial systems, upgrading the Internal Revenue Department's computer system and computerization of Federal Agriculture Marketing Authority (FAMA). In 1992, the Government Integrated Telecommunication Network (GITN) was launched to enhance the data communication infrastructure for an integrated network environment. Following that, the government introduced the Civil Service Link (CSL), Public Service Network (PSN) and Electronic Data Interchange (EDI), especially for customs and ports, general hospitals and the immigration department (SharifahM, 1995) to strengthen the move towards a more intensive use of IT in intra-governmental transaction. Since then, the allocation for and expenditure for the purchase of information IT has increased steadily (Abdullah & Ahmad, 2001).

Information technology (IT) transfer in the public sectors is usually due to policy implementation that was set by the government. The Malaysian government set up the National Telecommunication Policy (NTP), that calls for the development of a sophisticated IT infrastructure to meet the country's needs in achieving the national vision 2020 (SharifahM, 1995). One of the policies was to encourage all government agencies to install and use IT in order to meet current challenges and to cope with demand for better services from the public, moving towards the e-government initiative, which is one of the seven flagships of MSC (Abdul Karim, 1997, Abdullah & Ahmad, 2001, Raman et al., 2007). In the context of Malaysia, e-government is a multimedia networked paperless administration linking government agencies within the Federal administrative centre at Putrajaya and government agencies around the country.

In the Public Sector ICT Strategic Plan announced in 2003, nine strategic initiatives were initiated by MAMPU to enable all government agencies to operate in a fully integrated electronic environment (Raman et al., 2007). These strategic initiatives are:

- Citizen centric portal,
- Business community portal,
- Local government system,
- Land and property system,
- Online income tax,
- Integrated financial management system,
- Government to employee portal,
- E-learning, and
- E-social services.

Around the year 2004 to 2005, the government rolled out more pilot projects nationwide and the implementation of E-court, E-land and E-perolehan. Moreover, Human Resource Management Information System (HRMIS) that was implemented at 10 pilot agencies was rolled out to other agencies. Meanwhile, many government agencies services have been improved, such as:

- Road Transport Department (RTD) summons/enquiry and payment services,

- RTD learners driver’s license issuance and renewal services,
- RTD electronic scheduling and theory test,
- Royal Malaysian Police traffic summons/enquiry services, and
- Tenaga Nasional and Telekom Malaysia: utility bill enquiry and payment services.

Furthermore, a body of legislation (acts) were created and approved by Parliament to instil confidence in the reliability and effectiveness of the various mechanisms and systems under e-government initiative. For example include, the Digital Signature Act 1997, the Computer Crime Act 1997, the Copyright Act (amendment 1997), the Telemedicine Act 1998, and the Communications and Multimedia Act 1998 (Abdul Karim, 1997, Abdullah & Ahmad, 2001).

2.5.2 IT/IS evaluation in Malaysia

Literature on IS success has provided evidence that this area of study is popular in Western countries. In fact, this area of research has been ongoing for nearly three decades. However, the scenario in Malaysia is not the same. Searching for articles on IT/IS evaluation has resulted in just a small number of published papers retrieved via electronic media. None were published in top-tier IS journals and conferences, and most of the papers are published conference papers. Moreover, there have been just a few empirical studies on IS success in Malaysia, with some studies trying to understand IS success and investigate factors that contribute to the success of IS (i.e. Hussein, Karim, Mohamed & Ahlan, 2007, Mohamed, Husin & Hussein, 2006). The researcher is seeking evidence for any available framework or measurement model that is used by practitioners and researchers in Malaysia for evaluating their IS systems. It is one way of identifying important measures that can be added to the IS-Impact model based on the Malaysia context.

There are two reasons that may contribute to the small number of published studies on IS evaluation in Malaysia. First, the researcher believes that related studies on IS evaluation in Malaysia are published in Malaysian academic journals. However, limited access to these journals has been a constraint in locating relevant articles through the internet. Second, although IT/IS has been around in Malaysia since the early 60s, many IT/IS evaluation studies have extensively focused on implementation issues; thus, papers that discuss IT/IS adoption and acceptance (and employ Technology of Acceptance Model (TAM)) are easier to find. This also contributed to the fact that most Malaysian IT services are at a relatively basic level of customer sales-support, IT support and application development. However, there is evidence that the IT/IS industry and market in Malaysia are moving up the value chain, with many projects having been installed and in the maintenance stage (World Trade Executive, n.d.).

Moreover, based on a small number of published papers, it can be argued that research studies in evaluating IT/IS post-implementation are emerging, based on the work of Hussein, Karim, Mohamed and Ahlan (2007) and Hussein, Selamat and NS (2005). Hussein et al. (2007, 2005) were looking at the impact of e-government on several public organisations in Malaysia by applying DeLone and McLean's dimensions of IS Success. With a small numbers of studies of IS success in Malaysia, it provides an opportunity for the research to introduce and promote this domain of research, especially the IS-Impact model, in Malaysia.

Table 2.1 summaries eight of the studies that investigate IS adoption or implementation success and factors contributing to a success IS. These studies have employed a single method, either a quantitative survey or case study, at different type of organisations (public to private sector, small to large organisations). Given that many IS applications installed in many organisations in Malaysia are now in a mature state, IS researchers in Malaysia should now move their attention to the impact that these IS applications bring to the organisations to identify the state of these IS applications for future investment and planning.

Table 2.1

Articles on IT/IS Evaluation in Malaysia

#	Author(s)	Year	Publication	Issue addressed	Theory used	Method used	Type of Organisation
1	Hussein, Karim, Mohamed and Ahlan	2007	EJISDC	To investigate the influence of organisational factors on IS success and provide better understanding of the impact of organizational factors on IS Success in Malaysian e-government agencies.	D&M (constructs: SQ, IQ, Use and Satisfaction) and organisational factors (top management support, decision making structure, management style, managerial IT knowledge, goal alignment and resources allocation)	Survey	Public sector agencies
2	Ramayah and Lo	2007	Management Research News [Journal]	To examine the impact of shared beliefs concerning the benefits of ERP among executives and engineers in the northern region of Malaysia.	TAM (Technology of Acceptance Model)	Survey	Private sector (manufacturing industry)
3	Norhani and Rugayah	2005	ACIS 05 [Conference]	To examine the cultural influences on IT usage amongst industrial workers in Malaysia and the factors that influence the IT usage, their innovativeness and barriers that hinder IT application.	Modified TAM model.	Survey	Private sector (multiple types of industries)

#	Author(s)	Year	Publication	Issue addressed	Theory used	Method used	Type of Organisation
4	Zain, Rose, Abdullah and Masrom	2005	Information & Management [Journal]	To identify the relationships between IT acceptance and organizational agility in order to see how the acceptance of the technology contributes to a firm's ability to be an agile competitor.	TAM	Survey	Private sector (manufacturing industry)
5	Hussein, Selamat and Abdul Karim	2005	IIT 05 [Conference]	To investigate the influence of technological factors on DeLone and McLean's IS success dimension. (Are the technological factors antecedent to D&M model).	D&M (SQ, IQ, Use and Satisfaction) and technological factors (IS competency, IS facilities, IS integration, IS structure and user support).	Survey	Public sector agencies
6	Azlinah and Syed Helmi	2004	Electronic government 2004 [Book]	To foresee whether Malaysia has the potential to achieve successful implementation of IS.	Chris Sauer's dependencies model	Archival analysis	None in particular

#	Author(s)	Year	Publication	Issue addressed	Theory used	Method used	Type of Organisation
7	Daud and Kamsin	2004	WISICT '04 [Conference]	To understanding how information systems (IS) affect some key measures of work and organization structure.	None	Case study	Large organisation
8	Ndubisi and Jantan	2003	Logistics Information Management [Journal]	Impact of IS usage in Malaysian small and medium firms (SMF). Hypothesizes that perceived usefulness and perceived ease of use, and usage will be greater when there is greater computing skill and strong technical backing.	TAM (theory of acceptance, perceived usefulness and ease of use).	Survey	Small and medium firms

2.6 ISSUES WITH CURRENT IS SUCCESS OR IMPACT STUDIES

As mentioned in the opening chapter, one of the objectives of a literature review is to identify gaps or limitations from previous studies to position this research in the area of IS Success or Impact. From this review, there are a number of gaps identified that will be addressed in the following sub sections. These gaps are divided into two: gaps identified from previous IS Success studies and limitations of the IS-Impact model.

2.6.1 Gaps from previous IS success studies

From the literature, there is evidence of strong research in the area of IS/IT evaluation, both from the practical and knowledge perspectives. However, there are some limitations and weaknesses identified that are addressed in the following sub sections.

Pre-implementation vs post-implementation evaluation

IS success studies have mostly investigated the issue of implementation success and, less so, post-implementation evaluation. The focus and objective of these two stages of evaluation are different. Implementation evaluation focuses on implementation issues and factors for a successful IS project while the post-implementation evaluation focuses on the performance of the IS and the benefits or the impact that the systems provide to the users and the organisations after going live or at the utilization stage (Gargeya & Brady, 2005). Many available measures that were introduced in the literature are designed and tested in the implementation phase. These measures may not be appropriate to use in the post-implementation stage because of the differing objective. Shang and Seddon (2000) argue that different sets of measures are needed for evaluating IS in different phases of the IS lifecycle.

To overcome this problem, Shang and Seddon (2000) introduced an ES Benefit framework that provides a detail list of benefits that may achieved from an enterprise system. The framework consolidated benefits into five dimensions: operational, managerial, strategic, IT infrastructure and organizational. Though this is an ES-specific success model and accommodates multidimensionality and relevant ES success measures, it focuses on the organisation's perspective rather than the system itself. In addition, some of the measures are perceived as overlapping across dimensions (Gable et al., 2008). Furthermore, the framework focuses on benefits from only a managerial perspective. The framework is far from a model and the suggested measures have never been operationalized into an instrument. IS-Impact model is one measurement model that was designed to evaluate IS at the post-implementation stage, but it has some limitations that need to be addressed in future work.

Systematic approach to select IS success measures

Many IS success researchers have selected measures without providing a rationale for their selection of measures. It is believed that the choice of inconsistent measures for measuring IS Success has resulted in inconsistent empirical results with regard to the construct relationships (Burton-Jones & Straub, 2006, Rai et al., 2006, Sabherwal et al., 2006). As a result, it is difficult to assess how studies are interrelated when these studies are not using the same set of measures. Therefore, findings between these studies are incomparable.

A common method employed by many IS researchers for selecting measures is through extensive review of literature in the focus area (Petter et al., 2007). However, Gable et al. (2008) argue that this approach is inadequate. They used a systematic approach to specify and validate their selection of measures by employing two types of surveys (qualitative and quantitative). They argue that their approach of employing surveys (supplemented with literature study) will ensure that (1) the referent measures and dimensions are not only conceptually, but also empirically relevant in the contemporary context, and (2) new measures or dimensions not already identified in the literature but possibly of significance in that environment are specified (Gable et al. (2008), p. 384).

Burton-Jones and Straub (2006) introduced a similar systematic approach for operationalizing construct and selecting measures in a theoretically rigorous way. This approach involves two stages: defining the context and selecting the appropriate measures that are relevant to the context. Their two-stage approach adheres to two of the four issues on successful index construction for a formative construct found in the marketing literature which, are content specification and indicator specification (Diamantopolous & Winklhofer, 2001).

Clearly, there is value in employing a systematic approach for selecting appropriate measures to adequately capture the domain of interest, which is found lacking in the IS studies. This approach would be a relevant approach when trying to apply the same construct to a wide range of contexts or research settings that are new and under explore especially with limited literature.

Instrument validation

Another issue that is often discussed in IS literature is whether the IS researchers have sufficiently validated their quantitative instrument (Boudreau, Gefen, & Straub, 2001, Straub, 1989, Straub, Boudreau, & Gefen, 2004). This issue was raised by Straub in 1989 when he discovered that 17% of IS studies (published in three widely referenced IS journals between January 1985 to August 1988) reported reliability of their scales, 14% had validated their instrument and 19% had conducted either pretest or pilot test of their survey instrument. A concern raised regarding this issue is whether the measures that were selected and used by IS researchers are valid and whether the findings and interpretations from these measures can be trusted (Straub, 1989). In 2001, Boudreau and Gefen conducted a follow up study to see if there is any improvement made by IS researchers regarding the issue with instrument validation eleven years after Straub (1989) published his paper. Their finding suggests that there is slow but steady progress towards rigorous instrument validation in IS field. This indicates that the IS researchers had started taking instrument validation more seriously than before.

Straub et al. (2004) further argue that valid measures (p. 381):

- Represent the essence or content upon which the construct is focused.
- Are unitary.
- Are not easily confused by other constructs.
- Predict well.
- Where are supposed to manipulate the experience of subjects, they do so.

He further added that a validated instrument would give researchers, their peers, and society as a whole a high degree of confidence that the method being selected is useful in the quest of scientific truth. To help IS researchers validate their instrument with rigour, Straub et al. (2004) have offered research heuristics based on five key instrument validities (content validity, construct validity, reliability, manipulation validity and statistical validity). Each of these key validities is labeled as being mandatory, highly recommended or optional in order to provide guidelines for IS researchers to choose the appropriate validation tests.

Formative and Reflective Model

More recently, there has been a discussion among IS researchers about formative and reflective constructs and on measurement model misspecification. Commonly, reflective measures are used as indicators or measures to examine a latent variable (or construct). An alternative to this type of measure is a formative measure. However, many IS researchers have neglected it despite its appropriateness to represent a construct. This may be because many researchers have focused more on the structural model but fewer consider the relationship between the measures and their latent construct (Jarvis et al., 2003). Thus, these researchers assume their measurement model contains constructs that are by default reflective (Diamantopoulos & Winklhofer, 2001) rather than formative.

The difference between reflective and formative constructs is based on the causal relationship (or the direction) between the measures and the latent variable. A latent variable is an abstraction that describes the "phenomena of theoretical interest" which cannot be directly observed and have to be assessed by manifest measures (variables) which are observable (Cenfetelli & Bassellier, 2009, Diamantopolous & Winklhofer, 2001, Diamantopolous, Riefler & Roth, 2008, Fornel & Bookstein, 1982, Petter et al., 2007). Thus, an unobserved construct is represented by observed variables or indicators that can be treated as reflective or formative. A reflective construct has observed measures that are affected by the latent variable. In other words, the latent variable will cause changes to the observed measures. In contrast, a formative construct contains formative measures that work the opposite way of reflective measures. These formative measures will cause change to the latent variable. Formative measures are also known as composite variables because these measures make up or form the construct. Thus, removing or adding a formative measure would have implication for the content coverage and the meaning of the construct (Diamantopoulos & Winklhofer, 2001, Petter et al., 2007). Table 2.2 below provides a list of criteria to determine formative and reflective models.

Table 2.2

Comparison of Formative and Reflective Models

Criteria	Formative model	Reflective model
1. Direction of causality from construct to measure implied by the conceptual definition	*Direction of causality is from items to construct*	*Direction of causality is from construct to items*
Are the indicators (items) (a) defining characteristics or (b) manifestations of the construct?	Indicators are defining characteristics of the construct	Indicators are manifestation of the construct
Would changes in the indicators/items cause changes in the construct or not?	Changes in the indicators should cause changes in the construct	Changes in the indicators should not cause changes in the construct
Would changes in the construct cause changes in the indicators?	Changes in the construct do not cause changes in the indicators	Changes in the construct do cause changes in the indicators
2. Interchangeability of the indicators/items	*Indicator need not be interchangeable*	*Indicators should be interchangeable*
Should the indicators have the same or similar content? Do the indicators share a common theme?	Indicators need not have the same or similar content/indicators need not share a common theme	Indicators should have the same or similar content/indicators should share a common theme
Would dropping one of the indicators alter the conceptual domain of the construct?	Dropping an indicator may alter the conceptual domain of the construct	Dropping an indicator should not alter the conceptual domain of the construct
3. Co-variation among the indicators	*Not necessary for indicators to co-vary with each other*	*Indicators are expected to co-vary with each other*
Should a change in one of the indicators be associated with changes in the other indicators?	Not necessarily	Yes
4. Nomological net of the construct indicators	*Nomological net of the indicators may differ*	*Nomological net of the indicators should not differ*
Are the indicators/items expected to have the same antecedents and consequences?	Indicators are not required to have the same antecedents and consequences	Indicators are required to have the same antecedents and consequences

Adapted from Jarvis et al., 2003

According to Petter et al. (2007), many IS researchers are believed to have misspecified their measurement model as reflective and validate the measures as reflective, when they have actually conceived their measurement models as formative. This misspecification of formative or reflective measures can cause measurement error and affects the validity of the model (Jarvis et al., 2003) which increases the potential for both Type I and Type II errors. Type I error occurs when making false positive by declaring a path significant when it is really non-significant). Meanwhile, Type II error occurs when making a false negative by declaring a path non-significant when it is really significant (Petter et al., 2007).

There are a number of factors that may have caused this problem. First, lack of knowledge to identify formative measures has caused many researchers to miscategorise their model construct as reflective, when actually the construct is formative. Second, even though a researcher can identify formative constructs within the measurement model, the researcher may not have knowledge of how to analyse and assess the measurement model (Jarvis et al., 2003, Petter et al., 2007). Furthermore, guidelines for assessing the validity of formative constructs are difficult to find (Diamantopoulos & Winklholfer, 2001) compared to reflective constructs validation, which is well established (Straub et al., 2004). Additionally, wrong tools or Structural Equation Modeling (SEM) technique, for example using a co-variance-based SEM as implemented in LISREL, AMOS, EQS, SEPATH, and RAMONA (Urbach & Ahlemann, 2010) that only support co-variances among the measures is problematic for formative constructs (Chin, 1998). According to Jarvis et al. (2003), co-variation among formative measures is not necessary. This view is supported by Fornell and Bookstein (1982) who found that for similar tested models, LISREL and PLS (a component-based approach) present systematically different results. This is because these methods are different in terms of factor structure, mechanism of statistical inferences, matters of identification and interpretation of measurement error.

Petter et al. (2007) have provided guidelines for specifying and validating formative constructs, both before and after data collection. However, guidelines for interpreting results from statistical results are still lacking (Cenfetelli & Basselier, 2009) and inconsistent (Andreev, Heart, Maoz, & Pliskin, 2009). In the literature, some researchers are beginning to argue the instability in the estimation of formative measurement (Kim, Shin, & Grover, 2010). Moreover, according to several researchers, formative construct is subjected to interpretational confounding (Howell, Breivik, & Wilcox, 2007, Wilcox, Howell, & Breivik, 2008). Bollen (2007) argues that there are weaknesses of the validation methods used in prior studies. Clearly, there are considerable ongoing debate on formative construct specification and validation in the literature (Bagozzi, 2007, Coltman, Devinney, Midgley, & Venaik, 2008) thus there is yet a lack of concensus on what is appropriate (Polites, Roberts & Thatcher, 2011). Diamantopolous, Riefler and Roth (2008) acknowledge that more empirical studies are needed to clarify conceptual and practical issues of formative measurement models. They mention that, "literature has only recently started to pay serious attention to formative measurement models and empirical applications are still rare. As a result, experience with formative measures is limited and several conceptual and practical issues are not fully clarified yet" (Diamantopolous et al., 2008, p. 1211). Thus, there is a strong need for further research building up from prior studies to address limitations identified in the literature.

2.6.2 Limitation of the IS-Impact model

The IS-Impact measurement model introduced by Gable et al. (2003, 2008) forms the theoretical foundation in this research. It plays an important role for this research as the entire work revolves around this model. Section 2.4.3 has discussed in detail the development of the model and many advantages of the model. However, there are some limitations identified that will be addressed in this research. These limitations are discussed in the following section.

Assessing external validity and model completeness

According to Lucas (2003, p.238), external validity "refers to generalisability of research findings beyond the parameters of a particular research". Discussing in the context of social sciences, Lucas (2003) defined generalisability as a "concerns on how measurements will behave similarly across contexts (i.e. time, settings or groups of people)" (p.238). Outcomes from a particular study are bounded by the limitations imposed by the methodology used by the researchers. Researchers often try to generalise their research findings to increase the confidence of their results with the goal of producing general knowledge.

IS researchers have relied on subjective measures to understand phenomena that are impossible to measure directly. Thus, IS researchers are advised to use available and validated instruments because it is practical and efficient. Moreover, using a validated instrument would give researchers, their peers, and society as a whole, a high degree of confidence that the instrument being used is useful in the quest of scientific truth (Boudreau et al., 2001, Straub, 1989). Using a validated instrument will allow researchers to accumulate knowledge, and results are comparable (DeVellis, 2003).

In relation to the IS-Impact model, the model was developed and validated only in the Australian public sector. Gable et al. (2008) acknowledge the fact that this limitation may affect the generalisibility of the measurement model. This limitation has caused concern as to whether the measurement model is consistent or works well in different contexts. Their concern is also shared by many cross-cultural researchers who argue that existing theory or knowledge might not apply in different contexts or cultures (Hui, Chern, & Othman, 2008, Hofstede, 1980, Hunter, 2001, Samaddar & Kadiyala, 2006, Tayeb, 1994). However, any limitation of the model can be identified through replication research. Re-visiting previous findings through replication research is important to increase the confidence of one's propositions (theory, knowledge, measurement) and further demonstrates the applicability of one's findings to a wider and different population (King & He, 2005). The importance of testing external validity is supported by DeVellis (2003, p. 159), "It is important to think about one's findings. Especially if the results appear strongly counterintuitive or counter theoretical, the researcher must consider the possibility that the scale is invalid in the context of that particular study (if not more broadly). It may be that the extent to which the validity of the scale generalizes across populations, settings, specific details of administration, or an assortment of other dimensions, is limited."

Addressing the external validity of the IS-Impact model will also improve the comprehensiveness of the measures through potential identification of relevant new measures in a new context. DeLone and McLean (1992) suggest that a model must be both complete and parsimonious. Although the IS-Impact model has demonstrated completeness, the dimensions and measures were selected from and mapped into a universal pool of measures collected from literature published up to the year 2003. It is possible that there are new measures that have emerged after 2003, both from the current literature or derived from a new context. Moreover, the IS-Impact model was conceptualised as a formative measurement model. In a formative model, the construct comprises a composite of measures or indicators (Diamantopoulos & Winklhofer, 2001). Each of these measures or indicators carries specific facets of the construct. Therefore, for a formative model to be complete, a census of measures is required. Further investigation of completeness is essential for the IS-Impact model to present a comprehensive, up-to-date model and yet a simple one for measuring IS success.

2.7 CHAPTER CONCLUSION

This chapter has discussed on the area of this research by looking at relevant literature in order to provide a better understanding of this research area and to identify research gaps to help positioning this proposed research. The discussion in this chapter begins with a brief overview of the state of IS evaluation and the important for the organisations to evaluate their IS investment to justify the performance of their IS. Further discussion focuses on the DeLone and McLean IS success model and a detailed description of the IS-impact model. The chapter than move on to some discussion on IS evaluation in Malaysia and research gaps identified in IS evaluation studies in Malaysia.

Ensuring the effectiveness of information systems is an important factor in justifying the investment that has been made so that the organisation will continue receiving the benefits of the system. Many researchers claim that measuring a contemporary information system such as an ES is difficult. This difficulty relates to the complexity of the ES, the widespread range of benefits (both tangible and intangible) that the systems could provide to the organisation, and the involvement of multiple levels of users in an organisation.

Though there are a variety of measures that can be used to measure the impact of IS, there is some disagreement on ‘how’ and ‘what’ to measure in relation to IS success. Furthermore, most of available measures and models were validated with traditional IS and largely were designed for evaluating IS project success, less for measuring the performance of the IS in post-implementation stage. To date, there are few models or frameworks for evaluating IS success. One of them has been tested and validated by researchers at IT Professional Services, Queensland University of Technology. The IS-Impact model, together with its instrument, has been validated and found reliable in measuring contemporary information systems such as enterprise systems. However, there are some limitations identified that encourage further research in validating the IS-Impact model. One is to address the external validity of the model. Another is related to the approach for testing the structural relationship between the measures and the dimensions, and the validity of the model in the IS nomological net.

This review of literature has also shown the importance of extending the IS-impact model in the Malaysia context. From the review, it is found that the number of studies in IT/IS evaluation is very small. Thus, this research will give benefits in two ways, first by testing the robustness of the IS-impact model in a different context and, also by introducing the model to Malaysian practitioners and academics. These will contribute to both knowledge and practice, as well as yielding a universal measurement model instrument that can be used by practitioners in benchmarking their IS, to date and for the future.

The last section in this chapter discussed the research gaps identified from previous studies. The researcher has discussed some limitations regarding the model and approach used for evaluating an IS. This includes the confounding issues on measurement model validation with recent attention of formative construct measurement model. Clearly, with the identification of these research gaps, there is a need to address these limitations through further validation study, which also supports this replication study, to meet the goal of this research.

Chapter 3 : Research Design

3.1 CHAPTER INTRODUCTION

Research design is an important stage in any research project. It presents the structure of the major parts in a research project and describes how these parts work together in order to address the research questions. A research design should reflects planning, and describe methods and resources to sustain the effort necessary for the successful completion of the project.

In this chapter the research strategy, methodology and the research design will be discussed in detail. The chapter begins with an overview of the research strategy from which a design of the research is derived. This is followed by a discussion on the research methodology that employed two surveys in two phases: a qualitative survey to explore relevant new measure and a quantitative survey to further validate the IS-Impact model in the new context. Finally, the overall research design is presented.

3.2 RESEARCH STRATEGY

3.2.1 Replication by extending the IS-Impact model in a new context

According to Berthon, Pitt, Michael and Carr (2002), replication is regarded as an approach to verifying knowledge. Replicating previous work can contribute to cumulative knowledge by confirming existing findings, or generating new knowledge or shedding new insights (Brown et al., 2006, Lindsay & Ehrenberg, 1993, Samaddar & Kadiyala, 2006). Replication is widely accepted by researchers, in revisiting previously proposed theory to compare findings and to encourage confidence in the internal validity of findings (Bedeian et al., 1992) as well as external validity (Brady et al., 2005, Tsang & Kwan, 1999). The word research (research) itself promotes the process of going back to observe, investigate or experiment with previous theory for existing gaps and to expand knowledge (Berthon et al., 2002, Samaddar & Kadiyala, 2006).

However, studies relating to theory generation have received more attention than study on theory extension and generalisation, that is the ‘search’ dominates over ‘research’. In fact, replication research paper is difficult to have published in a top tier journal (Berthon et al., 2002, Brown et al., 2006, Hunter, 2001, Lindsay & Ehrenberg, 1993). Lindsay and Ehrenberg (1993) argue that the emphasis on ‘original research’ is the reason behind this, whereas replication research (whether it is successful or not at arriving similar result as the original research) provides the basis for further and deeper explanatory studies and theory (Lucas, 2003). Stressing the important of extension work in the IS field, Brown, Kelley, and Schwarz (2006) state that, “these studies enrich empirical findings, reduce sampling error and increase academic and practitioner confidence in generalisability statements” (p.12).

In order to cultivate replication study in the Management Information Systems (MIS) domain, Berthon et al. (2002) explain that replication has an important role in both objectivist (positivist) and subjectivist (interpretivist) research paradigms. In the objectivist paradigm, replication plays a role in assessing the accuracy of a particular subject (i.e. findings or outcomes). Accuracy here is referring to the validity, reliability, objectivity and generalisability of the subject across different contexts. On the other hand, in the subjectivist paradigm, replication plays a very different role from that in the objectivist paradigm. In the subjectivist paradigm, replication refers to depth of understanding of certain knowledge. For example, repeated observation will deepen the understanding of a particular subject. Berthon et al. (2002) further developed a framework that can help researchers identify the appropriate research strategy and define their ‘research space’. This framework contains eight possible research strategies, as depicted in Table 3.1. In the framework, Berthon et al. (2002) try to distinguish between research involving pure replication, research extension and pure generation.

Table 3.1

Berthon’s Research Space

Type of Study	Df	Theory	Method	Context
Pure Replication	0	r (validation)		
Context Extension	1	r	r	g (generalization)
Method Extension	1	r	g (method triangulation)	r
Theory Extension	1	g (theoretical extension)	r	r
Theory/Method	2	g (theory/method extension)		r
Method/Context	2	r	g (method/context extension)	
Theory/Context	2	g (theory/context extension)	r	g (theory/context extension)
Pure Generation	3	g (generation)		

Note r = replicate; g = generate; Df = number of changed parameter
Adapted from Berthon et al. (2002)

Berthon et al. (2002) explain that pure replication research refers to a duplication of the original research where all research parameters (theory, method and context) are held constant. Extension research refers to a research study that changes one or two research parameters of the original research. For pure generation research, all research parameters are changed; that makes this type of research very different from the original research.

The aims of the IS-Impact research track is to develop the most widely employed measurement model for benchmarking information systems in organisations for the joint benefit of both research and practice. Achieving this aim is the main objective of this research study. Referring to the research space depicted in Table 3.1, this research study fits into the ‘method/context-extension’ research strategy. According to Berthon et al. (2002), this strategy apply a new method and context, but the same theory is use to explain the results.

This study extends the IS-Impact theory and model to a new research context, which is Malaysia, by replicating the approach (i.e. employing two surveys) that was used in the original IS-Impact development work. The reason behind this replication work is to test and evaluate the general applicability (generalisability) of the IS-Impact theory, and the measurement model, together with its instrument, in order to present a robust and standard measurement model and instrument. Using data collected from the new context, the model will be validated using different SEM technique and employing different criterion measures. At the same time, this research will address limitations identified in the original work.

3.2.2 Instrument translation

One of the contributions from this research is producing a local Malaysian version of the instrument. With this objective, this research will not only re-validate the IS-Impact model, but at the same time, it will validate the local version of the instrument that is produced in the national language of Malaysia, Bahasa Malaysia. The Bahasa Malaysia version instrument would provide benefit to the research track and to practitioners by encouraging more organisations in Malaysia to use a standardised and systematic measurement tool that can include the perceptions of those users in the lower job category that are less conversant in English. By deriving the instrument in the local language, it is hoped that the instrument will tackle issues such as uncertainty of the intended meaning in questionnaire item, even in cases when the target respondents are conversant in English (Karahanna et al., 2002). Therefore, throughout this research, several translation works will be involved (see the overall research design figure 3.1).

The need for instrument translation is justified by experiences faced by many researchers who have conducted research in two or more contexts that are different in term of culture and language, or popularly known as cross-cultural research. For example, Behling and Law (2000) provide some reasons for deriving a local language instrument when extending a theory that was designed and developed in one context to a new context. First, lack of semantic equivalence across languages is often misleading to researchers in operationalising an instrument. Some languages have more than one word to describe a subject. Others would change the meaning of the intended measure when translating the instrument literally. Second, lack of normative equivalence across societies can cause the respondents to not respond to the questions delivered in the survey. Issues such as reaction to strange language might cause the respondents to answer the question with an answer that they believe will please the questioner, rather than expressing their true feelings or beliefs. Ifinedo (2006) experienced this problem when extending the IS-Impact model to several private organisations that had implemented ERP in Finland and Estonia. He claimed that the instrument which was designed in English posed a problem and some issues were wrongly understood.

Translating an instrument is not as easy as changing the words from the original language into the targeted language. The goal of translation is to obtain an instrument that conveys similar meanings to members of various groups (Berry, 1980), thus, the respondents are responding to a culturally equivalent version of an instrument and results are not due to some function of translation of the instrument (McGorry, 2000). Often studies that use survey methods in extending theory or framework from one culture to another provide little information about survey translation, and briefly indicate, “a bilingual friend did the translation”. Some even completely omit any description of the survey development (Hambleton, 1993, McGorry, 2000). According to Hambleton (1993, p. 3-4), instrument translation is also about adaption to the target context.

> "Some researchers prefer the term 'test adaption' to 'test translation' because the former term seems to more accurately reflect the process that takes place: Producing an equivalent test in a second language or culture often involves not only a translation that preserves the original test meaning, but also additional changes such as those affecting item format and testing procedures maybe necessary to insure the equivalence of the versions of the test in the multiple languages or cultures."

In this study, it is believed that by translating the instrument, respondents will feel more comfortable in responding to the questions in the instrument, especially in the first round of the survey in which the respondents are required to give their perception of the impact of the information systems under study. However, an important issue needs to be considered when reporting the outcome of surveys, which needs to be done in English. Therefore, the translation process would be in both directions, from English to Bahasa Malaysia and vice versa.

In the literature, there are four translation procedures recommended by researchers (Hambleton, 1993, Karahanna et al., 2002, Maxwell, 1996, McGorry, 2000):

One way translation or direct translation

This procedure is the simplest translation method compared to the other three methods. A translator is asked to review the original instrument and translate the instrument into the target language. Often this procedure involves a few translators, who would translate the instrument independently. This will produce multiple independent translations of the instruments, which will be compared item by item.

This method is less expensive and less time consuming than other methods. However, there may be loss of information through translation by not comparing the translated version with the original version.

Back-translation or double translation

This procedure involves at least two bilingual translators, who participate independently during the translation process. This procedure involves three steps. i) The instrument is translated from English into the target language; ii) a different translator translates the translated version back into English (which produced a back-translated English version); and iii) finally an English-speaking person compares the original instrument with the back-translated English version.

This procedure is considered one of the most adequate translation procedures by many researchers (McGorry, 2000). The instrument goes through a number of filters by the translators to ensure proper translation. However, more iteration will lead to a more costly translation process.

Translation by committee

This procedure is a variation of back-translation. This procedure involves at least two translators who are familiar with both languages and requires them to work closely together. Both translators will translate the instrument to the targeted language independently and then compare the two translated versions to arrive at the consensus on the final version. A third translator may be involved to choose a version that closely captures the meaning of the original instrument.

One of the drawbacks of this procedure is the translators may be reluctant to criticize one another.

Decentering

This procedure is recommended for those researches who develop instruments that are culturally appropriate across different cultures. It involves actual revision of the original instrument to fit the new research situation, such as grammatical structure or word or tense that must be changed to appropriately fit the cultural group under study. Translators made modifications to the original version to consider any limitation of the target language. Compared to other procedures, that only consider the language, this procedure allows “culturally and linguistically equivalent” translation of both the original and translated instrument.

In this particular study, several translation processes were involved in a number of stages throughout the research. The translation process was applied in the following activities:

1. Translating the Identification Survey instrument that was used in prior work, from English to Bahasa Malaysia in order to capture a broad response from the targeted IS users in Malaysia.
2. Translating the responses collected from the Identification Survey from Bahasa Malaysia to English for easier discussion with the supervisory team and comparing result from previous findings.
3. Translating the Confirmatory Survey instrument that was used in prior work, from English to Bahasa Malaysia, not only considering the language equivalency but also cultural equivalency, to fit in the new research setting.

Reviewing the need to translate the instruments for data collection and the goal of producing a local version of the IS-Impact instrument, three translation techniques or procedures are chosen in this research. The <u>Back-Translation</u> procedure, also known as double translation, is employed generally as the initial translation procedure when translating the instruments. This technique was chosen because it is effective, simple (in comparison with ‘translation by committee’ and ‘decentering’ approach) yet, it is an adequate translation process and the most commonly used translation procedure by researchers (Chow, Harrison, Lindquist, & Wu, 1997, McGorry, 2000, Samaddar & Kadiyala, 2006). In addition to the Back-Translation technique, the Decentering procedure will also be employed when translating the Confirmation Survey to ensure that item wording of the previous instrument fits in the new context. Additionally, Direct Translation procedure will be employed to translate the responses collected from the Identification Survey.

3.3 RESEARCH METHODOLOGY

This research employs the survey method as the chosen research methodology. Survey has been the most popular method employed by IS researchers for decades (Sivo, Saunders, Chang, & Jiang, 2006). This method is appropriate when looking at the relationships between various factors across a large population and is often used in theory verification and validation (Gable, 1994, Newsted, Huff, & Munro, 1998). The survey method is relatively easy to administer, an efficient method for collecting data with a large sample size, it is low cost, and, because it is self-administered, the questionnaire is not influenced by interviewer bias (Sivo et al., 2006). In short, this method has the potential to provide a speedy and economical means of determining facts about any phenomenon (Scheuren, 2004).

Pinsonneault and Kramer (1993) have classified survey research into three categories according to the purpose of using it. These categories are exploration, description and explanation. The purpose of exploratory survey research is to become more familiar with the topic and to try out any preliminary concepts. This kind of survey research is used to discover the range of responses likely to occur in some population of interest, then focusing on determining what concepts to measure and how best to measure them.

Descriptive survey research aims to find out what situations, events, attitudes or opinions are occurring within a population. The main concern in this type of survey is to describe a distribution or to make comparisons between distributions. The explanatory survey research is used to test theory and causal relations within that theory. This kind of survey will focus on the relationships between variables and do so from theoretically grounded expectations about how and why the variables ought to be related.

According to Yin (2003), the survey method is the best methodology to answer research questions that start with ‘what’, ‘who’, ‘where’, ‘how many’ and ‘how much’. Table 3.2 below shows the strength of the survey method according to some features as given by Gable (1994), and Table 3.3 presents the strengths and weaknesses of the survey method.

Table 3.2

The Strength of Survey Methods with Some Features

Feature	Strength
Controllability	Medium
Deductivity	Medium
Repeatability	Medium
Generalizability	High
Discoverability	Medium
Representability	Medium

Referring to the aim of this research, which is to generalise and validate the IS-Impact model to yield a standardised measurement model that can be used across multiple contexts (i.e. system users, different application, different geography region, etc.), the survey method is the appropriate method to be used in this research.

Additionally, the ability to administer the instrument remotely, for example through email and via a website (Sivo et al., 2006), provides an advantage for the researcher to conduct this research without being present at the targeted organisation. Furthermore, the main research question proposed by this research, *"How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively?"* is seeking a generalisable outcome that is applicable to a wide range of organisations in Malaysia. For these reasons, the survey method is selected as the main research method in this research.

Table 3.3

The Strength and Weaknesses of Survey Methods

Strengths	Weaknesses
Surveys are relatively inexpensive. Surveys are useful in describing the characteristics of a large population. They can be administered from remote locations using mail, email or telephone. Many questions can be asked about a given topic giving considerable flexibility to the analysis. There is flexibility at the creation phase in deciding how the questions will be administered: as face-to-face interviews, by telephone, as group administered written or oral survey, or by electronic means. Standardized questions make measurement more precise by enforcing uniform definitions upon the participants. Standardization ensures that similar data can be collected from groups then interested comparatively (between-group study). Usually, high reliability is easy to obtain.	A methodology relying on standardization forces the researcher to develop general questions. Surveys are inflexible in that they require the initial study design (the tool and administration of the tool) to remain unchanged throughout the data collection. The researcher must ensure that a large number of the selected sample will reply. It may be hard for participants to recall information or to tell the truth about a controversial question. As opposed to direct observation, survey research (excluding some interview approaches) can seldom deal with "context."

Adopted from Colorado State University (2008).

3.4 OVERALL RESEARCH DESIGN

In this section, the overall research design is presented. This research employs two rounds of surveys that were conducted in two phases, exploratory and confirmatory phase, following “The Scientific Research Cycle” proposed by MacKenzie and House (1979) and McGrath (1979). The first survey is qualitative and exploratory (conducted in the exploratory phase) and aims to investigate the applicability of the IS-Impact dimensions and measures for the Malaysian context. Furthermore, this exploratory survey seeks to capture possibly relevant new measures derived from the new context. Referring to the research questions discussed in Chapter 1 (see 9), this survey is conducted to address the first research question. This survey is more interpretative and data driven, deductively probing the applicability of the IS-Impact model in Malaysian organisations and, at the same time, inductively identifying any relevant new measure. The IS-Impact model will be modified (when necessary) at the end of this phase, which will then be operationalised in the survey instrument for the confirmatory phase.

The second survey is quantitative. This survey is developed based on the modified model (the outcome of the qualitative survey), and aims to validate the dimensions and measures of the model. Thus, the survey was conducted to address research question two. Statistical analysis will be used to test construct validity and reliability, employing structural equation modelling techniques for formative construct validation. This is followed by the interpretation phase, revisiting the research questions and objectives, interpreting results and drawing conclusions.

Figure 3.1 illustrates the overall research design. The research design adopted from Gable (1994) is analogous to the MacKenzie and House (1979) and McGrath (1979) research cycle. It depicts four main phases: Definition Phase, Exploratory Phase, Confirmatory Phase and Interpretation Phase. Each phase consists of several stages that are represented by rectangles, the arrows indicate the process flow between stages, and rounded rectangles represent the outcomes/outputs derived from the different stages. The following sub sections describe in detail each phase and the stages involve in each of the phases.

3.4.1 Definition phase

This phase aims at generating understanding about the area of this research that will lead to research problem and context identification. This phase involves three research activities.

Define Research Problem and Context

This stage identifies the research problem, objectives, and implications for this research. This stage involves careful understanding of the research purpose and clearly defines the research questions and the objectives. A research questions hierarchy (as described in Chapter 1, section 1.4), is derived from this stage, together with the research scope and research context.

Preliminary Literature Review

A literature review helped the researcher understand the research topic and to address the research problem well. It involves a comprehensive literature review on the Information Technology or Information System Success phenomena, which is the core of this research. The literature review also includes other related topics, such as the IS-Impact Measurement Model, Model Validation, IT in Malaysia and IS Evaluation in Malaysia (as discussed in Chapter 2). In the literature review, the researcher identified, assessed, and critically examined the gaps in previous IS success studies and in the IS-Impact measurement model, thus positioning this research in the similar stream of research.

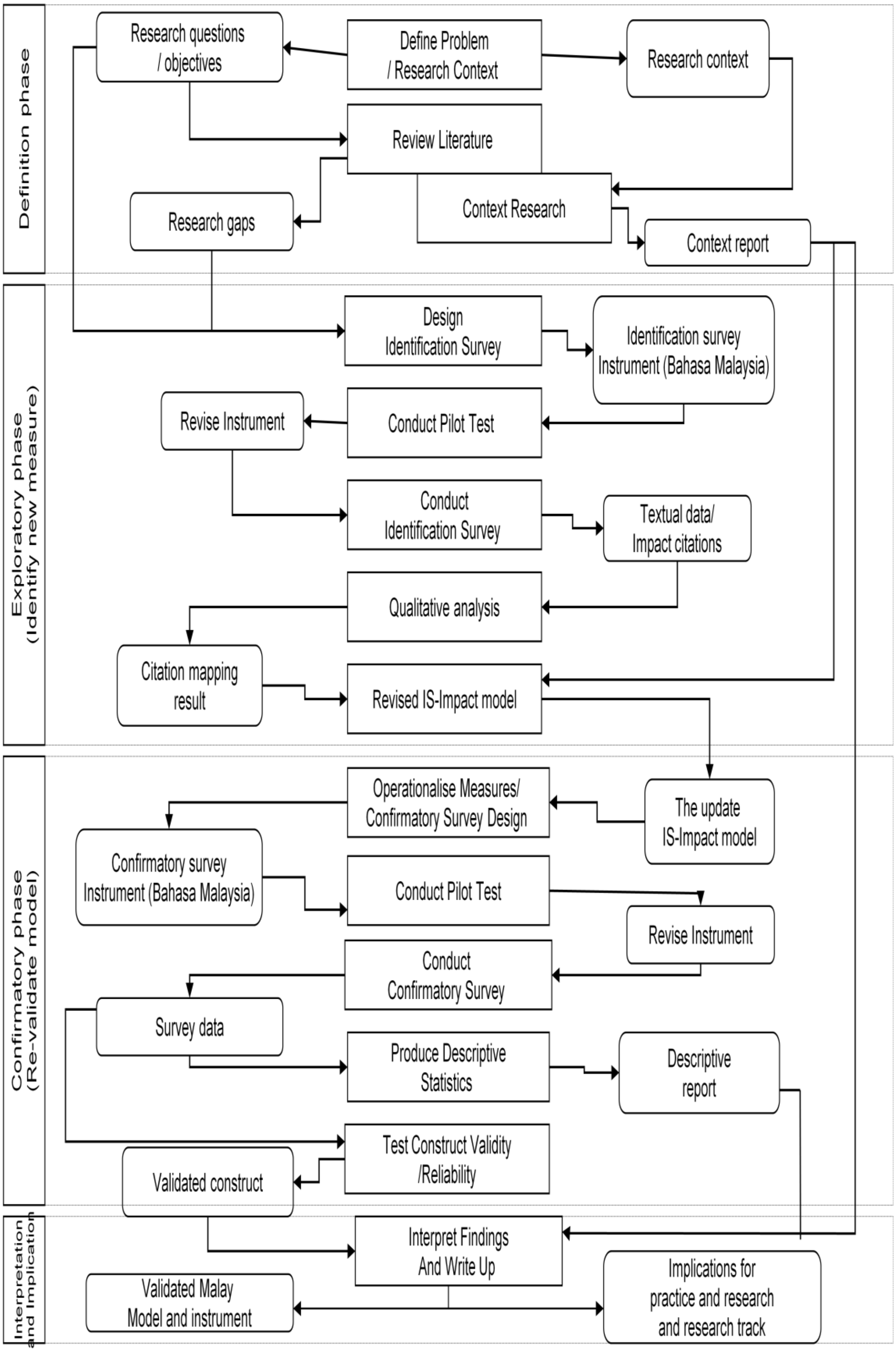


Figure 3.1. Overall research design.

Context Research

The third stage in the Definition Phase is to produce a context report that will help the researcher in understanding the background of the research setting. This stage investigates the research context to explore and describe the organisations and the IS under study. It was conducted as a part of the literature review. The main issue that the researcher addressed through the context research is "The state of Information Systems in Malaysia", focusing the IS evaluation study conducted in Malaysia. The information from the context report was mainly retrieved from academic literature and from the commercial press, that could be found online or available at QUT library, annual reports from MAMPU (Malaysian Administrative Modernisation and Management Planning Unit), and reports produced by Accountant General Department of Malaysia.

3.4.2 Exploratory phase

The primary goal of this phase is to instantiate the original measures and dimensions of the IS-Impact model in the new context and at the same time identify relevant new measures or dimensions that have not been identified from previous work due to the context influence or current trend to ensure model completeness. This approach is akin to the 'function method', a two-step method for selecting measures that are appropriate to the context as suggested by Burton-Jones and Straub (2006).

In this phase, a qualitative type survey (Identification Survey) is employed. The survey instrument contains an open-ended question that canvas the impact of the IS under study as experience by the users. In order to get quality responses from respondents, the identification survey instrument was designed in Bahasa Malaysia (the national language of Malaysia). The design and dissemination of the identification survey is discussed in detail in Chapter 4, section 4.1 through 4.4.

The identification survey elicits responses in textual forms. Data from this survey is maintained and analysed in NVivo 8, a qualitative data analysis tool. This tool assists the researcher in the qualitative analysis of the data. Since this research starts with a pre-specified framework (the IS-Impact model), a deductive (top-down) approach is employed in the data analysis. In the deductive approach, the responses collected were decomposed into a meaningful single impact citation. This citation was mapped or coded into the original measures and dimensions of the IS-Impact model. The dimensions and measures in the IS-Impact model are mutually exclusive; therefore, mapping the citation from the identification survey into the framework will reduce the error of overlapping measures. The qualitative data analysis is discussed in detail in Chapter 4, section 4.5.

Two outputs are generated from the exploratory phase: 1) a survey instrument (see Appendix A and B), and 2) the revised IS-Impact model. The revised IS-Impact model was operationalised in the Confirmatory Phase.

3.4.3 Confirmatory phase

The primary goal of this phase is concerned with the implementation of a survey to test and validate the revised IS-Impact model. The objectives of this phase are several: (1) Validate the IS-Impact model; (2) Validate the Bahasa Malaysia version of the IS-Impact instrument, and (3) Produce a descriptive and comparative report for the organisations.

In this phase, a quantitative type survey (Confirmation Survey) is employed. The design and dissemination of the confirmation survey is discussed in detail in Chapter 5, section 5.2 through 5.5. The IS-Impact model was validated using a formative construct validation technique following guidelines suggested by Diamantopoulos and Winklhofer (2001), Petter, Straub and Rai (2007) and other researchers. A series of tests were conducted, 1) to identify the presence of multicollinearity among the items, 2) to examine how well the formative items capture the construct by correlating these measure with a reflective variable (global item) of the same construct, 3) to assess the validity by linking the items to other constructs that have significant and strong relationship known through prior research (nomological validity) and 4) to observe significant weights of the formative measurement model. Detail of this validation process is discussed in Chapter 6.

Three outputs are generated from the confirmatory phase: 1) A survey instrument (see Appendix E and F), 2) A validated IS-Impact model and 3) A descriptive report for the organisations (see Appendix K).

3.4.4 Interpretation phase

The last phase of the research design, the interpretation phase, revisits the research questions and objectives, interprets the results, involves writing-up the entire research, and drawing conclusions. This phase includes a discussion on research implication for academia and practitioners. Moreover, limitations of this research are identified to promote future work.

3.5 CHAPTER CONCLUSIONS

This chapter first discussed the research strategy and approach for extending the IS-Impact model in a new context to achieve the goal of this research. This is followed by the research methodology employing survey methods to collect evidence. The rationale of choosing the survey method is discussed in this section. This chapter is concluded by presenting the overall research design, describing every phase conducted in this research and the outcome from each phase.

Chapter 4 : The Identification Survey

4.1 CHAPTER INTRODUCTION

The previous chapter discussed the overall design of this research. Two surveys were employed in the research, each having a distinct purpose. This chapter describes the first survey, a qualitative survey that contains an open question with several objectives. The main objective of this survey is to answer the first research question, "**Is the IS-Impact model complete in measuring the impact of IS in Malaysian public sector organisations?**" Since IS evaluation research in Malaysia is under study, based on the small number of publications in this area it was difficult to compare the IS-Impact model with any local measuring tool in order to test the appropriateness of the measures in the IS-Impact model while at the same time seeking to ensure completeness of the model. Thus, this survey explores and captures relevant measures of impact based on the users' opinions and experiences with a particular information system. The users' opinions will indicate or show the essence of the impact that they have received and any potential impact that they are expecting from the system (though the focus is mainly on the current benefits that they get from the system). Serving the purpose of identifying salient measures of impact, the survey is called the Identification Survey.

The chapter commences with the translation work involved in translating the survey instrument that was first derived from the instrument that was used in prior work. The discussion then moves on to the pilot test that was conducted with a number of targeted respondents. This is followed by a discussion on the administration of the survey. Next, the process of qualitative analysis is presented. This chapter concludes by presenting the re-specified model of IS-Impact.

4.2 THE SURVEY INSTRUMENT

4.2.1. The English version instrument

The instrument was designed by initially replicating the identification survey instrument that was used by Gable et al. (2008). However, some modifications were made to the instrument to fit the new context. The instrument contains two sections (see sample of the questionnaire in Appendix A), with the first section being designed to gather information about the respondents. The respondents are requested to provide their name and information about their job, such as their position and working duration in the organisation, and a brief description of their involvement with SPEKS. The second section contains an open-ended question, requesting feedback about the impact that the respondents have experienced associated with SPEKS. The intention in using one general open-ended research question is to avoid leading and limiting the respondent’s thinking, and to let them reflect on the question intensively and brainstorm the answer. This will also allow respondents to think broadly and provide as many impact statements that they can think of that relate to their experience with SPEKS.

This survey is a non-anonymous survey. Although the researcher realises the potential risk of this approach in as much as the respondents may be restrained from giving negative perceptions or opinions of the IS, through fear that their actions will have implications on their position or career in the organisation, and, thus, respondents may only provide positive feedback leading to bias when evaluating the IS. It is important that the respondent can be identified in this survey for the researcher to be able to reach the respondents again if the feedback needs clarification. This can be related to the clarity of the handwriting or the unclear meaning of feedback given by the respondents. Another reason for non-anonymity is to identify potential respondents for the following confirmation survey. Therefore, realising the greater benefits of having the instrument non-anonymous, to make them feel more comfortable in providing their honest opinions of the IS, the respondents were given an assurance that their identity will not be reported,

The question in section two is the most important part of the survey. This question probes important impact measures from the context. Thus, more attention was given in redesigning the question. In the original instrument, a single question was asked, *"[the IS] has been installed in your department/organisation for some time. What do you consider has been the impact of [the IS] to you and your organisation, since its implementation?"* A concern was expressed about the word 'impact'. Although the credibility of the question in Gable et al. (2008) was proven by arriving at 485 citations, the researcher, however, felt the word 'impact' may not elicit responses that reflect the 'quality' of SPEKS, thus related to the two quality dimensions in the IS-Impact model. Furthermore, the researcher considered the word impact as being too narrow for the respondent and that it might cause difficulty for the respondent in considering it in a broader sense.

A simple test was conducted with a number of colleagues who converse well in both English and Bahasa Malaysia in order to test this assumption. The researcher asked these colleagues what they thought about the impact of any information system that they have experienced. The majority of them replied with a short answer for instance 'good' or 'ok'. The feedback received from this exercise indicates that respondents tend to provide a general statement when answering the question. Therefore, based on this exercise, some synonyms for the word 'impact', which are *effect, influence, outcome, result or consequence,* were added to the question. The final version of the question that was used in the survey is, "*SPEKS has been* *installed in your department/organisation for some time. What do you consider has been the impact* of SPEKS to you and your organisation since its implementation? *the word impact herein is similar to effect, influence, outcome, result or consequence*".

The instrument also included a cover note that describes the purpose of the survey, the targeted respondents, and the benefits that the organisation will get from the research. General instructions for completing and returning the questionnaire were also included in the cover note. Additionally, every section begins with detailed instructions to provide the respondents with a specific description for each section.

4.2.2. Translation process

The English version instrument was then translated into Bahasa Malaysia, the national language of Malaysia. The purpose of conducting the survey in the national language was discussed in Chapter 3. Furthermore, as discussed in Chapter 3, many researchers have discussed the advantages of translating an instrument to the language of the context.

Using the 'Back-Translation' technique, the translation process involved four steps (Behling & Law, 2000, McGorry, 2000). This technique involves at least two translators. The steps taken in this process are described as follows (figure 4.1 illustrates the translation process):

Step 1: Translate the English version instrument to Bahasa Malaysia.

Step 2: A different translator then translates the Bahasa Malaysia version back to English. This English version is called the 'back translated' version.

At this stage, the candidate has two English version instruments.

Step 3: Compare both the first English version with the 'back-translated' English version for any inconsistencies, mistranslation or lost words or phrases.

Step 4: Discuss with both translators to resolve inconsistencies and modify the instrument accordingly.

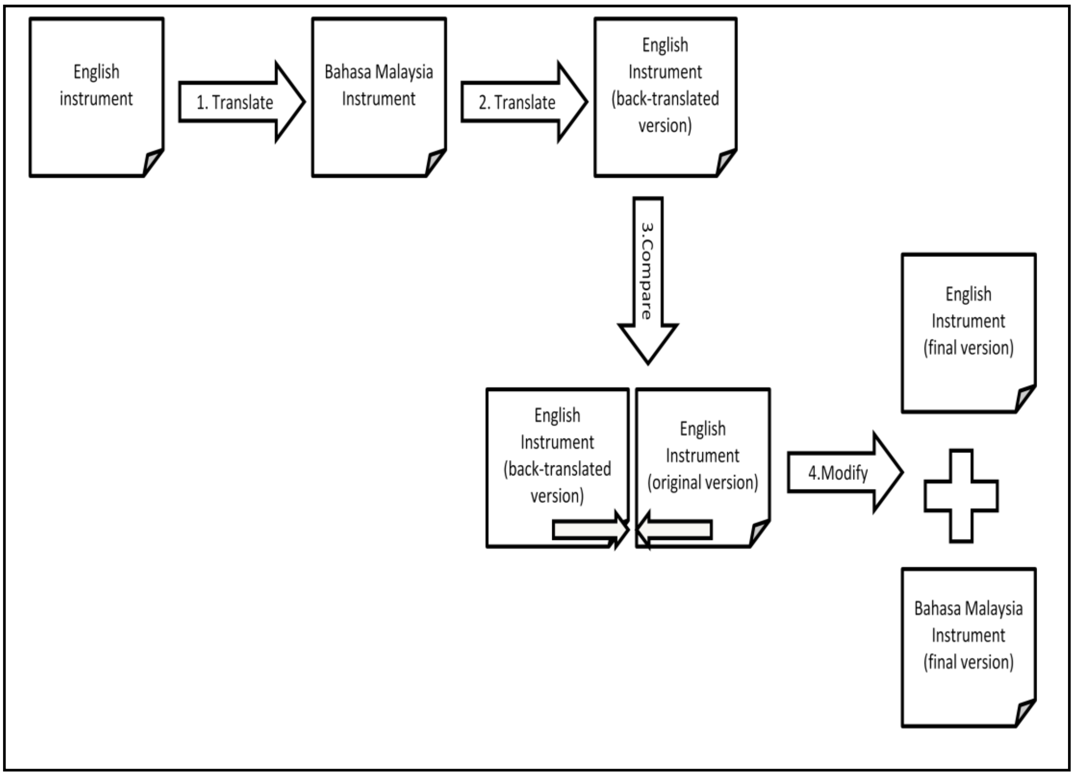


Figure 4.1. Translation process for I-Survey instrument.

The English version instrument was translated to Bahasa Malaysia by the researcher. The researcher then asked the help of a colleague who is conversant in both English and Bahasa Malaysia to translate the Bahasa Malaysia version back to English. The candidate than compared the two English versions for any inconsistency. The difference between the two versions was not much. It was observed that many changes were made to the cover note; however, the original meaning (semantics) remained the same. The difference between the two versions was in the choice of words and the sentence structure.

No changes were found in the first section of the survey. This section is more straightforward. Hence, translating this section was easy. Similar to the cover note, the second section of the 'back-translated' version has showed some differences, but only in the choice of words and the sentence structure. The difference in the way sentences are structured is expected because Bahasa Malaysia and English are different in terms of morphology and syntax (Jalaluddin, Awal & Bakar, 2008).

Overall, both English versions are almost the same. This shows that the translated version, the Bahasa Malaysia instrument, was translated well. Further discussions between the translator and the researcher were then held to 'clean' the Bahasa Malaysia instrument from grammatical error and uses simpler sentences and words.

4.3 THE PILOT TEST

Although this research adopted the same instrument as was used in the preceding work, changes were made to localise the instrument in order to obtain a high response rate in the new context. A pilot test was then carried out for testing the face validity of the questionnaire, namely, the feasibility of the translated instrument, with a small number of targeted respondents.

Pilot testing is an opportunity to try out the instrument before the actual data collection. Pilot testing can provide useful information about how well the instrument performs in the real setting (Fink, 2003, Litwin, 2003). Straub (1989) argued the importance of a pilot test and recommended that IS researchers should always conduct a pre-test or pilot test as a part of instrument validation. A pilot tests has three main benefits (Litwin, 2003):

a. It helps the researcher to identify errors in the survey.
b. It allows the researcher to learn which part of the survey instrument needs redesigning.
c. It predicts possible problems that may be encountered in using the instrument.

Fink (2003) suggested that during the pilot test, the researcher should ask the respondent whether the instructions for completing the survey are clear, the questions are easy to understand, whether the wording suggests any ambiguity and whether the respondent knows how to provide responses to the survey. Along with Fink's suggestions, the researcher wanted to test whether the translation is valid and the additional words that were used to describe "impact" were helping the respondents to think widely about the impact that they may (or may not) have received from SPEKS. In addition, the pilot test can provide an opportunity to obtain contextual information that relates to the SPEKS status in the state government while at the same time, identifying potential respondents for the formal survey.

4.3.1 Conducting the pilot test

The researcher went back to Malaysia to conduct the pilot test and to seek approval from the authority and the targeted organisation to conduct the research. A letter of permission, along with a copy of the instrument and a proposal (containing an introduction to the research, the purpose of the survey, benefits that the organisations would get from this research and the conduct of the survey), were submitted to the Accountant General's (AG) Department Office. This included a request to collect data at the State Government of Melaka (from here on 'Melaka' will be used, replacing the 'State Government of Melaka', for simplicity, with both referring to the same organisation). AG is a department under the Ministry of Finance located at Putrajaya, the federal administrative centre of Malaysia. Although SPEKS is only being used at the state level, the systems are monitored and maintained by AG with support from the vendor. An approval letter was received allowing the survey to be conducted at Melaka.

Melaka is one of the eleven state governments in Malaysia that are currently using SPEKS. Melaka implemented SPEKS in March 2003; therefore, it had been using the system for 7 years when the survey was conducted. The system is used across 18 departments in the state government, with approximately 800 users.

With the help of an IT Officer at Melaka, a meeting was set up with 17 SPEKS users from the Department of Finance and Treasury at Seri Negeri, Melaka State Secretary's Office. A brief introduction of the purpose of the pilot test and the expected outcome was presented at the beginning of the meeting. It is important that the users/volunteers understand the purpose of the pilot test to get maximum feedback that can be used to improve the instrument. Fifteen minutes were given to the pilot test volunteers to complete the questionnaire. At the end of the allocated time, before collecting the form, the volunteers were encouraged to give any comments about the questionnaire on a space provided in the form. However, no comments were received from the volunteers.

4.3.2 Feedback from the pilot test

Based on the feedback given by the pilot test volunteers, overall, the instructions and the questions in the survey instrument are clear. However, the volunteers experienced difficulty with the "impact" questions, not because they did not understand the question, but because they faced problems in expressing their opinions in words in order to respond to the question. The researcher observed that this difficulty was faced mostly by volunteers who had less than one-year work experience at Melaka. Nonetheless, most of the volunteers provided adequate responses to the questions.

Many expressed their opinion about the system, which at this stage is not primarily the interest of this research. Moreover, a few volunteers gave suggestions regarding their experience with SPEKS. These volunteers suggested that users who had been working before SPEKS was implemented (i.e., involved with a financial related job), preferred the old manual way rather than using the computer-based system. Thus, they suggested that the researcher should take into consideration the working duration of each employee in the department when conducting the survey.

4.3.3 The "Impact" question covers the "Quality" dimensions of the IS-Impact model

A sample of the responses from the pilot test was briefly analysed to get some insight into the single impact question to see if the single impact question was able to elicit responses that could describe the quality of SPEKS, and, hence, instantiate the measures under the "quality" dimensions of IS-Impact. The sample did demonstrate some responses that reflect the quality of the systems. For example, "can automatically cancel all expired cheques at the same time" and "the user can gain access to anything quickly" both reflect the quality of the system. This shows that although some of the volunteers had problems in expressing their opinion on the impact of SPEKS (as discussed in section 4.3.2), the single 'impact' question, along with the synonyms was able to elicit responses that reflect the quality of the system, thus, demonstrating the goodness of the question.

4.3.4 Getting access to potential respondents for the formal Identification Survey

Besides testing the feasibility of the questionnaire, the pilot test was an opportunity to become acquainted with the IT officer at Melaka and to discuss matters regarding the formal identification survey. Two important issues were discussed. One was about getting access to a large sample size and another was related to disseminating the questionnaire and figuring out the best way to do it. Since the survey was going to be conducted remotely from Australia, the plan was to disseminate the questionnaire to the targeted respondents using email. However, there were some problems that might affect the process of disseminating the questionnaire using email. According to the IT officer, not all employees at Melaka were given an official email address for their use due to regulations imposed by the state government. This caused difficulty in accumulating email addresses for the targeted respondents. One way to resolve this issue was by getting personal email addresses from the targeted respondents. With the help of the IT officer, the researcher managed to get a list of email addresses from the potential respondents.

4.4 CONDUCTING THE IDENTIFICATION SURVEY

4.4.1 Survey distribution and sample size

It is a policy set by the university for the researcher to apply for research clearance when the research involves the participation of humans or animals or when there will be activities that involve the use of biosafety materials. Following the guidelines provided by the university for the ethical clearance application, the survey instrument was submitted to the University's Ethics Committee together with the approval letter given by the organisation. The application was approved and the survey instrument received clearance from the committee (see Appendix C for the ethical clearance approved by the committee).

A specific email address was created through the QUT email systems for a survey repository. The email address, *impactmalaysia@qut.edu.au* was added to the final version of the instrument. The questionnaire was sent to 20 SPEKS users at the State Government of Melaka, based on the list provided by the IT officer. The candidate contacted each respondent personally. Each email contained a cover letter, a letter of approval from AG and the questionnaire. All documents were in the MSWord format. The respondents were given three weeks to return the completed questionnaire by using email attachment. However, after the due date, only one had responded to the survey. This low response prompted the candidate to conduct another round of surveys.

A further discussion was made between the IT officer and the researcher to find the best way to get the SPEKS users to participate in the survey. A decision was made to distribute the questionnaire by hand instead of using email, during one of the annual meetings held with all the SPEKS users, organised by the state government.

4.5 DATA ANALYSIS

Thus far, the design and the conduct of the identification survey have been discussed in this chapter. The following sections are dedicated to the qualitative data analysis and to present the outcome of the process.

4.5.1 Respondents' demography

The identification survey collected 82 responses (from both rounds of the survey) from 16 departments at the State Government of Melaka, 13 of these respondents are those who were involved in the pilot study. Given that 16 out of 18 departments (Table 4.1) were involved in the survey, it can be assumed that there is at least one representative from almost all departments that have used SPEKS, thus the sample adequately represents the population for all SPEKS-using departments.

Table 4.1

Number of Respondents Across Departments

Departments	Frequency
Chief Minister Incorporated	1
Melaka's Chief Minister Department	1
The Governor Office	3
State Legislative Assembly	1
The Executive Council Unit, Melaka's Chief Minister Department	2
Social Welfare Department	1
Department of Finance and Treasury	25
Department of Veterinary Services	8
Sungai Udang Agriculture	1
Public Works Department	8
Melaka Housing Board	3
Melaka Zoo	3
The State Development Office of Melaka	4
Land and Minerals Office of Melaka	9
State Islamic Department	9
Melaka Mufti Department	2
Unidentified	1
Total	**82**

Respondents were then classified according to employment groups. In Malaysia, government employees are divided into two employment groups: 1) Professional and Management staff and 2) Support staff. Respondents can be identified according to these employment groups based on the job title and the job code provided by the respondents. The job code is a description of the job speciality. For example, a job code that starts with ‘W’ indicates that the employee is under the Account and Finance Management job scheme. A complete list of job codes can be retrieved from the Public Service Department website (www.jpa.gov.my). Table 4.2

below shows the classification of the respondents according to the employment groups.

Table 4.2

Classification of Respondents

Employment Group	**Frequency**	**Percentage**
Professional and Management	8	10%
Support	73	89%
Unidentified	1	1%
Total	**82**	**100%**

The survey tried to obtain a representative sample from the population of SPEKS users at Melaka in order to capture the IS impact opinion across all levels of employment groups. The data in Table 4.2 above indicates that a large number of users are those from the support group. This indicates that a large percentage of SPEKS users came from the support group.

4.5.2 Managing data and translation

All of the returned questionnaires were coded with sequential numbers. All responses written in the questionnaires were transferred to MSWord. A separate MSWord file was created for each returned questionnaire. These digital copies were created as backup and were imported into a qualitative analysis tool. Next, the questionnaires were scanned for any missing data. From the scanning process, five (5) respondents did not respond to the impact question, and, thus, were considered invalid and were removed from the analysis.

Given that the survey was conducted entirely in Bahasa Malaysia, responses collected from the survey were translated to English. It should be noted that the qualitative analysis was conducted entirely in English, except when the translated responses looked confusing, and then the researcher relied on the original responses

(Bahasa Malaysia) for clarity. Translating the responses from Bahasa Malaysia to English served several purposes. It helped with the discussion with supervisors and made dialogue with other researchers in the same track more meaningful and conveyed ideas to them more easily. In addition, triangulating results among other researchers in the same track became possible. Using the direct translation technique, the responses were translated by the researcher. A bilingual colleague helped verify the translation. All translation was done directly on the MSWord files that were created for each respondent. Once the translation process was completed, responses were exported to Nvivo, a qualitative software application that was used to help with the analysis.

4.5.3 The deductive approach

Content analysis is a method or technique for analysing and interpreting qualitative survey results (Fink, 2003). It allows researchers to analyse unstructured data in relation to the meaning, symbolic meanings, and expressive contents (Krippendorf, 2004). Data that were collected from the identification survey contained vast amounts of information that had to be summarized, analysed and interpreted.

Generally, qualitative data can be analysed using an inductive or deductive approach (Fink, 2003, Gibbs, 2002, Punch, 2005). In an inductive approach, a researcher will start the analysis with no pre-specified themes and let the data suggest initial themes (Fink, 2003, Punch, 2005). Whereas, a deductive approach will start with pre-specified themes or more general coding frameworks (Punch, 2005) and data will be linked to these themes and noted in every instance as support for the pre-specified themes (Fink, 2003). A deductive approach often starts with a theory in which hypotheses are derived from it and the study is designed to test these hypotheses. This approach is related to research that sets out to test theory, also known as theory verification (Punch, 2005). Both approaches have several advantages and disadvantages (Sedera, 2006). Table 4.3 below outlines the advantages and disadvantages of both approaches.

Given that this research is re-validating the IS-Impact model with a goal of generalisability (fitting the theory verification study), in which the themes and the coding scheme were pre-specified, a deductive approach is the appropriate approach in analysing the qualitative data. The IS-Impact model acts as the conceptual framework that drives the qualitative analysis. The dimensions and measures in the IS-Impact model are mutually exclusive (Gable et al., 2008) in which each of the measures carries a distinct concept of IS impact. The mutual exclusivity of these measures helps data coding and synthesis becomes easier. The measures are used to create the initial coding scheme in the data analysis.

Table 4.3

Advantages and Disadvantages of the Deductive and Inductive Approaches

Deductive Approach		**Inductive Approach**	
Advantages	Disadvantages	Advantages	Disadvantages
Validity of the models/frameworks	Respondents may not be familiar with the categories of the framework. However, examples and guidelines can be used to overcome this	Respondents are familiar with the categories.	Difficult to generalise and validate the results
Clear separation of categories and sub-categories	Context specific – data are usually not represented in the dimensions and measures	Context specific – data are represented in categories	Separation of categories and sub-categories may have overlaps
Results can be generalized	Some measures or dimensions may not be populated		Repeatability with direct comparisons against prior studies is difficult
Helps to test the generalisability and the validity of the framework	New dimensions and measures may be required		

Adopted from Sedera (2006).

The data analysis was conducted with the help of NVivo 8, a computer-assisted qualitative data analysis software application. It was developed by QSR International, the developer of NUD*IST, the company's first product, that was created in 1981 to support social science research. Nvivo helps in managing and organising the qualitative data and at the same time acts as an inventory for accumulating qualitative type evidence. Several advantages of Nvivo have been recognised by researchers who conduct qualitative data analysis. For example, the software can handle large volumes of data and provides analytical tools that help researchers in varied analysis processes, such as reviewing, recoding, matching, sorting, querying, presenting and reporting the data (Bazeley, 2007). Furthermore, it allows the researcher to move back and forth between the source, the coded text and the theme/node easily, and assists the researcher to analyse and justify the findings (Bandara, Gable, & Rosemann, 2005).

4.5.4 Coding procedures

The qualitative analysis in this research involves the process of coding textual data to the pre-specified themes. According to Gibbs (2002, p. 57), "coding is the process of identifying and recording one or more discrete passages of text or other data items (e.g., parts of a picture) that, in some sense, exemplify the same theoretical or descriptive idea." It is an essential procedure for qualitative analysis and remains one of the central activities in qualitative research (Gibbs, 2002).

Looking for reoccurrence is often part of qualitative analyses. For example Miles and Huberman (1984, p.215) stated, "(we) identify themes or patterns that happened a number of times and that consistently happen a specific way". Counts that reflect the reoccurrence of the themes may support the necessity of the themes. In other words, the number of textual data items coded into a measure of the IS-

Impact model may indicate that the measure is important to the context. However, if there is no textual data coded to a measure, it may not indicate that the measure is not important to the context. The outcome of the process is entirely subjective and reliant on the opinions of the respondents.

However, if there are textual data items that cannot be coded into any of the IS-Impact measures, this may suggest a new measure for the model, thus, an extension to the IS-Impact model. Nonetheless, further judgement is needed to remove or add measures. Moreover, careful consideration should be taken when removing a measure because it may affect the construct's definition (Petter et al., 2007).

Overall, the analysis entails several steps. The first step is to decompose or break down the textual data into meaningful single impact citations. Each of these citations was given an ID to indicate the source of the citation. Below is an example of a response from the survey:

"SPEKS is satisfying so far [R16a]. (the system) helps increase the quality of the job [R16b]."

Using the example above, the text was decomposed into two impact citations. These citations came from respondent #16 (source #16); hence, R16 was labelled to both citations. The letter following the ID (e.g. R16a) indicates the sequence of the particular citation extracted from the source.

The second step is to create nodes in NVivo. A node is like a tag or a label that brings together ideas, thoughts and definitions about the data (Gibbs, 2002). At the beginning of the analysis, tree nodes (*Figure 4.2*) were created. These nodes represent the measures and dimensions of the

IS-Impact model. As the analysis gradually progressed, some free nodes were created to represent citations that could not be coded into any of the existing nodes.

Tree Node	Quality		58
	Tre System Quality		
		Tree Node	User requirements
		Tree Node	Systems features
		Tree Node	Systems accuracy
		Tree Node	Sophistication
		Tree Node	Reliability
		Tree Node	Integration
		Tree Node	Flexibility
		Tree Node	Efficiency
		Tree Node	Ease of use
		Tree Node	Ease of learning
		Tree Node	Database contents
		Tree Node	Data currency
		Tree Node	Data accuracy
		Tree Node	Customisation
		Tree Node	Access
	Tre Information Quality		
		Tree Node	Usability

Figure 4.2. Tree nodes created in NVivo.

Each node contains a definition or description of the analytic idea. This definition can be used to record the concept or idea that the node represents and to keep any theoretical and associated thoughts about ideas and ways to ensure that the coding is reliable (Gibbs, 2002). Moreover, a clear definition for each node is important so that different coders will have the same understanding if the process needs to be repeated (Miles & Huberman, 1994). However, except for the dimensions of the IS-Impact model, there are no specified definitions for each of the measures. Thus, the questionnaire items that were used in the specification survey to represent each of the measures of the *a-priori* model proposed by Gable et al. (2008) are used as the definition or description for each of the nodes in this analysis (Table 4.4).

Table 4.4

The Definition of the Four IS-Impact Dimensions

Individual Impact is a measure of the extent to which (the IS) has influenced the capabilities and effectiveness, on behalf of the organization, of key-users.		
Measure code	**Measure**	**Questionnaire Item**
II1	Learning	I have learnt much through the presence of (the IS)
II2	Awareness/Recall	(the IS) enhances my awareness and recall of the job related information
II3	Decision Effectiveness	(the IS) enhances my effectiveness in the job
II4	Individual Productivity	(the IS) increases my productivity
Organizational Impact is a measure of the extent to which (the IS) has promoted improvement in organizational results and capabilities.		
Measure code	**Measure**	**Questionnaire Item**
OI1	Organisational Costs	(the IS) is cost effective
OI2	Staff Requirement	(the IS) has resulted in reduced staff costs
OI3	(Operating)Cost Reduction	(the IS) has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)
OI4	Overall Productivity	(the IS) has resulted in overall productivity improvement
OI5	Improved Outcome/Output	(the IS) has resulted in improved outcomes or outputs
OI6	Increased Capacity	(the IS) has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.
OI7	e-Government	(the IS) has resulted in better positioning for e-Government/Business
OI8	Business Process Change	(the IS) has resulted in improved business processes

Information Quality is a measure of the quality (of IS) outputs: namely the quality of the information the system produces in reports and on-screen.		
Measure code	**Measure**	**Questionnaire Item**
IQ1	Importance	Information available from the (the IS) is important
IQ2	Availability	Information needed from the (the IS) is always available
IQ3	Usability	Information from the (the IS) is in a form that is readily usable
IQ4	Understandability	Information from (the IS) is easy to understand
IQ5	Relevance	(the IS) provides output that seems to be exactly what is needed
IQ6	Format	Information from (the IS) appears readable, clear and well formatted
IQ7	Content Accuracy	Though data from (the IS) may be accurate, outputs sometimes are not
IQ8	Conciseness	Information from (the IS) is concise
IQ9	Timeliness	Information from (the IS) is always timely
IQ10	Uniqueness	Information from (the IS) is unavailable elsewhere
System Quality is the measure of the performance of (the IS) from a technical and design perspective		
Measure code	**Measure**	**Questionnaire Item**
SQ1	Data accuracy	Data from (the IS) often needs correction.
SQ2	Data currency	Data from (the IS) is current enough
SQ3	Database contents	(the IS) is missing key data
SQ4	Ease of use	(the IS) is easy to use
SQ5	Ease of learning	(the IS) is easy to learn
SQ6	Access (Convenience of access)	It is often difficult to get access to information that is in (the IS)
SQ7	User requirements	(the IS) meets (the Unit's) requirements
SQ8	Systems features	(the IS) includes necessary features and functions
SQ9	Systems accuracy	(the IS) always does what it should
SQ10	Flexibility	The (the IS) user interface can be easily adapted to one's personal approach
SQ11	Reliability	The (the IS) systems is always up-and-running as necessary
SQ12	Efficiency	The (the IS) systems responds quickly enough
SQ13	Sophistication	(the IS) requires only the minimum number of fields and screens to achieve a task
SQ14	Integration	All data within (the IS) is fully integrated and consistent
SQ15	Customisation	(the IS) can be easily modified, corrected or improved

The third step is to code citations. Citations were coded or connected to a code on the basis that they are examples of the idea or concept that the node represents. Ideally, each citation is only coded to one node, meaning that each citation is linked to one node (thus describing one measure). However, a citation can also be coded to more than one node (multiple coded). This is possible because a citation can have an implicit meaning and be capable of multiple levels of understanding and interpretation (Gibbs, 2002). However, further decomposing this citation to meet a one to one relationship (one citation to one node) will make the citation become meaningless or, worse, deviate from the original meaning. Simultaneously, new nodes were created to accommodate citations that could not be coded into existing IS-Impact measures.

The final step is to review and synthesise coded citations to make sure that the coding was done appropriately. Decisions were made to refine multiple coded citations and other citations that were coded at newly created nodes. This mapping process, however, is an iterative process, where sometimes the citations need to be decomposed and recoded until the final decision was made.

4.6 STUDY FINDINGS

The identification survey received 82 responses from the State Government of Melaka. However, five respondents did not respond to the impact question. Thus, five (5) responses were considered invalid and were removed from the analysis. A total of 278 impact citations were extracted from the 77 valid responses. That results in an average of 4 citations per respondent. These citations were coded to the 37 IS-Impact measures. The goals of the analysis are: (1) to evaluate the sufficiency of the IS-Impact model, and, (2) to demonstrate the applicability of the measure in the model. Table 4.5 and Table 4.6 present the counts of the citations coded for the measures and dimensions of the IS-Impact model.

Table 4.5

Counts of Citations Coded at Four IS-Impact Dimensions

Dimensions	#	%
System Quality	97	35%
Information Quality	9	3%
Individual Impact	46	17%
Organizational Impact	101	9%
Uncoded citations	25	9%
Total	**278**	**100%**

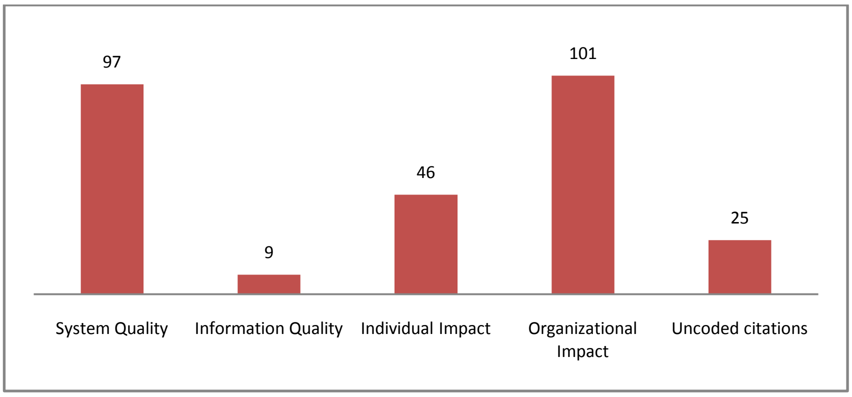


Figure 4.3. Number of citations coded at IS-Impact dimensions.

Table 4.5 and *Figure 4.3* demonstrate the counts of citations across dimensions of the IS-Impact model; 91% of the citations (253 from 278 total citations) are coded against the IS-Impact measures. Three of the four dimensions of IS-Impact were sufficiently cited across respondents, with the highest number of citations (36%) coded for Organizational Impact, closely followed by System Quality (35%) and Individual Impact (17%). Information Quality, however, has a small number of citations and is represented by only 3% of the total citations. The high percentage of coded citations indicates the sufficiency of the four dimensions of the IS-Impact

Table 4.6

Counts of Citations Coded Against the IS-Impact 37 Measures

Individual Impact		Organizational Impact		System Quality		Information Quality	
Measures	#	Measures	#	Measures	#	Measures	#
II1 Learning	0	OI1 Organisational Costs	3	SQ1 Data accuracy	0	IQ1 Importance	1
II2 Awareness/Recall	0	OI2 Staff Requirement	0	SQ2 Data currency	1	IQ2 Availability	3
II3 Decision Effectiveness	3	OI3 (Operating)Cost Reduction	5	SQ3 Database contents	7	IQ3 Usability	3
II4 Individual Productivity	43	OI4 Overall Productivity	15	SQ4 Ease of use	13	IQ4 Understandability	0
		OI5 Improved Outcomes/Outputs	57	SQ5 Ease of learning	1	IQ5 Relevance	1
		OI6 Increased Capacity	0	SQ6 Access	8	IQ6 Format	1
		OI7 e-Government	0	SQ7 User requirements	4	IQ7 Content Accuracy	0
		OI8 Business Process Change	21	SQ8 Systems features	14	IQ8 Conciseness	0
				SQ9 Systems accuracy	1	IQ9 Timeliness	0
				SQ10 Flexibility	0	IQ10 Uniqueness	0
				SQ11 Reliability	26		
				SQ12 Efficiency	14		
				SQ13 Sophistication	7		
				SQ14 Integration	1		
				SQ15 Customisation	0		

model in evaluating the IS impact in Malaysia. The 9% uncoded citations will be discussed further in the following section.

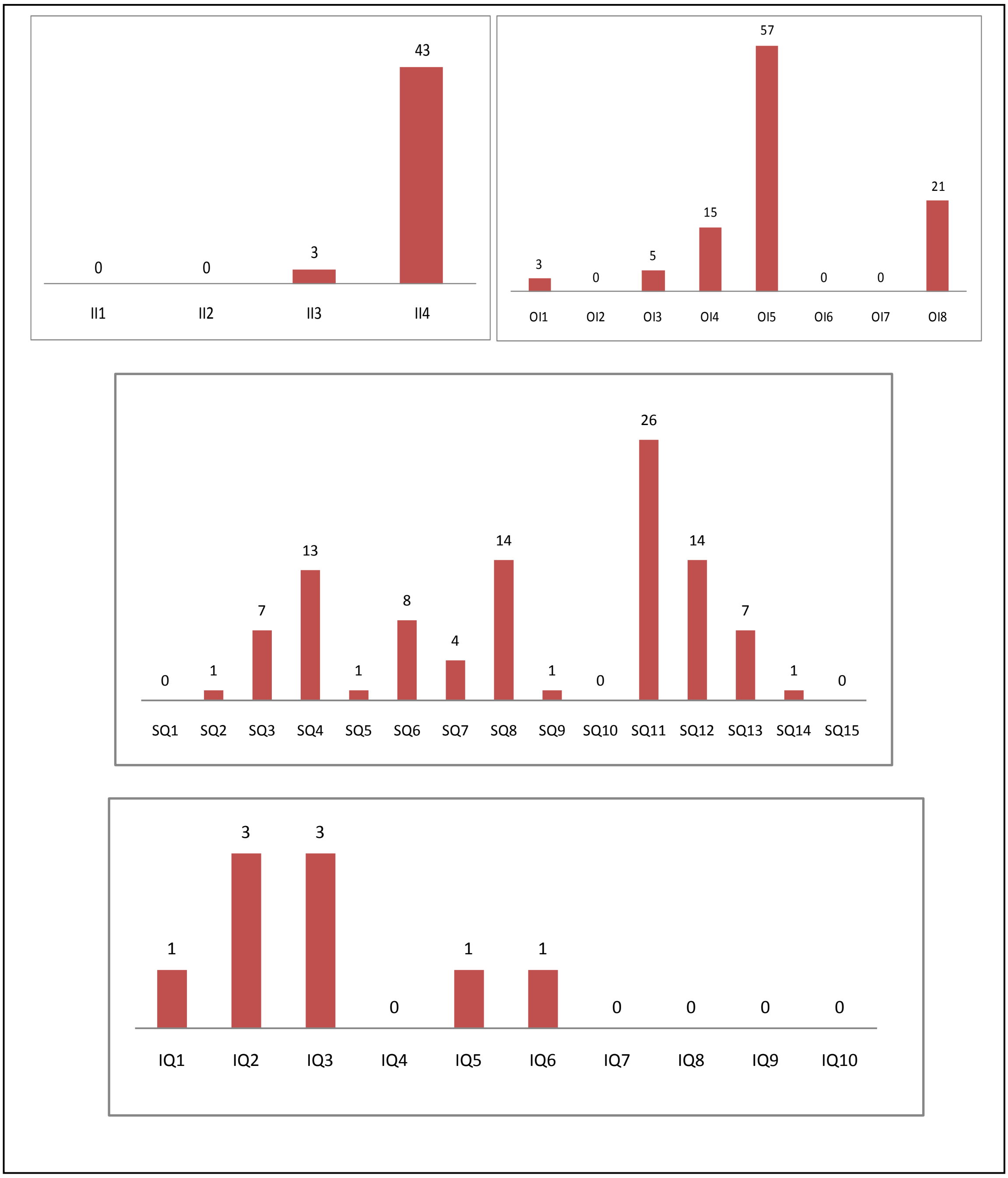


Figure 4.4. Number of citations coded at IS-Impact measures.

Moving on to the coding outcome for the measures of IS-Impact, Table 4.6 and *Figure 4.4* present the counts of citations coded for the measures of the IS-Impact model. Overall, 24 out of 37 measures were instantiated and represented by at least one citation. These 24 measures are as follows: two measures of Individual Impact dimension, ‘Decision Effectiveness’ and ‘Individual Productivity’ were cited by the respondents; in Organizational Impact dimension, five measures were cited by the respondents; System Quality has a large number of measures and the citations provided by the respondents have adequately populated the dimension with 13 out of 15 measures were cited by the respondents; and only half of the Information Quality measures were cited by the respondents.

The Organizational Impact’s ‘Improved Outcomes/Outputs’ measure was the most cited impact measure by the respondents with 57 citations. From the citations provided by the respondents that relate to this measure, it was observed that the users had received positive impact from SPEKS based on the high number of respondents who claimed they have experienced many improvements in job outcomes with the application of SPEKS. The respondents may have compared their experience before SPEKS was implemented with their current experience in which SPEKS had improved, for example, how a task was carried out at their department.

The second highest count of citation related to ‘Individual Productivity’ (with 43 citations). Most of the citations that related to this measure described how SPEKS had helped the respondents in handling their task or job easily and how they were able to complete the task quickly. Some of the respondents agreed that SPEKS reduced their workload and they were able to work more systematically.

The System Quality’s ‘System Reliability’ is the third measure that had a high number of citations, with 26 citations. A reliable system seemed to be one of the relevant aspects for these respondents. From the responses provided by these respondents, there was an issue with the reliability of SPEKS. Systems interruption, freezing or slow response were commonly cited by the respondents.

Thirteen (13) of the IS-Impact measures were not instantiated during the coding process (see Table 4.6). This, however, may not indicate that these measures are not important and not appropriate in measuring the impact of IS in Malaysia. The content of the IS-Impact model has been validated in prior work through a number of steps (literature review, content analysis and construct validity) and the results demonstrate the necessity and appropriateness of the 37 measures to measure the impact of IS. Given that there is some similarity between this research and the previous work (i.e., collecting evidence at the state government, and evaluating financial systems), thus, it is believed that measures that were not instantiated in this survey are appropriate in the Malaysian context.

One possible reason why 13 measures were not instantiated is due to the representative sample of each employment group. The survey received feedbacks from the majority of the Support group users, which represent 89% of the sample. Only 10% of the sample users are those from the Professional and Management group, with 90% of the citations were provided by the Support staff which indicates that the data that supported 65% or 24 of the IS-Impact measures were mostly based on the experience of the Support staff (Table 4.7). Meanwhile, the Professional and Management employment group that was only represented by 8 SPEKS users only provided 23 citations, which were populated across all IS-Impact dimensions. This may suggest that those instantiated measures are mostly experienced by the Support Staff, while those measures that did not instantiate may be more relevant to the Professional and Management employment group. Therefore, it may be that with a higher numbers of respondents from the Professional and Management group, the measures in the IS-Impact model can be more populated.

Table 4.7

Counts of Citations According to the Employment Groups

Dimensions	#	%	Employment Group	#	%
System Quality	**97**	**38%**	**P&M**	**8**	**8%**
			Support	**87**	**90%**
			Unidentified	**2**	**2%**
Information Quality	**9**	**4%**	**P&M**	**1**	**11%**
			Support	**7**	**78%**
			Unidentified	**1**	**11%**
Individual Impact	**46**	**18%**	**P&M**	**3**	**7%**
			Support	**42**	**91%**
			Unidentified	**1**	**2%**
Organizational Impact	**101**	**40%**	**P&M**	**11**	**11%**
			Support	**89**	**88%**
			Unidentified	**1**	**1%**
Total	**253**	**100%**		**253**	

Note:

P&M: Professional and Management group

Another reason that might explain the uncited IS-Impact measures is related to the time given for the respondents to complete the survey. The respondents were given 15 minutes to complete the survey and had to return the completed survey form at the end of the allocated 15 minutes. No additional times was given (for example allowing the respondents to submit the completed form on the next day). Although the questionnaire had been pilot tested and no issue was raised by the volunteers regarding the time allocated to complete it, the time may not have been enough to allow the respondents to think further and deeper about their experience with SPEKS and what they have received from it. Finally, it may be suggested that the responses provided by the respondents were common, things that they frequently experienced or things that they had recently experienced. This also explains why some of the IS-Impact measures have higher numbers of citations compare to those that were less mentioned by the respondents.

Therefore, in order to avoid removing important aspects of the IS impact phenomena (which would affect the content validity of the model) without empirically testing these measures, it was decided that all measures would be retained and operationalised in the subsequent survey.

4.6.1. Revisiting the uncoded citations

In the previous section, the outcome of the coding process was discussed. A total of 253 citations extracted from the qualitative data were coded to 24 measures of IS-Impact. However, 25 citations were unable to be coded to any of the IS-Impact measures. During the coding process, these citations were grouped into a newly created node, and reviewed once the first round of coding was completed. With the revision of these uncoded measures, these measures were grouped or coded into six new categories, as depicted in Table 4.8 below:

Table 4.8
Number of Citations Coded into Other Nodes

Nodes	#
Free Node KIV	1
Free Node General	6
Free Node Suggestion	4
Tree Node Satisfaction	5
Tree Node Security	8
Tree Node Maintenance	1

Free node ‘General’ was created to group citations that provide general goodness (or the opposite) about SPEKS. For example, a citation provided by respondent number 4, “*However, there are also some weaknesses/limitations of SPEKS*“ and another general citation provided by respondent 37, “*The system is good*”. Six citations were grouped in the ‘General’ node.

Four citations were grouped under the second new node, 'Suggestion'. At first, it was difficult to determine if these four citations were related to one of the IS-Impact measures, 'User Requirements'. Reviewing the meaning of 'User Requirements' from the original IS-Impact model, this measure is seen as targeting the current situation of the system, whether the system is functioning according to the user's working requirements or whether there are some functions that did not meet the user's needs, which may affect the performance of both the user and the system. This measure does not refer to extensive modification or changes to meet the user's need. The four citations that could not fit in the 'User Requirements' measure were opinions given by respondents to improve SPEKS in the future. For example, "*If the system can be used out of the office or after office hours, it will help LPM employees to make collection outside the hours*". Therefore, it is reasonable to isolate these four citations from the 'User Requirements' measure and code them into a new node 'Suggestion'.

The outcome of the coding process further suggested eight (8) citations describing 'Security', five (5) citations that related to 'Satisfaction', one (1) citation that mentioned 'Maintenance', and one (1) that was unclear.

4.6.2. Adding new measure

Section 4.6.1 discussed the reviewing and recoding process of 28 citations that could not be coded into any of the 37 IS-Impact measures. Some of the new nodes (KIV, General, and Suggestion) contained citations that provide general opinions and suggestions about SPEKS and how SPEKS can be improved in the future. Thus, these new nodes do not apply to the IS impact phenomena.

As discussed in the previous section, there are a number of citations on 'Satisfaction'. 'Satisfaction' is not a new construct in IS Success research. It has been possibly the most widely used single measure of IS Success (DeLone & McLean, 1992). However, the Satisfaction construct also showed substantial overlap with other measures of multiple IS Success constructs (e.g., quality and impact) (Gable et al., 2008, Rai et al., 2002, Sedera & Tan, 2005). Gable et al. (2008) recently suggested that Satisfaction is an immediate consequence of IS-Impact, and this view is supported in the marketing literature (Anderson & Sullivan, 1993, Brady et al., 2005). An empirical test further supported Gable et al. (2008) who claimed and demonstrated Satisfaction as a consequence of IS-Impact construct. With this argument, citations that were coded to Satisfaction were ignored and Satisfaction was not included in the model.

The coding process also discovered eight (8) citations that described ‘Security’. Table 4.9 below presents these citations.

Table 4.9
Citations that Describe Security

Code	Citation
R5c	Documents are secure.
R8e	Documents are secure [R8e] and easy to find [R8f].
R12b	...because every employee is given a unique ID ...
R25c	Information security.
R45c	Security features: With the use of ID and password to login to system.
R46d	SPEKS ID should be implemented quickly for security.
R59b	Information security is guaranteed.
R61e	The security of SPEKS can be maintained by the use of a unique password and only authorised user can use it.

These citations came from eight different respondents. All of them are support group users. Referring to these citations, many respondents were satisfied with the security of the document or data provided by SPEKS. These impact citations further informed the security feature of SPEKS with the implementation of a unique ID for every SPEKS users. From this evidence, it may be suggested that users feel more comfortable with SPEKS when the system provides security, particularly when some information is protected. The findings also indicate that 'Security' is one of the important features of an information system in Malaysia.

A number of papers in the literature support 'Security' as an important aspect for an information system. 'Security' is one of the traditional IS Success measures and mostly used in evaluating the success of e-commerce systems (for example, in Gupta, Stahl, and Whinston (1998), Unal (2000) and Molla and Licker (2001)). According to Molla and Licker (p. 138, 2001), "Security relates to the protection of information or systems from unsanctioned intrusions or outflows. Lack of security is one of the factors that have been identified in most studies as affecting e-commerce growth and development." Security also refers to authentication and authorization of users (Gupta et al., 1998, Unal, 2000). The arguments provided by these researchers strongly suggest that 'Security' is one of the important aspects in measuring the success of an IS or the impact of IS.

DeLone and McLean (2004) defined e-commerce as "the use of the Internet to facilitate, execute, and process business transaction". SPEKS is not an e-commerce application. However, SPEKS is one of the Malaysian government initiatives to facilitate e-government. Similar to e-commerce, SPEKS is a web-based application that facilitates financial and accounting matters in state governments in Malaysia. Moreover, security was one of the main objectives when SPEKS was developed. More recently, Ainin and Hisham (2008) conducted a study with 163 users of various information systems in Malaysia (including office automation systems) to identify important attributes of information systems and to measure the performance of selected systems, using the identified attributes. They found that data security was the most important attribute of information systems based on the highest mean score given by the respondents when they were asked to rate the importance for each of the identified attributes.

Looking back at the original study (Gable et al., 2008), the selection of measures of IS-Impact model was based on the DeLone and McLean IS Success model published in 1992. ‘Security’ was not listed as one of the IS success measures in the DeLone and McLean’s 1992 paper. This maybe because this measure may not be an important measure for evaluating IS Success before year 1992, which might be one of the reasons why ‘Security’ was not considered during the development of the IS-Impact model. In fact the earliest paper that used ‘Security’ as one of the measures for managing information sharing and collaboration work in intra-organizational network was introduced by Gupta (1998).

Referring to the number of citations that had mentioned about security, ‘Security’ is considered an important measure to evaluate IS Success/IS Impact and was included in the model. Moreover, DeLone and McLean claimed that ‘Security’ is related to the technicality and design of the system and becomes a more significant system-quality issue (DeLone & McLean, 2004, pp.36). Therefore, it was included as a further measure of ‘System Quality’ in the IS-Impact model. *Figure 4.5* shows the modified IS-Impact model that consists of 37 measures in the original IS-Impact model and one (1) new measure named Security.

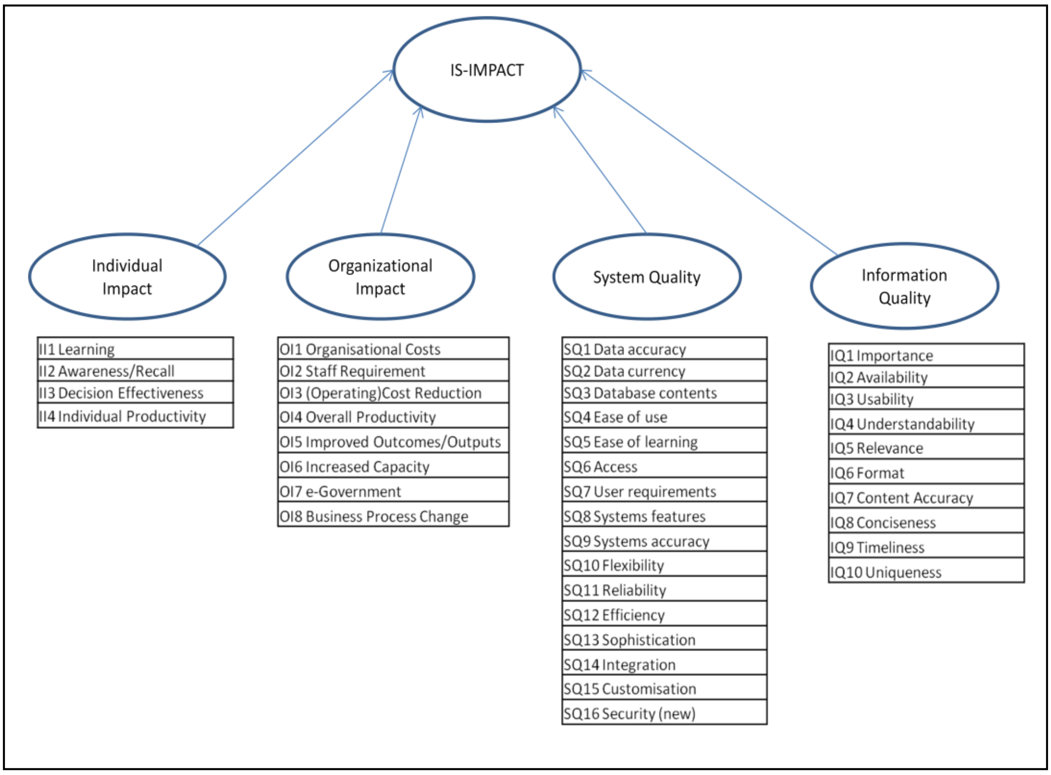


Figure 4.5. The modified IS-Impact model.

4.7 CHAPTER CONCLUSION

This chapter discussed the conduct and outcome of the identification survey that investigated the sufficiency of the IS-Impact model for measuring the impact of information systems in Malaysia. It first described the design of the questionnaire and the translation involved in producing a questionnaire in the local language of the new context. Then the survey findings were presented in which a total of 278 impact citations were extracted and coded using a deductive approach to illustrate in detail how 24 out of 37 measures of the IS-Impact model were supported by the data. The chapter concluded with the discussion of a new measure identified from the coding process and argued its appropriateness as one of the IS-Impact measures.

Nevertheless, the researcher is aware that the qualitative process undertaken involved a lot of subjectivity. The results are highly dependent on the opinions given by the respondents at the time the data were collected. Moreover, data were coded by a single coder. However, a document that contained a step-by-step description (see appendix D) of the coding process was established and was used in this research. This step-by-step description can be adopted to replicate the study. Furthermore, the decision to retain all measures, although some were not instantiated in the analysis, was made based on several considered arguments without any strong empirical evidence. The subsequent survey was designed to overcome these limitations by operationalising the IS-Impact model and empirically testing the fit of all measures. This process will be described in detail in the next chapter.

Chapter 5 : The Confirmation Survey

5.1 CHAPTER INTRODUCTION

In the previous chapter, the process of testing the applicability and adequacy of the IS-Impact measures was presented. Findings from the identification survey have shown the representativeness of 24 out of 37 measures in the model. A new measure is identified and found reasonably appropriate to be added in the model (has been discussed in detail in Chapter 4). The outcome of analysis is highly driven by the context, therefore although some of the measures were not represented by the data, the fact that there were some similarities (i.e. type of organisation, type of system, level of analysis) and differences (i.e. conduct survey in different language, evaluate a custom financial system that was developed for the state governments in Malaysia, different geographical context) between this research with the previous Gable et al. (2008) work, these uncited measures are retained for further analysis. In this chapter, the 37 of the original IS-Impact with an addition of a new measure, 'Security', will be tested and operationalise in the following quantitative survey for subsequent statistical testing of the model.

This chapter begins with an introduction of the survey process that includes designing and administering the questionnaire. Following the survey process, data are managed and prepared for analysis. Descriptive analyses were carryout to describe the respondents. SPSS17 and Microsoft Excel 2007 applications are used in managing the data and analysis.

Before preceding this chapter and forth coming chapters, the researcher would like to point out that there are several terms that will be used interchangeably throughout this thesis. The term 'measure' is referring to the 38 measures of the IS-

Impact model that are operationalised in the confirmation survey. This term is use interchangeably with the word ‘item’. The term ‘item’ is used prominently by many researchers when conducting construct validation process. Furthermore, the word ‘dimension’ is referring to the four dimensions of the multi-dimensional IS-Impact model, namely Individual Impact, Organizational Impact, Information Quality and System Quality. Sometimes the word ‘construct’ is use in place.

5.2 THE SURVEY DESIGN

Fink (2003) suggests seven steps when designing a survey. These include setting objectives for the data collection, designing the study, preparing a reliable and valid survey instrument, administering the survey, managing and analysing survey data, and reporting the results.

5.2.1 Setting the objectives

The main purpose of the confirmation survey is to operationalise the IS-Impact measures in a new context in order to test the external validity of the measurement model. For generalisability, this survey was conducted at several organisations, across multiple stakeholders or user groups, by measuring the impact of SPEKS as experienced by different level of employment cohorts. There are several specific objectives (that are expressed in questions form) of the survey:

- Are the 37 measures valid as formative items for the IS-Impact construct?
- Is the new measure (Security) valid as an item for System Quality?
- Are all criterion measures valid and can these criterion measures be used as reflective measures in validating the IS-Impact construct through measurement relations?

- Is the IS-Impact construct can be identified through structural relationship by employing Satisfaction as consequence of IS-Impact?
- Is there any significance difference between different groups of respondents (e.g. based on state governments, cohorts, sets of instruments) when scoring the measures?

5.2.2 Instrument design and modification

The design of the survey instrument followed the original specification survey instrument used in the prior work of Gable et al. (2008). The same 37 questionnaire items were adopted; however, some modifications were made to the questionnaire items to fit the current context. An English version instrument was first created to ensure that the instrument replicated the original instrument. Some wordings in the original instrument were changed to include contextual information, for example the word ‘agency’ in the original instrument was changed to ‘department’.

The modification of the questionnaire items was iterative, where some changes were made before translation, while some were made based on the suggestions given by the appointed translators (see section 5.2.4 for details) and from the feedback given by the pilot test volunteers (see section 5.3). Table 5.1 depicts changes that were made to some of the questionnaire items. Through further discussion with the researcher’s supervisory team, the finalised questionnaire was constructed (see Appendix E (English version) and F (Bahasa Malaysia version)).

Table 5.1

The Original and Finalised Questionnaire Items

Item code	Item name	Original Item	Finalised item	Change description
II1	Learning	I have learnt much through the presence of (the IS)	I have learnt much through the presence of SPEKS	
II2	Awareness/Recall	(the IS) enhances my awareness and recall of the job related information	SPEKS enhances my awareness and helps me recall job related information.	rephrasing "recall of the job related information"
II3	Decision Effectiveness	(the IS) enhances my effectiveness in the job	SPEKS enhances my effectiveness in the job	
II4	Individual Productivity	(the IS) increases my productivity	SPEKS increases my productivity	
OI1	Organisational Costs	(the IS) is cost effective	SPEKS is cost effective	
OI2	Staff Requirement	(the IS) has resulted in reduced staff costs	SPEKS has resulted in reduced staff costs	
OI3	(Operating)Cost Reduction	(the IS) has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	SPEKS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	
OI4	Overall Productivity	(the IS) has resulted in overall productivity improvement	SPEKS has resulted in overall productivity improvement	
OI5	Improved Outcome/Output	(the IS) has resulted in improved outcomes or outputs	SPEKS has resulted in improved outcomes or outputs	

Item code	Item name	Original Item	Finalised item	Change description
OI6	Increased Capacity	(the IS) has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.	SPEKS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.	
OI7	E-Government	(the IS) has resulted in better positioning for e-Government/Business	SPEKS has helped the organisation to be better prepared for e-government	rephrasing "resulted in better positioning"
OI8	Business Process Change	(the IS) has resulted in improved business processes	SPEKS has resulted in improved organisational processes	changing the word "business" to organisational
IQ1	Importance	Information available from the (the IS) is important	Information available from SPEKS is important	
IQ2	Availability	Information needed from the (the IS) is always available	Information needed from the SPEKS is always available	
IQ3	Usability	Information from the (the IS) is in a form that is readily usable	Information from the SPEKS is in a form that is readily usable	
IQ4	Understandability	Information from (the IS) is easy to understand	Information from SPEKS is easy to understand	
IQ5	Relevance	(the IS) provides output that seems to be exactly what is needed	SPEKS provides output that seems to be exactly what is needed	
IQ6	Format	Information from (the IS) appears readable, clear and well formatted	Information from SPEKS appears readable, clear and well formatted	
IQ7	Content Accuracy	Though data from (the IS) may be accurate, outputs sometimes are not	Though data from SPEKS may be accurate, outputs sometimes are not	
IQ8	Conciseness	Information from (the IS) is concise	Information from SPEKS is concise	

Item code	Item name	Original Item	Finalised item	Change description
IQ9	Timeliness	Information from (the IS) is always timely	Information from SPEKS is always timely	
IQ10	Uniqueness	Information from (the IS) is unavailable elsewhere	Information from SPEKS is unavailable elsewhere	
SQ1	Data accuracy	Data from (the IS) often needs correction.	Data from SPEKS often needs correction.	
SQ2	Data currency	Data from (the IS) is current enough	Data from SPEKS is current enough	
SQ3	Database content	(the IS) is missing key data	Key data is missing from SPEKS.	changed " the IS is missing key data"
SQ4	Ease of use	(the IS) is easy to use	SPEKS is easy to use	
SQ5	Ease of learning	(the IS) is easy to learn	SPEKS is easy to learn	
SQ6	Access (Convenience of access)	It is often difficult to get access to information that is in (the IS)	It is often difficult to get access to information that is in SPEKS	
SQ7	User requirements	(the IS) meets (the Unit's) requirements	SPEKS meets department/agency requirements	replace the word "(Unit's)" to departments/agency
SQ8	Systems features	(the IS) includes necessary features and functions	SPEKS includes all the necessary features and functions	add the word "all the"
SQ9	Systems accuracy	(the IS) always does what it should	SPEKS always does what it should	
SQ10	Flexibility	The (the IS) user interface can be easily adapted to one's personal approach	SPEKS user interface can be easily adapted to one's personal approach	
SQ11	Reliability	The (the IS) systems is always up-and-running as necessary	SPEKS is always up-and-running as necessary	

Item code	Item name	Original Item	Finalised item	Change description
SQ12	Efficiency	The (the IS) systems responds quickly enough	SPEKS responds quickly	remove "enough"
SQ13	Sophistication	(the IS) requires only the minimum number of fields and screens to achieve a task	SPEKS requires only the minimum number of fields and screens to achieve a task	
SQ14	Integration	All data within (the IS) is fully integrated and consistent	All data within SPEKS is fully integrated and consistent	
SQ15	Customisation	(the IS) can be easily modified, corrected or improved	SPEKS can be easily modified, corrected or improved	
SQ16	Security	NEW	All information in SPEKS is secure	

Note in the previous chapter, a new measure, ‘Security’, was identified. Three things need to be considered when adding a new measure in a validated model. First is the placing of the new item in the model’s dimension. Second is the definition of the item, and third, the correct wording to represent the item in the questionnaire or instrument so that the question is able to clearly represent the item. The placing of the item has already been discussed in Chapter 4. The identified item is referring to the technicality and the design of the system (DeLone, 2004); thus, it was added as one of the System Quality measures.

The questionnaire item representing ‘Security’ was derived from the literature and the citations given by respondents. Care was taken in choosing the correct wording that could best represent the item. The item should be meaningful to the respondents. Importantly, a respondent should be able to grasp what the item is trying to measure and not be confused with any other item in the instrument.

Furthermore, the item should be able to relate to the experience of the user in order to get a true score for the measure. Based on the definition given by Molla and Licker (2000) on ‘Security’ (see section 4.6.2) and citations given by the survey respondents, ‘Security’ of SPEKS is measures by employing this statement, *“All information in SPEKS is secure*”. The word ‘information’ that was included in the question can help the user in determining the state of security of the IS. This hereto is in line with the definition given by Molla and Licker (2004) and it is more related to users experience when discussing about the security aspect. It should be noted that the word ‘information’ herein is not associated with Information Quality dimension because it does not relate to the information presentation but rather information protection.

Similar with the original survey, the questionnaire contains a mixture of positive and negative statements. The inclusion of negatively worded items is to prevent response bias or acquiescence bias (DeVellis, 2003, Pallant, 2005). There is a tendency for respondents to agree with a statement in the questionnaire without properly understanding the statement (Colosi, 2005). With reverse statements, respondents are expected to score lower if they have scored the positive items higher. Adding negatively worded question can help identify those respondents who were carefully completing the questionnaire as against those who were not.

The questionnaire also includes two sets of items to conduct a range of validity test. The first set comprises nine criterion measures: four criterion measures that summarised each of the dimensions of the IS-Impact model, and five global items that summarised IS-Impact as a second order construct (see *Figure 4.5* for the conceptual model) following suggestion given by Diamantopolous and Winklhofer (2001) for external variables that can be used for assessing the suitability of the items in the measurement model. The first four items were adopted from the original instrument. Table 5.2 provides the list of criterion measures that were included in the questionnaire.

Another set of measures was included as a means to validate the IS-Impact model through measurement relations. Four measures of Satisfaction were included in the questionnaire for this purpose. In the prior work of Gable et al. (2008), they have conceptualised the Satisfaction construct as the antecedent or consequence of the IS-Impact (*Figure 5.1*) by reconciling the IS-Impact model with Benbasat and Zmud's (2003) 'IS nomological net'. According to Gable et al. (2008, p. 383), "Impact from the information system in one iteration will influence the IS quality and thereafter Satisfaction and Use, and so on." However, rather than isolating

Table 5.2

Criterion Measures

Item code	Items
C1	Overall, the impact of SPEKS on the department/agency has been positive.
C2	Overall, the impact of SPEKS on me has been positive.
C3	Overall, the System Quality of SPEKS is satisfactory.
C4	Overall, the Information Quality of SPEKS is satisfactory.
C5	SPEKS is good.
C6	SPEKS has negatively affected the organisation's performance
C7	SPEKS has no problem.
C8	I have received many advantages from SPEKS
C9	Overall, how would you rate SPEKS?

Impact and Quality, these two halves are measure at the same time and in combination these two halves represent a complete measure of the information system (yielding a second order construct, thus the IS-Impact construct). This means the outcome of the information system impact can influence the Satisfaction of the user or the Use of the system. In relation to this conceptualisation, ideally, the relationship between Impact and Satisfaction or Use should be positively correlated.

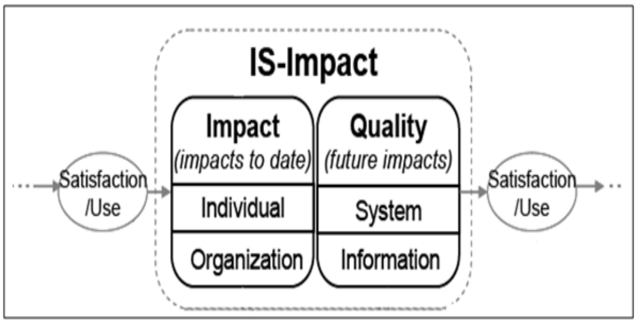


Figure 5.1. IS-Impact nomological net.

Gable et al. (2008) have tested the relationship between the IS-Impact and Satisfaction constructs using a single reflective Satisfaction measure. They have hypothesised that a higher level of IS-Impact yields a higher level of Satisfaction, and they found a strong positive relationship between these two constructs. Model estimation revealed a path between IS-Impact and Satisfaction with beta=0.854 and p<.001 thereby supporting their hypothesis and further evidencing the validity of the IS-Impact construct and its measures (Gable et al., 2008). This finding demonstrates that IS-Impact precedes Satisfaction in the nomological net.

Replicating the same approach, this research made further improvement in the validation process by including different Satisfaction measures from the one used by Gable and friends (2008). Careful consideration in choosing the appropriate Satisfaction measures was taken in order to avoid possible overlap Satisfaction measures with four dimensions of the IS-Impact construct. This argument was made based on the issue that was reported by some authors who claimed that measures for measuring Satisfaction (that was originally introduced by Bailey and Pearson (1983) and then was improved by Ives, Olson and Baroudi (1983) and Doll and Torkzadeh (1988)) were found to be mixed with the Information Quality and System Quality measures of IS Success (Rai et al., 2002, Sedera & Tan, 2005). Four Satisfaction measures that do not overlap with any dimension of success were identified from the IS and marketing literatures. These measures have been empirically tested in previous studies (see Table 5.3 for the source of these Satisfaction measures). The inclusion of more Satisfaction measures is to increase the reliability of the test. With more measures, more variance is introduced in the measurement of Satisfaction. The test will then demonstrate whether there is a significant and strong relationship between IS-Impact and Satisfaction constructs with the addition of more measures, thus indicating the reliability of the results and the validity of the IS-Impact measurement model.

Table 5.3

Satisfaction Items

Item code	Items	Source
S1	Overall, SPEKS is satisfactory.	The original survey
S2	I am satisfied with SPEKS.	Brady et al. (2005), adapted from Oliver (1997)
S3	I am happy with SPEKS. (note: this item was negatively reworded in the questionnaire)	Brady et al. (2005) adapted from Westbrook and Oliver (1991)
S4	I like SPEKS.	Brady et al. (2005) adapted from Westbrook and Oliver (1991)

5.2.3 The format of the questionnaire

A copy of the survey instrument is included in Appendix E. The front page contains an introduction to the research and the purpose of the survey, after which follows the general instructions for completing and returning the survey. Providing clear instructions upfront is important for a self-administered type survey. This helps the questionnaire to explain itself in a way and the respondents are able to complete it without the presence of the researcher (Bourque & Fielder, 2003).

The questionnaire items were divided into two main sections. The first section collects demographic information from the respondents. The demographic data is used to describe the respondents and to identify any significant characteristics of the respondent that may influence the way items in the survey are scored. Another reason for collecting demographic data is to identify SPEKS users according to employment cohorts. However, this survey is anonymous, as the respondents are not requested to state their name. Thus, who responds to the questionnaire cannot be identified.

The second section contains the 38 items of the IS-Impact model and the 13 dependent variables. Two sets of questionnaire were prepared. In the first set, the items (only the IS-Impact measures) are designed as blocked (non-randomised) questions. In this questionnaire set, six sub-sections were created. Four of these sub-sections are dedicated to each dimension of the IS-Impact model. Two more sub-sections contain questions for the Satisfaction construct and criterion variables as the dependent variables, for model validation purposes. The second section begins with an instruction on how to respond to every question in the survey; then, each sub-section is introduced by providing the definition of the dimension, to provide a better understanding of the concept being measured by the following questions. Another questionnaire set was designed by randomizing the 38 items of the IS-Impact model. These two sets of questionnaire were created to test for possible common method variance in the instrument due to the instrument design and same approach.

Items in the questionnaire were measured using a LIKERT scale. The LIKERT scale is widely used in instruments measuring opinions, belief and attitudes (DeVellis, 1991). Items in this type of scale are presented as declarative statements, where the response options indicate varying degrees of agreement with the statement. The number of response options, either an odd or even number, is dependent on the phenomenon being investigated and the goal of the researcher.

The original instrument used a seven-point LIKERT scale for all the items in the questionnaire. However, there are arguments that Asian people are inclined to give neutral responses, or score in the middle when given option to choose (Behling & Law, 2000, Hussein et al., 2005). Therefore, a six-point LIKERT scale is used (with 'strongly agree' and 'strongly disagree' as the end values) to reduce the problem. However, the researcher is aware that with this six-point LIKERT scale those respondents who may be neutral on certain statement in the questionnaire are forced to choose the two middle scores when scoring. Therefore, this can be detected if the mean score for each item is near the middle (i.e mean score = 3.5).

All questions in the questionnaire (i.e. the demographic, the IS-Impact items and dependent variables), were made mandatory in the survey. The respondents were asked to complete all questions in the questionnaire and this requirement is stated at the front page of the questionnaire and at the start of the second section of the questionnaire (see sample questionnaire included in Appendix E).

5.2.4 Translating the confirmation survey

Once the design of the questionnaire was completed, the questionnaire was translated to Bahasa Malaysia. The reason behind the translation has been discussed in Chapter 3 of this thesis. In order to introduce rigour in the translation process, two techniques were employed that involved three translators and one reviewer. This was to make sure that the instrument that was established in a different context was translated well into both the language and culture of the target context (Litwin, 2003).

The questionnaire was translated using a 'back-translation' technique. The questionnaire was first translated to the targeted language, Bahasa Malaysia, by the researcher. Two colleagues of the researcher were contacted and asked to review the translated version questionnaire and translate it back to English independently. Both of the translators are conversant with English and Bahasa Malaysia. At the end of the translation process, there were three versions of the English questionnaire, the original English version, and two from the translation process. The two newly translated English versions were then compared with the original version for any inconsistency. There were some differences observed; however, these differences were related to the structure of the sentences and different choice of words. These changes did not deviate from the original meaning of the items. It can be concluded that the translated version are almost identical to the original questionnaire. This may suggest that the Bahasa Malaysia version is equivalent to the original English version. The outcome of this process also demonstrated that the language used in the original English instrument was good and simple, that allow the instrument to be translated easily (Brislin, 1970). The instrument translation process is illustrated in *Figure 5.2*.

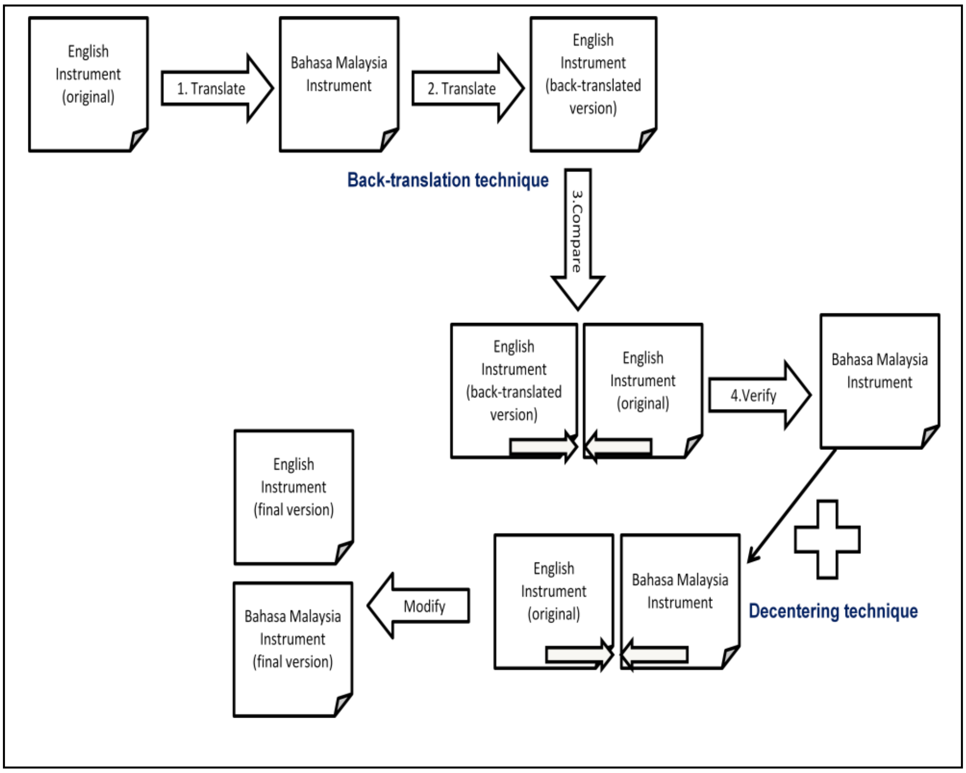


Figure 5.2. Translation process for C-Survey instrument.

To help with the review process and to come up with a conclusion to arrive at the final version of the instrument, the researcher sought help from another colleague who was not involved in the previous translation process. In this review process, modifications were made to the original English instrument, taking into consideration the cultural and linguistic aspects that were appropriate to fit the context. This includes changing any word that did not translate well. For example, changing a word that may be difficult for the target respondent, (i.e. from "SPEKS has resulted in better positioning for e-Government/Business" to "SPEKS has helped the organisation to be better prepared for e-government") and changing the sentence structure (i.e. "SPEKS is missing key data" to "Key data is missing from SPEKS"). This technique called 'decentering' involves actual revision of both versions of the instrument (the English and Bahasa Malaysia instrument) (Brislin, 1970, McGorry, 2000). Changes that were made to the original English instrument are depicted in Table 5.1.

5.3 PILOT TEST

Once the Bahasa Malaysia questionnaire was finalized, it was ready for a pilot test. Due to time and cost constraints, the questionnaire was pilot tested with a group of Malaysian students who were currently pursuing PhDs at QUT. These PhD students have a background in IT and the majority are academics at public universities in Malaysia. The purpose of the pilot test was to test for face validity, which is to identify whether the questions are clear and straightforward, understandable, to identify any misleading or confusing words. Moreover, the pilot test sought to find out whether the instructions were clearly written, and to establish that the questionnaire can be completed within the allocated time.

To help the pilot test volunteers in assessing the questionnaire, a form that contained instructions and questions was given to the volunteers to complete (see Appendix G). Although the instructions in the form were written in English, volunteers were allowed to complete the form using either English or Bahasa Malaysia. The questionnaire and the form were sent to each volunteer by email. The feedback received from the pilot test resulted in minor changes to the questionnaire, for example spelling errors and fine-tuning a number of items in the questionnaire. A copy of the Bahasa Malaysia version survey instrument is included in Appendix F.

5.4 CONDUCTING THE CONFIRMATION SURVEY

The survey was conducted at four state governments in Malaysia; the Negeri Sembilan, Melaka, Johor and Kelantan. SPEKS was implemented about the same time at these four state governments which started at the end of 2002. The installation was completed in mid 2005 and the system had been running completely for at least 4 years when the data was collected. It is believed that the system is in the mature stage and it is the right time to evaluate the impact of the system to the organisation. The number of users at these state governments ranged from 800 to 1600 (based on the statistics provided by the Accountant General's Department).

Before the questionnaire could be distributed, a series of discussions with the IT officers at each state government were held using email, to set the date and time and to seek help in organising the survey. Due to time constraints, the survey was conducted concurrently across the four states. Prior to the data collection, each state government had circulated a notice to the potential SPEKS users to seek cooperation in completing the survey.

5.4.1 Sampling procedure

One of the discussions held with the IT officers was related to the sample selection. It is noted that the unit of analysis in this study is the information system under study, specifically SPEKS in this instance. The sample should have been extracted from a population of SPEKS users. In the state governments, SPEKS is only used by selected users, who handled financial matters in their departments. Thus, eligible respondents were to be identified before disseminating the questionnaire.

The respondents were selected using a combination of cluster, convenience and snowball sampling methods. These non-probability methods were chosen to select only appropriate respondents. With the help of IT officers, a list of departments that were currently used SPEKS at each of the state governments was prepared. These departments were then clustered according to location and the distance between these departments. Taking into consideration of the location and distance, departments that were in the vicinity of the headquarters (the centre of the state government) were selected, at the same time taken into consideration of the targeted sample size. Planning for an appropriate sample size is an important factor in a sampling process and is largely influence by the research goal and the tests that are planned to be conducted (Fink, 2003). Based on the statistical tests that will be used in this research, at least 100 respondents were expected from each state government.

Once the departments had been selected, the respondents were chosen by convenience and snowball sampling methods. Through this method, the respondents were selected based on the suggestion given by the IT officers. The IT officers at each state government were unable to provide a complete list of current SPEKS users prior to data collection. However, a representative at each of the selected departments was identified. The questionnaires were then distributed to the targeted respondents with the help of the representative, who was the Chief Clerk (CC) at the selected departments. The Chief Clerk will then distribute the questionnaire to the SPEKS users in her/his department. The Chief Clerk also helped with the collection of the questionnaires after the respondents have completed answering the questionnaire. Through this technique, an appropriate sample of respondents could be identified.

5.4.2 Administering the questionnaire

The survey instrument was reviewed for ethics clearance by the University's Ethics Committee, similar to the procedure applied for the Identification Survey instrument (see Chapter 4 for details). The survey instrument received clearance to be distributed to the respondents from the committee (see appendix for the approval H).

The distribution of the paper-based questionnaires was done with the help of IT officers and representatives at the four state governments. At Negeri Sembilan, the researcher herself distributed and collected the questionnaire at the selected department. In Melaka, Johor and Kelantan, the IT officers at the respective states helped in the distribution and collection. At these states governments, the IT officers were given a due date (2 weeks from the distribution date) for the final collection and a date when the complete set would be collected by the researcher or sent by post in the case of Kelantan.

Much effort was made to get a high response rate at every selected department and across different levels of employment cohorts. These efforts include:

- Making the instructions easy to read and understand, with the instructions being reviewed and agreed by the pilot test volunteers.
- The questionnaire could be completed within the time allocated and any ambiguity in the questions had been minimised, based on the review given in the translation process and the pilot test.
- Non-monetary incentives were given out to those who have completed the questionnaire. Although the survey is anonymous, the Chief Clerks at every department involved in this survey kept a list of the respondents for his/her record, thus the incentives were passed to the respondents by the Chief Clerks.

- A follow-up visit or calls were made to those who had received the questionnaire (through the Chief Clerk at selected department) but had not responded to the survey. It the case of Melaka, Johor and Kelantan, a follow-up called were made to the IT officers to get update of the progress of the survey.

5.5 THE SAMPLE

The size of a sample is usually determined based on the objective of the research and the type of tests that will be used to analyse the data. There is little agreement among the researchers on how large a sample should be, however, the recommendation generally is the larger, the better (Pallant, 2005). The data collected in this research was to be analysed using several statistical techniques, including Structural Equation Modelling (SEM) technique. Thus, the sample size to achieve for this research would need to meet a minimum requirement for any of the tests that would be used in the data analysis. For Factor Analysis, some recommend at least 300 respondents for comfortable analysis. Others suggest a minimum of 150 responses while some argue that the appropriate sample size depends on the ratio of respondents to items, hence between 5 to 10 respondents for each item (Pallant, 2005, Tabachnick & Fidell, 2001).

For SEM, there are many suggestions on the minimum number in the sample. Mitchell (1993) suggests a minimum sample of 10 to 20 respondents for each item in the tested model. In other case, Kline (1998) argues that a sample size of less than 100 is not appropriate for SEM. Meanwhile, Schumacker and Lomax (2004) found, based on their study of literature, that many studies had sample size between 250 to 500 sample size, and any sample size that is within this range is considered appropriate by many researchers.

A rule of thumb for the right sample size was suggested by researchers when using Partial Least Squares (PLS) analysis (Henseler, Ringle & Sinkovics, 2009): 1) ten times the number of items of the scale with the largest number of formative items, or 2) ten times the number of structural paths directed at a particular construct in the structural path model. In the IS-Impact model, System Quality has the largest number of items, that is 16 items, compare to the other three constructs. Therefore, the ideal sample size is 160. Thus, a sample size larger than 160 was targeted to avoid any potential sampling error.

In this research, a total of 415 questionnaires were distributed in four states, each targeting departments with a high number of SPEKS users at the same time canvassing all cohorts (from strategic to technical users). 310 questionnaires were returned with the response rate of 75%. Table 5.4 below shows the number of questionnaires distributed at each state government. Kelantan provided the highest response rate, with 81% returned questionnaires. This is followed by Negeri Sembilan (75%), Melaka (69%) and Johor (73%). Overall, the response rate from each state is considered adequate based on Fink (2003) suggestion. A high response rate may be attributed to the design of the survey and by manually distributing the questionnaire at each state government.

Table 5.4

Survey Administration at Four State Governments

States	Send	Return	% Response
Negeri Sembilan	135	101	75%
Kelantan	100	81	81%
Melaka	80	55	69%
Johor	100	73	73%
Total	415	310	75%

5.6 DATA PREPARATION

In this section, data preparation activities will be discussed that mainly consists of two main activities: cleaning and coding missing data, and reversing the score of negatively reworded items. These activities are discussed in details in the following sub-sections.

5.6.1 Data cleaning

Data were keyed-in and stored in SPSS 17 and MSExcel 2007. A codebook was created that contained descriptions of the questions, codes and variables associated with the surveys. This codebook is a documentation that describes the data and can be effectively used by future researchers to be able to reproduce the survey, and the survey instrument (Litwin, 2003). Sample of the codebook can be found in the Appendix I.

Once all data was stored in SPSS, the data were scanned for any 'dirty' data that might have resulted from errors in entering the data or errors made by the respondents (Narins, 1999). Data entry errors include mistyping responses, entering data out of range or leaving an answer blank although a valid response was included in the questionnaire. Respondent error includes failing to accurately follow a skip pattern, writing a response that is difficult to interpret or providing false answers (Litwin, 2003, Narins, 1999).

Missing data is one of the most problematic areas in survey research. Extensive effort should be taken to minimize missing data. Missing data should also serve to alert the researcher to the possibility that the research methods need a quality check. Data may be missing for a variety of reasons (Fink, 2003):

- Respondents omit data intentionally.
- Misunderstood the patterns.

- Fail to grasp the language used.
- Unable to read the type.
- Grown tired of lengthy survey.

Simple descriptive analysis was conducted to identify any ‘dirty’ or missing data. Although all the questions were made mandatory and respondents were asked to complete the questionnaire, a number of missing values were identified. It was further noted that some respondents were not appropriate as valid respondents based on their inexperience with SPEKS.

More extensive efforts in filtering valid respondents were taken in order to arrive at a quality set of data. This was to make sure that the data is highly reliable and results from the analyses are convincing. Therefore, besides removing respondents who were not appropriate or had responded with a large amount of missing data, a number of respondents were removed because they provided the same score for all items. This includes respondents who provided almost uniform score on each dimension in the IS-Impact model. This resulted in removal of 18% of the total returned questionnaires; 1% of the respondents did not respond to any of the questions in the questionnaire, 5% said they could not respond to the survey for they do not involve in SPEKS, 6% were removed because of higher number of missing data (more than 3 missing data for the IS-Impact measures) and 6% have provided almost uniform scores for all dimension in the IS-Impact model.

Some of the remaining respondents with missing values were retained because these respondents represent less than 5% of the total number of the sample and had less than three missing values per respondent. These values were considered to be missing at random. Missing values were coded but not replace to avoid interferring the data. During analysis, these missing values were flagged and excluded from analysis based on the missing value options provided by the statistical tests used. Similar tests were repeated after removing the invalid respondents, to uncover any overlooked data. A total of 254 respondents remained for further data analysis at the end of this data cleaning activity.

5.6.2 Reversing negatively reworded items

As mentioned in an earlier section, there is a mixture of positive and negative statements in the questionnaire. Six items in the questionnaire were designed as negatively reworded statements. The scale used with these negatively reworded items was similar to that with the other items, however, for the negatively reworded questions, the high score indicates high disagreement as opposed to the positively reworded questions, where the high score indicates high agreement. The negatively reworded items need to be reverse coded before any analysis can be conducted. This is to ensure that all items scores are on the same scale, meaning that high score indicates high agreement.

All scores for the six negatively reworded items were reverse coded by using the Transform and Recode function in SPSS. This is done by changing the value of 1 to 6, value of 2 to 5, the value of 3 to 4, the value of 4 to 3, the value of 5 to 2 and the value of 6 to 1 in the dialog box.

5.7 DESCRIBING THE SAMPLE

The previous section described the cleaning process for the data in which 56 respondents were found to be invalid and were removed from the sample. This has resulted in 254 respondents that can be used in the model validation test that will be discussed in Chapter 6.

In Section 1 of the questionnaire, respondents are requested to provide some personal details that relate to their working background. All fields in Section 1 are mandatory. The identity of the respondents remained anonymous. However, some respondents were uncomfortable in providing a description of their job, hence did not complete Section 1. This section presents the descriptive analysis of the participating respondents in the confirmation survey.

5.7.1 Distribution across state governments

Figure 5.3 below shows the number of valid respondents according to the state governments involved in the survey. The highest number of respondents came from Negeri Sembilan, with 33% of valid respondents. This is followed by Kelantan (29%), Johor (19%) and Melaka (19%).

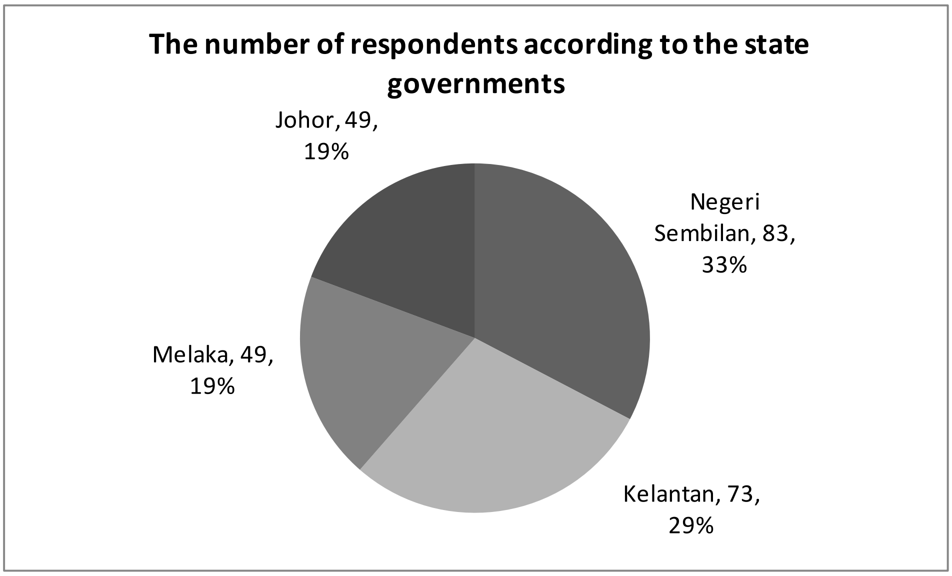


Figure 5.3. Sample distributions across four state governments.

Twenty-six (26) departments from four state governments participated in this survey (see Table 5.5). Ten (10) out of 254 respondents did not respond to the question; however, the researcher believed that these unidentified respondents came from any of the department listed in Table 5.5. From the table, the highest number of respondents came from Department of Finance and Treasury. This department, in fact, had the highest number of respondents in each state government. This is expected, as SPEKS is a financial system that supports the functions and processes in this department, so the users used the system on a day-to-day basis.

Table 5.5

Distribution of Respondents by Departments

Departments	Total
Accountant General's Department	2
Department of Agriculture	7
Department of Financial and Treasury	99
Department Of Fisheries	1
Department of Irrigation and Drainage	15
Department of Lands and Mines	9
Department of Syariah Judiciary	1
Department of Veterinary Services	3
Forestry Department	5
Housing and Local Government Unit	5
Land and Regional Office	14
Melaka Chief Minister's Department	3
Melaka Chief Minister's Incorporated	2
Melaka Education Trust Fund (TAPEM)	1
Melaka Housing Board	1
Melaka Mufti Department	1
Melaka Zoo	1
Public Works Department	24
Sate Development Office	4
Social Welfare Department	5
State Islamic Department	18
State Secretary Office	13
State Services Commission	2
The Governor of Melaka Office	1
Tourism Promotion Unit	2
Town and Regional Planning Department	5
NA	10
Total	254

Table 5.6 and *Figure 5.5* show the duration of working for all participating respondents, in their respective departments and state governments. In the questionnaire, the respondents were asked to state the duration of working at their department in months and years. The respondents were then placed into three groups, as shown in Table 5.6, based on their working duration at their respective departments and state government. From the table, it can be seen that 94 respondents have less than 3 years of experience working at that department, 108 respondents had been working at the same department for at least 3 years but less than 10 years, and 36 respondents had been working at the same department for more than 10 years. 16 of the respondents, however, did not respond to the question.

Table 5.6

Working Duration at the Department and State Government

	Duration in department	Duration in state
Less than 3 years	94	73
Between 3 to 10 years	108	78
More than 10 years	36	85
NA	16	18
Total	**254**	**254**

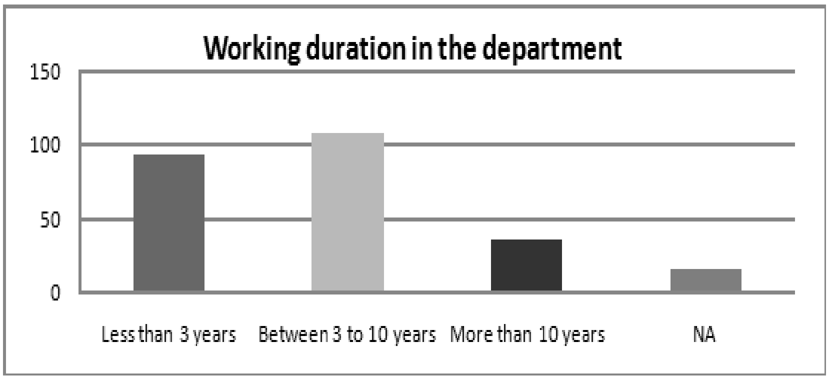


Figure 5.4. Duration of the respondents working in their respective departments.

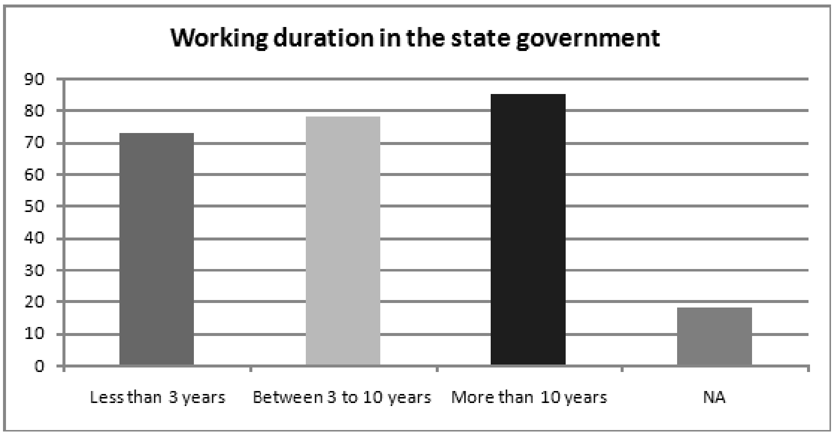


Figure 5.5. Duration of the respondents working for their respective state government

For the working duration at the state government, 73 respondents had less than 3 years serving as an employee at their respective state government, 78 respondents had between 3 to 10 years working at their respective state government and 85 respondents had been serving their state government for more than 10 years. 18 respondents, however, did not respond to the question.

Table 5.7, *Figure 5.6* and *Figure 5.7* show the working duration of the respondents according to the respective states governments.

Table 5.7

Working Duration of the Respondent According to the Respective States Governments

	Working Duration in the Department				Working Duration in the State Government			
	Negeri Sembilan	Melaka	Johor	Kelantan	Negeri Sembilan	Melaka	Johor	Kelantan
Less than 3 years	24	18	23	21	16	16	21	12
Between 3 to 10 years	33	24	14	28	29	20	7	17
More than 10 years	5	1	9	16	19	5	16	37
Total	**62**	**43**	**46**	**65**	**64**	**41**	**44**	**66**

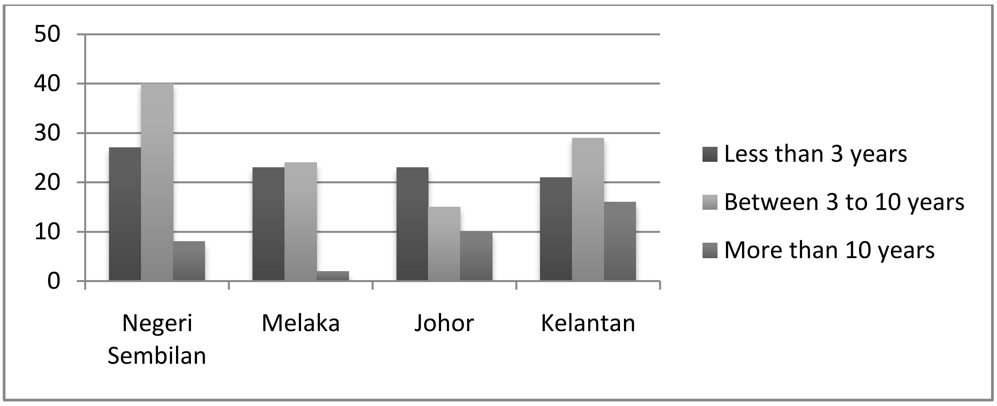


Figure 5.6. Duration of the respondents working at their respective departments.

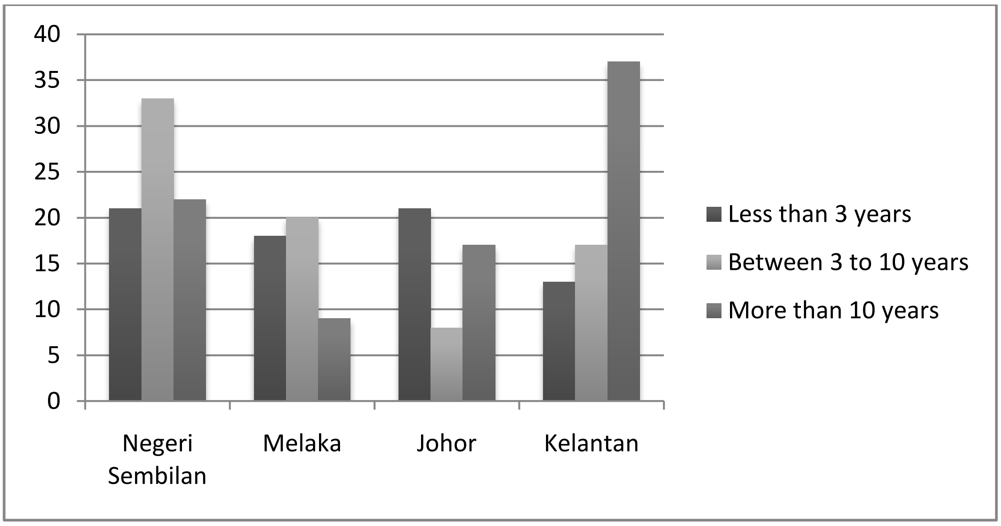


Figure 5.7. Duration of the respondents working for their respective state government.

5.7.2 Classification of respondents according to job role and cohort

Moving on to the job description, respondents are classified according to the government's service scheme and their position in the respective state governments. Government employees in Malaysia are generally divided into two groups, the 'Professional and Management' staff and 'Support' staff. Employees are classified into these two groups according to the service scheme and their job title. In this research, respondents were required to provide information about their job and experience with SPEKS. This information was to be used to group the respondents into four employment cohorts. Furthermore, the information provided by respondents would help in understanding their roles as a user of SPEKS. These employment cohorts are based on the classification provided by Anthony (1965), in which he suggested three employment cohorts: Strategic, Managerial and Operational cohorts, and the fourth cohort, Technical, as suggested by Sedera, Tan and Dey (2007).

Table 5.8

Classification of Respondents According to the Service Scheme

States	Government service scheme			Total
	Professional and Management	Support	NA	
Negeri Sembilan	7	73	3	83
Melaka	2	47	0	49
Johor	1	47	1	49
Kelantan	8	59	6	73
Total	**18**	**226**	**10**	**254**

226 (89%) of the respondents are support staff (see Table 5.8 and *Figure 5.8*). This observation is similar with the identification survey where by the support staff group is the largest respond group in the survey. This indicates that SPEKS users in the state governments are mostly those from the support service scheme. Based on the respondent's job title, these support staff are those whose work involved clerical and administrative work, for example assistant accountant, clerk, administrative assistant or data processing machine operator. Meanwhile, 18 (7%) of the respondents are Professional and Management staff and hold a position such as engineer, accountant, administrative officer, deputy director of a department or IT officer.

Table 5.9 shows the number of respondents according to job title. Overall, the respondents of this survey represent 21 job titles, ranging from director to clerk to data processing machine operator. From the table, it is obvious that a high number of respondents are those who hold positions as administrative staff, with the highest number 145 (54%) being administrative assistance for finance. This is followed by administrative assistance (general) and assistant accountant.

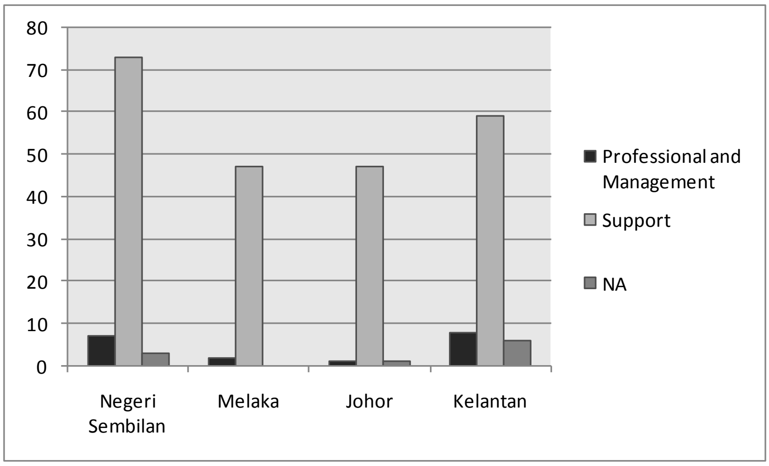


Figure 5.8. Professional and management staff versus support staff.

Table 5.9

Classification of Respondents According to Job Title

Job Title	Total
Administrative Assistant (Finance)	130
Account Clerk	6
Assistant Accountant	22
Administrative Assistant	37
Assistant Director	3
Assistant Administrative Officer	5
Deputy Director	2
Chief Clerk	5
Technical Assistant	3
Malaysian Home and Foreign Services	2
IT Officer	1
Accountant	3
Assistant IT Officer	4
Assistant District Officer	1
Assistant Secretary	3
Administrative Officer	3
Data Processing Machine Operator	7
Clerk (audit)	4
Engineer	1
Chief Assistant Director	1
Assistant Engineer	1
NA	10
Total	**254**

The respondents are further classified according to the employment cohorts based on the respondents' job titles and the service scheme. All respondents under the 'Professional and Management' service scheme are grouped under the Managerial cohort, except for four assistants to the IT officer. The majority of the 'Support' staff is grouped under the Operational cohort, except for two technical assistants. The Technical cohort comprises four assistants to the IT officer, and two technical staff.   Table 5.10 shows the frequency of respondents across the three employment cohorts.

Table 5.10

Classification of Respondents According to Employment Cohorts

States	Cohorts			NA	Total
	Managerial	Operational	Technical		
Negeri Sembilan	6	72	2	3	83
Melaka	2	47	0	0	49
Johor	1	45	2	1	48
Kelantan	8	58	1	6	74
Total	**17**	**222**	**5**	**10**	**254**

As shown in Table 5.10, data was collected from Managerial, Operational and Technical cohorts. However, no Strategic staffs participate in the survey. The non-involvement of this cohort is not intentional. This survey was designed to include all levels of cohorts, and this was highlighted in the introductory page of the questionnaire, "*All employees at selected States Governments in Malaysia, who either use SPEKS directly or receive its output are being contacted and encouraged to participate in this survey*". Strategic users may not use the system directly; however, reports that they received, for example, a monthly spending report, were generated from the system. Therefore, the Strategic cohort may have indirect impact from SPEKS and their opinion of SPEKS is as valuable as that of employees who are direct users of SPEKS. There are a number of possible reasons for the exclusion of Strategic cohort. First, since the distribution of the questionnaires were made with the help of the IT officers or representatives at each department, the researcher believe that; (1) the Strategic staffs are accidentally absence in the sampling frame even though they are users, (2) Strategic staffs are not user of SPEKS or have no experience in using the system, thus were omitted in the sampling frame. The third reason that may contributed to the exclusion of the Strategic cohort is; (3) although this cohort was approached, however, they have no interest in responding to the questionnaire.

5.8 DESCRIPTIVE ANALYSIS OF THE ITEMS

Section 2 of the questionnaire contains 51 questions that relate to the quality and impact of the IS under study. The respondents were requested to complete all questions in this section by providing a score for each of the questions on a scale from 1 to 6. Each question was related to their experience with the quality of SPEKS and the impact that they had received from the IS. These 51 questions comprise the 38 measures of the IS-Impact model, four Satisfaction items, and nine criterion measures. The data collected in Section 2 is highly important, as it will be used for testing the validity of the IS-Impact model. The model validation process, however, will be discussed in Chapter 6.

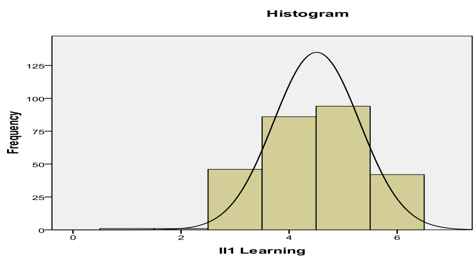
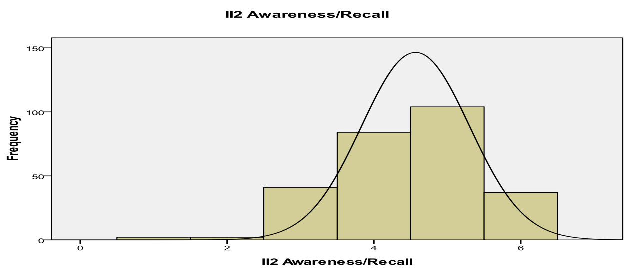
In this section, the descriptive analysis of the items is reported. Each of the items is explored to provide a description of its distribution, and assessing the normality of the data. Furthermore, data are scanned for any outliers. The results of the test are presented in the following subsection.

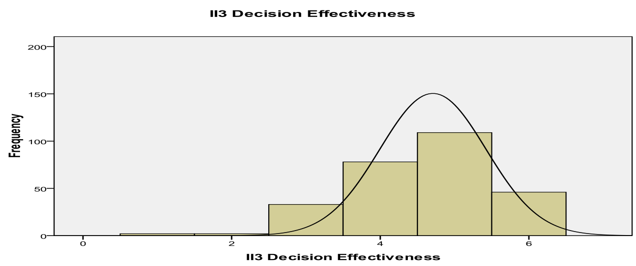
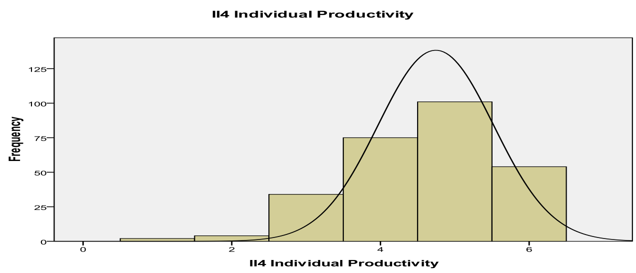
5.8.1 Descriptive report for the 38 IS-Impact measures

Table 5.11 to Table 5.14 present the distribution and statistics for each of the items in the four dimensions of the IS-Impact model. The skewness value provides an indication of the symmetry of the distribution, whereas Kurtosis provides information about the peakedness of the distribution. For a perfectly normal distribution, the skewness and kurtosis value is zero (Pallant, 2005). Positive skewness occurs when the mean is greater than the median or scores are clustered to the left of the low values, while, negative skewness occurs when the mean is less than the median or the scores are clustered at the right-hand side of the graph. Positive kurtosis values indicate that the distribution is rather peaked or clustered in the centre with long thin tails. Negative kurtosis values indicate a flatter distribution (Gaur & Gaur, 2006, Pallant, 2005).

Table 5.11

Distribution and Statistics of Individual Impact Items

<table>
<tr><th colspan="3">Individual Impact</th></tr>
<tr><td colspan="3">Item ID: II1 Learning
Survey question: I have learnt much through the presence of SPEKS</td></tr>
<tr><td colspan="2">Statistics</td><td>Normality</td></tr>
<tr><td>Valid</td><td>253</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.47</td></tr>
<tr><td>Std. Dev.</td><td>0.974</td></tr>
<tr><td>Skewness</td><td>-0.191
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.395</td></tr>
<tr><td colspan="3">Item ID: II2 Awareness/Recall
Survey question: SPEKS enhances my awareness and helps me recall job related information.</td></tr>
<tr><td colspan="2">Statistics</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.47</td></tr>
<tr><td>Std. Dev.</td><td>0.974</td></tr>
<tr><td>Skewness</td><td>-0.436
left skewed</td></tr>
<tr><td>Kurtosis</td><td>0.264</td></tr>
</table>

Individual Impact		
Item ID: II3 Decision Effectiveness Survey question: SPEKS enhances my effectiveness in the job.		
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.60	
Std. Dev.	0.968	
Skewness	-0.583 left skewed	
Kurtosis	0.581	
Item ID: II4 Individual Productivity SPEKS increases my productivity.		
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.61	
Std. Dev.	1.023	
Skewness	-0.581 left skewed	
Kurtosis	0.331	

All Individual Impact items are found to have negatively skewed distributions with means between 4.47 and 4.61. This indicates that scores are clustered to the right or high end of the scale. All mean values are greater than the middle scale (>3.5); thus, it can be concluded that SPEKS has a high impact in the opinion of the respondents. The positive kurtosis values for items II2, II3 and II4 indicate that the scores are clustered in the centre. However, item II1 has a flatter distribution, indicating some cases at the extremes.

Table 5.12

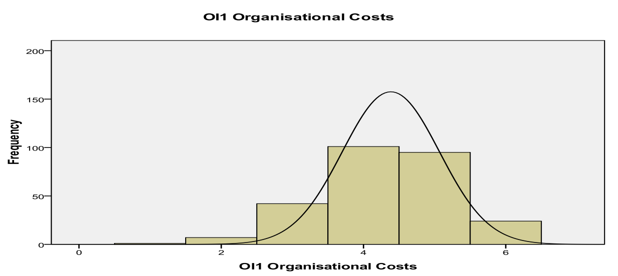
Distribution and Statistics of Organizational Impact Items

Organizational Impact

Item ID: OI1 Organisational Costs
Survey question: SPEKS is cost effective.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.32
Std. Dev.	0.922
Skewness	-0.310 left skewed
Kurtosis	0.148

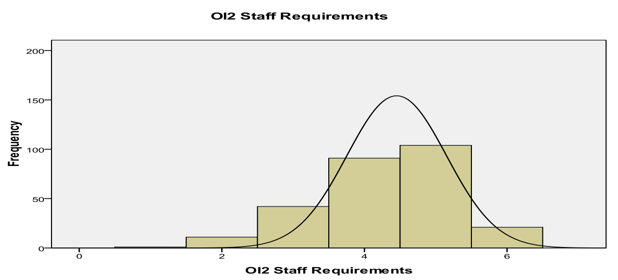
Normality



Item ID: OI2 Staff Requirements
Survey question: SPEKS has resulted in reduced staff costs.

Statistic	
Valid	252
Min	1
Max	6
Mean	4.30
Std. Dev.	0.959
Skewness	-0.473 left skewed
Kurtosis	0.138

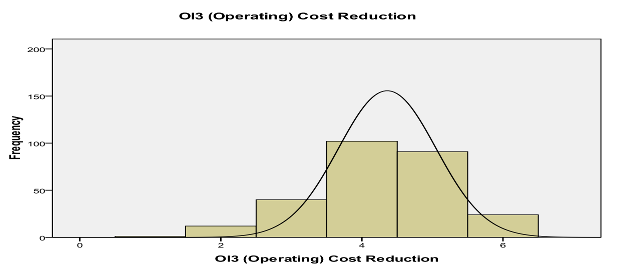
Normality



Item ID: OI3 (Operating) Cost Reduction.
Survey question: SPEKS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.).

Statistic	
Valid	251
Min	1
Max	6
Mean	4.27
Std. Dev.	0.970
Skewness	-0.372 left skewed
Kurtosis	0.137

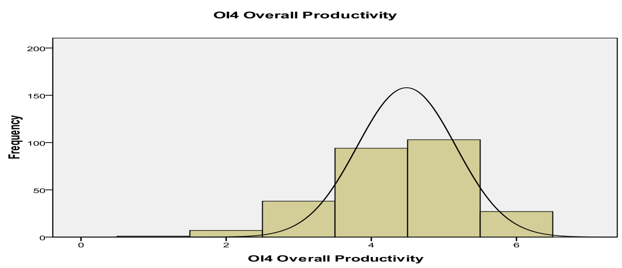
Normality

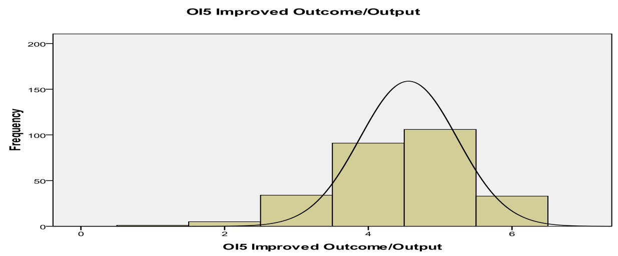
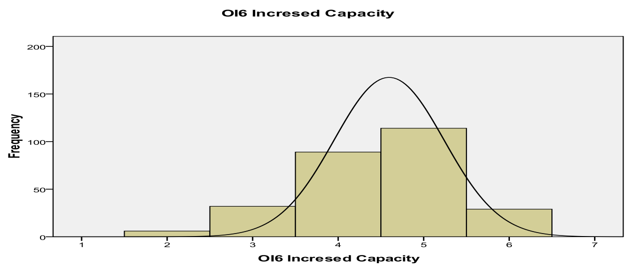


Item ID: OI4 Overall Productivity
Survey question: SPEKS has resulted in overall productivity improvement.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.39
Std. Dev.	0.929
Skewness	-0.404 left skewed
Kurtosis	0.217

Normality

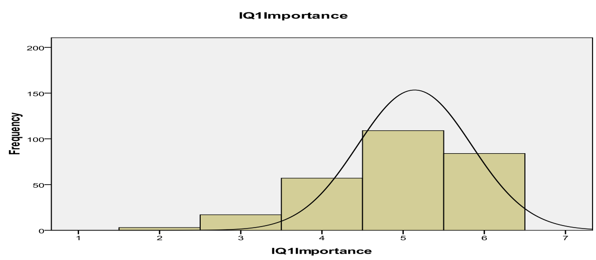
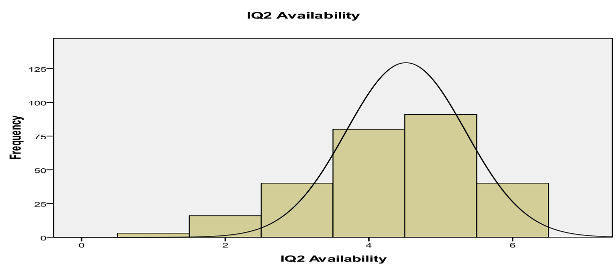
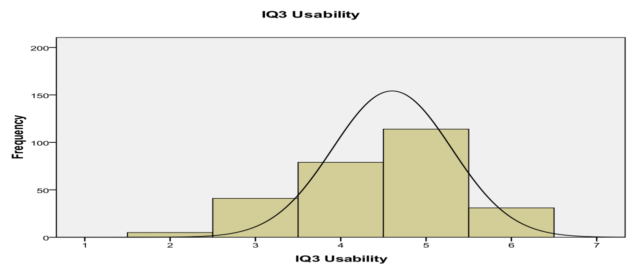
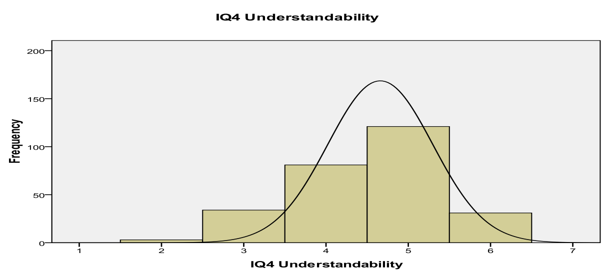


Organizational Impact		
Item ID: OI5 Improved Outcome/Output Survey question: SPEKS has resulted in improved outcomes or outputs.		
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.48	
Std. Dev.	0.918	
Skewness	-0.389 left skewed	
Kurtosis	0.243	
Item ID: OI6 Increased Capacity Survey question: SPEKS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.		
Statistic		Normality
Valid	253	
Min	2	
Max	6	
Mean	4.49	
Std. Dev.	0.880	
Skewness	-0.357 left skewed	
Kurtosis	-0.061	

As illustrated in Table 5.12, all Organizational Impact items are found to have negatively skewed distributions with means between 4.27 and 4.49. Scores are clustered at the high end of the scale. All the mean values are greater than the middle scale (>3.5), which indicates that SPEKS has had a high impact on the state governments. The positive kurtosis values for items OI1, O12, OI3, OI4, OI5 and OI8 indicate that scores are clustered in the centre. However, items OI6 and OI7 have a flatter distribution, indicating some cases at the extremes.

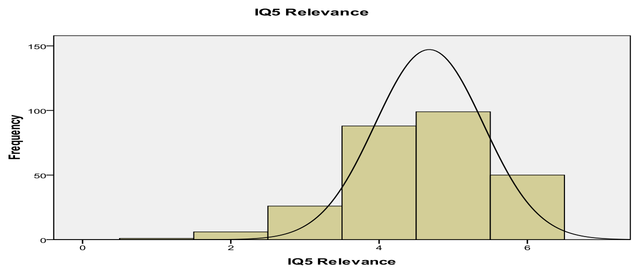
Table 5.13

Distribution and Statistics of Information Quality Items

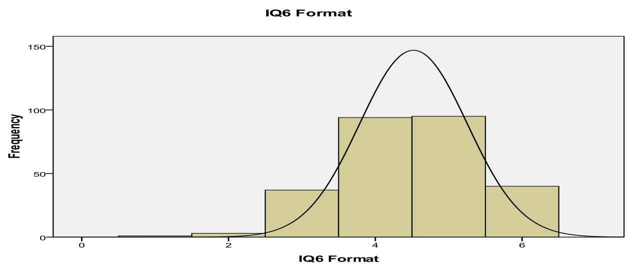
<table>
<tr><th colspan="3">Information Quality</th></tr>
<tr><td colspan="3">Item ID: IQ1 Importance
Survey question: Information available from SPEKS is important.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.96</td></tr>
<tr><td>Std. Dev.</td><td>0.936</td></tr>
<tr><td>Skewness</td><td>-0.884
left skewed</td></tr>
<tr><td>Kurtosis</td><td>1.075</td></tr>
<tr><td colspan="3">Item ID: IQ2 Availability
Survey question: Information needed from the SPEKS is always available.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.33</td></tr>
<tr><td>Std. Dev.</td><td>1.135</td></tr>
<tr><td>Skewness</td><td>-0.554
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.023</td></tr>
<tr><td colspan="3">Item ID: IQ3 Usability
Survey question: Information from the SPEKS is in a form that is readily usable.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>2</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.47</td></tr>
<tr><td>Std. Dev.</td><td>0.927</td></tr>
<tr><td>Skewness</td><td>-0.403
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.239</td></tr>
<tr><td colspan="3">Item ID: IQ4 Understandability
Survey question: Information from SPEKS is easy to understand.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>252</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>2</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.54</td></tr>
<tr><td>Std. Dev.</td><td>0.872</td></tr>
<tr><td>Skewness</td><td>-0.401
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.097</td></tr>
</table>

Information Quality

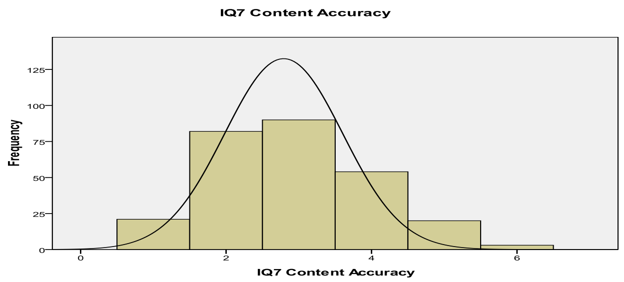
Item ID: IQ5 Relevance
Survey question: SPEKS provides output that seems to be exactly what is needed.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.59	
Std. Dev.	0.972	
Skewness	-0.516 left skewed	
Kurtosis	0.391	

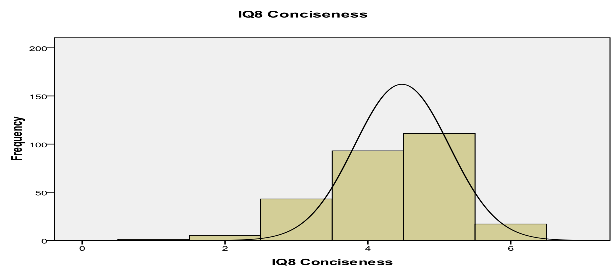
Item ID: IQ6 Format
Survey question: Information from SPEKS appears readable, clear and well formatted.

Statistic		Normality
Valid	252	
Min	1	
Max	6	
Mean	4.48	
Std. Dev.	0.951	
Skewness	-0.291 left skewed	
Kurtosis	0.026	

Item ID: IQ7 Content Accuracy
Survey question: Though data from SPEKS may be accurate, outputs sometimes are not.

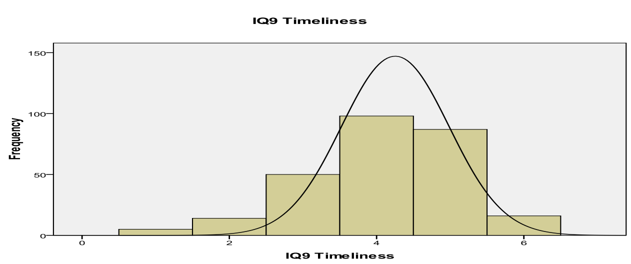
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	2.92	
Std. Dev.	1.079	
Skewness	0.348 right skewed	
Kurtosis	-0.288	

Item ID: IQ8 Conciseness
Survey question: Information from SPEKS is concise.

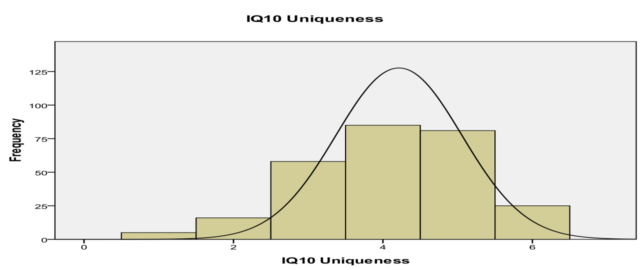
Statistic		Normality
Valid	252	
Min	1	
Max	6	
Mean	4.32	
Std. Dev.	0.886	
Skewness	-0.539 left skewed	
Kurtosis	0.318	

Information Quality

Item ID: IQ9 Timeliness
Survey question: Information from SPEKS is always timely.

Statistic		Normality
Valid	232	
Min	1	
Max	6	
Mean	4.03	
Std. Dev.	1.052	
Skewness	-0.609 left skewed	
Kurtosis	0.313	

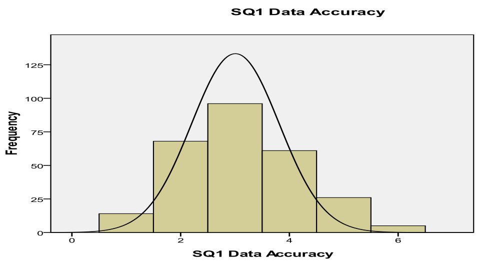
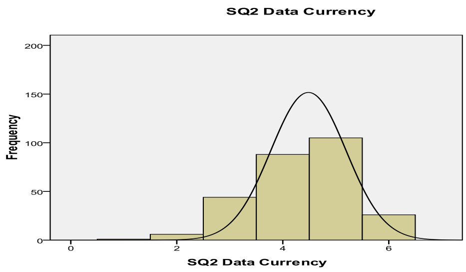
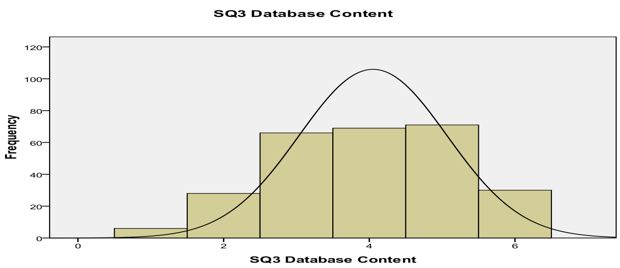
Item ID: IQ10 Uniqueness
Survey question: Information from SPEKS is unavailable elsewhere.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.06	
Std. Dev.	1.035	
Skewness	-0.623 left skewed	
Kurtosis	0.383	

In Table 5.13, except for item IQ7, the rest of the Information Quality items are found to have negatively skewed distributions, with means between 4.03 and 4.96. Scores are clustered at the high end of the scale. Except IQ7, all mean values are greater than the middle scale (>3.5), which indicates that SPEKS has provided high information quality. However, the mean score of item IQ7 is smaller than the middle scale (<3.5), thus, scores for this particular item are clustered at the low end of the scale. This indicates that respondents were less positive about the quality of the content, even though the other aspects concerning Information Quality were scored higher. Additionally, scores for item IQ7 were more scattered (based on the kurtosis value), thereby indicating a larger range of scores for this item. Therefore, SPEKS users may have mixed perceptions concerning the content accuracy of SPEKS. There is a mixed dispersion among all the items of Information Quality. The scores for items IQ1, IQ5, IQ6, IQ8 and IQ9 are clustered to the centre, indicating a smaller range of dispersion. Meanwhile, the scores for item IQ2, IQ3, IQ4, IQ10 (including IQ7, which was discussed earlier) are more scattered, which results in flatter distributions.

Table 5.14

Distribution and Statistics of System Quality Items

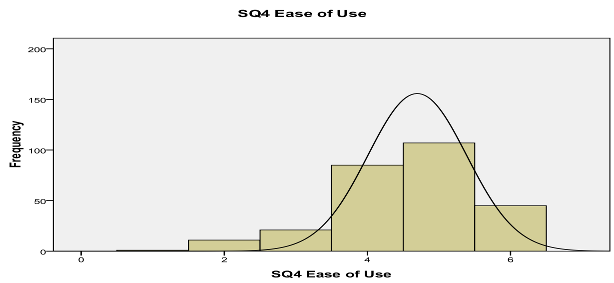
System Quality		
Item ID: SQ1 Data Accuracy Survey question: Data from SPEKS often needs correction.		
Statistic		Normality
Valid	250	
Min	1	
Max	6	
Mean	3.08	
Std. Dev.	1.069	
Skewness	0.218 right skewed	
Kurtosis	-0.381	
Item ID: SQ2 Data Currency Survey question: Data from SPEKS is current enough.		
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.37	
Std. Dev.	0.947	
Skewness	-0.454 left skewed	
Kurtosis	0.101	
Item ID: SQ3 Database Content Survey question: Key data is missing from SPEKS.		
Statistic		Normality
Valid	253	
Min	1	
Max	6	
Mean	3.02	
Std. Dev.	1.233	
Skewness	0.167 Right skewed	
Kurtosis	-0.727	

System Quality

Item ID: SQ4 Ease Of Use
Survey question: SPEKS is easy to use.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.57
Std. Dev.	1.002
Skewness	-0.706 left skewed
Kurtosis	0.675

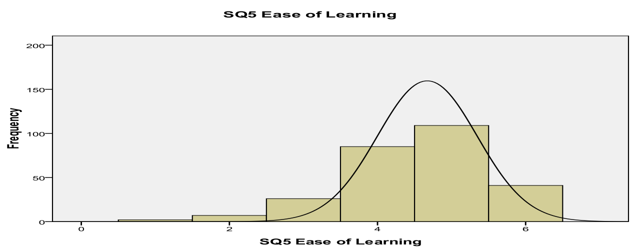
Normality



Item ID: SQ5 Ease of Learning
Survey question: SPEKS is easy to learn.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.56
Std. Dev.	0.988
Skewness	-0.701 left skewed
Kurtosis	0.865

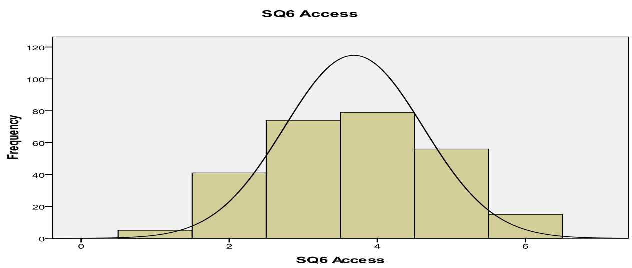
Normality



Item ID: SQ6 Access
Survey question: It is often difficult to get access to information that is in SPEKS.

Statistic	
Valid	253
Min	1
Max	6
Mean	3.33
Std. Dev.	1.151
Skewness	0.016 right skewed
Kurtosis	-0.682

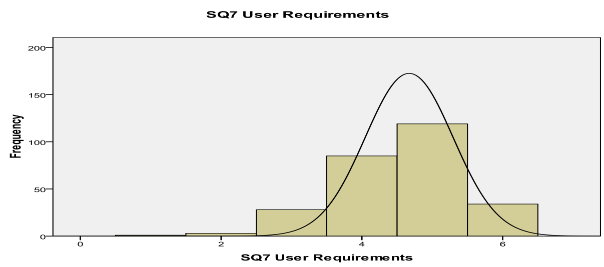
Normality

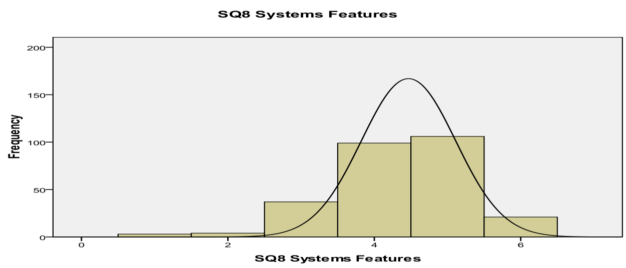
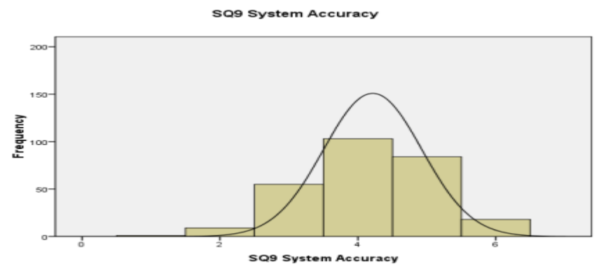
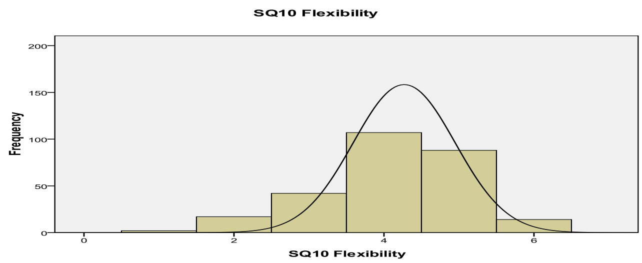
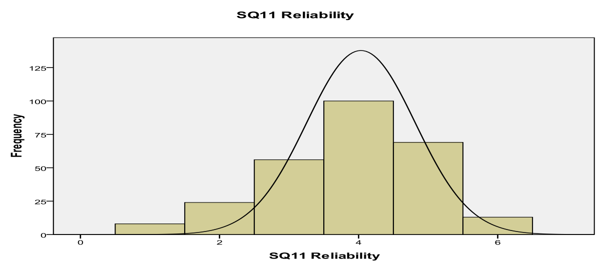


Item ID: SQ7 User Requirements
Survey question: SPEKS meets department/agency requirements.

Statistic	
Valid	252
Min	1
Max	6
Mean	4.57
Std. Dev.	0.883
Skewness	-0.574 left skewed
Kurtosis	0.743

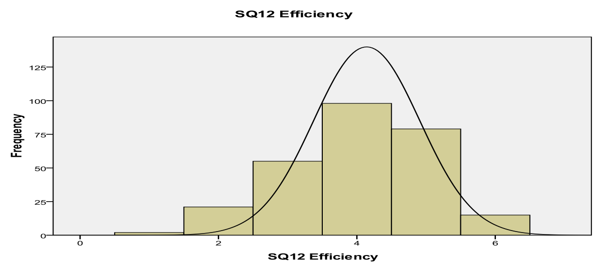
Normality



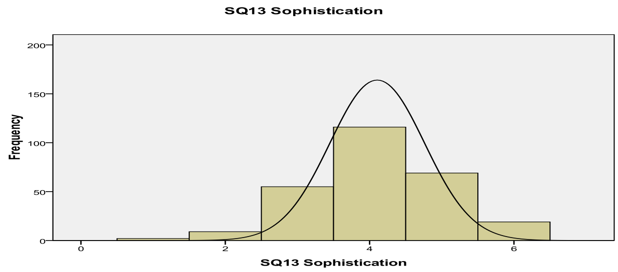
<table>
<tr><th colspan="3">System Quality</th></tr>
<tr><td colspan="3">Item ID: SQ8 Systems Features
Survey question: SPEKS includes all the necessary features and functions.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>253</td><td rowspan="7"></td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.34</td></tr>
<tr><td>Std. Dev.</td><td>0.915</td></tr>
<tr><td>Skewness</td><td>-0.736
left skewed</td></tr>
<tr><td>Kurtosis</td><td>1.237</td></tr>
<tr><td colspan="3">Item ID: SQ9 System Accuracy
Survey question: SPEKS always does what it should.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>253</td><td rowspan="7"></td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.15</td></tr>
<tr><td>Std. Dev.</td><td>0.935</td></tr>
<tr><td>Skewness</td><td>-0.304
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.008</td></tr>
<tr><td colspan="3">Item ID: SQ10 Flexibility
Survey question: SPEKS user interface can be easily adapted to one's personal approach.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>252</td><td rowspan="7"></td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.11</td></tr>
<tr><td>Std. Dev.</td><td>0.978</td></tr>
<tr><td>Skewness</td><td>-0.603
left skewed</td></tr>
<tr><td>Kurtosis</td><td>0.329</td></tr>
<tr><td colspan="3">Item ID: SQ11 Reliability
Survey question: SPEKS is always up-and-running as necessary.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7"></td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>3.85</td></tr>
<tr><td>Std. Dev.</td><td>1.129</td></tr>
<tr><td>Skewness</td><td>-0.483
left skewed</td></tr>
<tr><td>Kurtosis</td><td>-0.103</td></tr>
</table>

System Quality

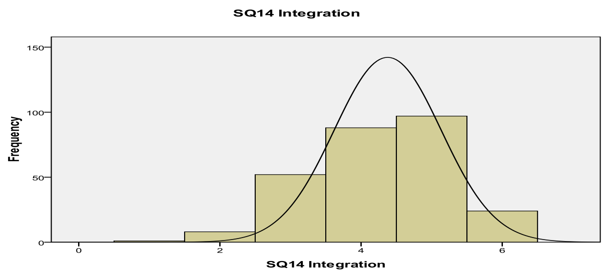
Item ID: SQ12 Efficiency
Survey question: SPEKS responds quickly.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	3.99	
Std. Dev.	1.039	
Skewness	-0.382 left skewed	
Kurtosis	-0.228	

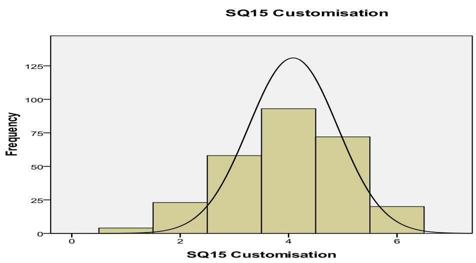
Item ID: SQ13 Sophistication
Survey question: SPEKS requires only the minimum number of fields and screens to achieve a task.

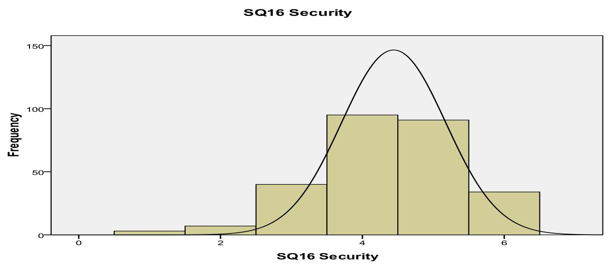
Statistic		Normality
Valid	253	
Min	1	
Max	6	
Mean	4.11	
Std. Dev.	0.959	
Skewness	-0.232 left skewed	
Kurtosis	0.311	

Item ID: SQ14 Integration
Survey question: All data within SPEKS is fully integrated and consistent.

Statistic		Normality
Valid	252	
Min	1	
Max	6	
Mean	4.27	
Std. Dev.	0.976	
Skewness	-0.348 left skewed	
Kurtosis	-0.125	

Item ID: SQ15 Customisation
Survey question: SPEKS can be easily modified, corrected or improved.

Statistic		Normality
Valid	252	
Min	1	
Max	6	
Mean	3.98	
Std. Dev.	1.117	
Skewness	-0.342 left skewed	
Kurtosis	-0.224	

System Quality		
Item ID: SQ16 Security Survey question: All information in SPEKS is secure.		
Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.35	
Std. Dev.	1.028	
Skewness	-0.537 left skewed	
Kurtosis	0.457	

In Table 5.14, the dispersion of scores for items SQ1, SQ3 and SQ6 are positively skewed with the mean scores of 3.08, 3.02 and 3.33, respectively, which indicates that the scores for these three items are clustered at the low end of the scale (many lower scores were given for these three items). The mean value is smaller than the middle scale (<3.5), which indicates that the majority of the respondents did not agree about the accuracy of the data, the database content and access to information that they obtain from SPEKS.

The other items in System Quality were found to have negatively skewed distributions with the means between 3.85 and 4.57; thus, the mean values are greater than the middle scale (>3.5). The scores are clustered to the high end of the scale. Overall, the mean values and the distributions illustrate medium to high agreement of the System Quality's aspects of SPEKS.

Meanwhile, the kurtosis values for all items in the System Quality are mixed. The scores for items SQ2, SQ4, SQ5, SQ7, SQ8, SQ10, SQ13 and SQ16 are clustered in the centre, indicating a smaller range in dispersion. Meanwhile, the scores for items SQ1, SQ3, SQ6, SQ9, SQ11, SQ12, SQ14 and SQ15 are more scattered, which results in flatter distributions.

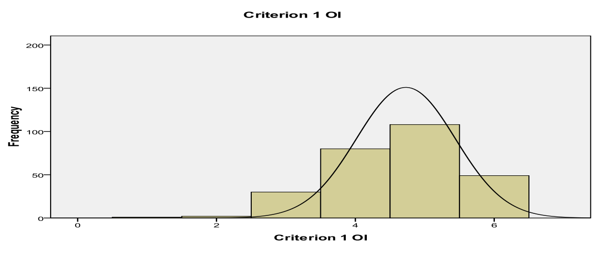
Overall, it can be concluded that the majority of the responses are negatively skewed and clustered around the centre. This indicates that SPEKS has had a high impact and provides high quality to the respondents. As observed from the data, respondents scored mostly 4 or 5 for all items (except for IQ7, SQ1 and SQ3). This shows the tendency of the respondents to score in the middle, thus, leading to the assumption that, the impact of SPEKS is slightly above the average. Some aspects of SPEKS can be improved. Although the distributions of all items are skewed, this is common for social sciences research (Pallant, 2005).

5.8.2 Descriptive report for the criterion measures

Table 5.15 depicts the distributions and statistics for criterion measures. All criterion measures indicate similar patterns of dispersion. The distributions are negatively skewed and most of the data are clustered around the centre of the scale. The mean scores for all criterion measures are between 3.55 and 4.65.

Table 5.15

Distribution and Statistics of the Criterions Measures

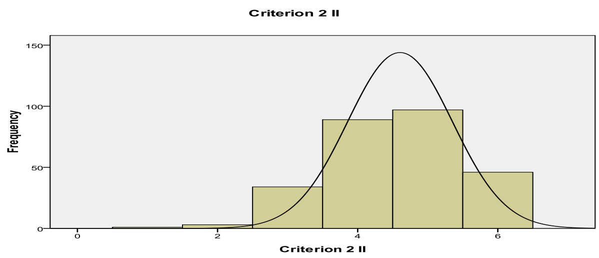
<table>
<tr><th colspan="3">Criterion Measures</th></tr>
<tr><td colspan="3">Item ID: Criterion 1
Survey question: Overall, the impact of SPEKS on the department/agency has been positive.</td></tr>
<tr><td colspan="2">Statistic</td><td>Normality</td></tr>
<tr><td>Valid</td><td>254</td><td rowspan="7">
</td></tr>
<tr><td>Min</td><td>1</td></tr>
<tr><td>Max</td><td>6</td></tr>
<tr><td>Mean</td><td>4.65</td></tr>
<tr><td>Std. Dev.</td><td>0.941</td></tr>
<tr><td>Skewness</td><td>-0.471
left skewed</td></tr>
<tr><td>Kurtosis</td><td>0.201</td></tr>
</table>

Criterion Measures

Item ID: Criterion 2
Survey question: Overall, the impact of SPEKS on me has been positive.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.55
Std. Dev.	0.963
Skewness	-0.360 left skewed
Kurtosis	0.021

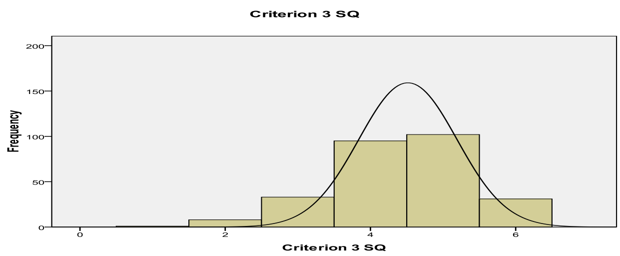
Normality



Item ID: Criterion 3
Survey question: Overall, the System Quality of SPEKS is satisfactory.

Statistic	
Valid	254
Min	1
Max	6
Mean	4.42
Std. Dev.	0.945
Skewness	-0.479 left skewed
Kurtosis	0.382

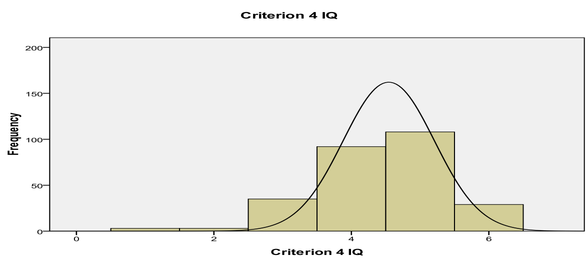
Normality



Item ID: Criterion 4
Survey question: Overall, the Information Quality of SPEKS is satisfactory.

Statistic	
Valid	253
Min	1
Max	6
Mean	4.44
Std. Dev.	0.943
Skewness	-0.693 left skewed
Kurtosis	1.130

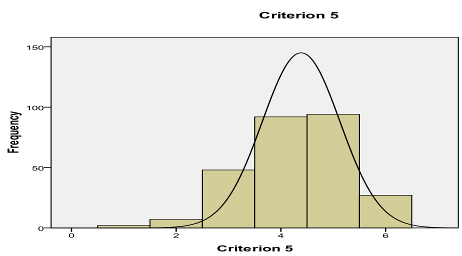
Normality



Item ID: Criterion 5
Survey question: SPEKS is good.

Statistic	
Valid	252
Min	1
Max	6
Mean	4.29
Std. Dev.	0.994
Skewness	-0.411 left skewed
Kurtosis	0.156

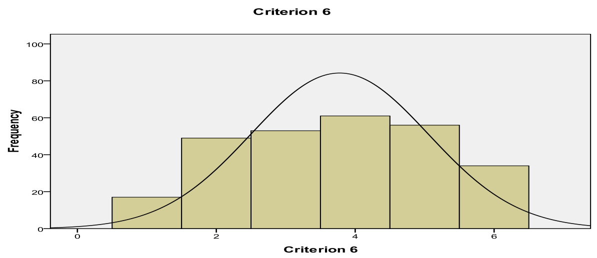
Normality



Criterion Measures

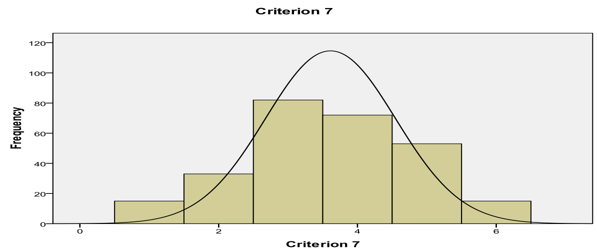
Item ID: Criterion 6
Survey question: SPEKS has negatively affected the organisation performance.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	3.75	
Std. Dev.	1.452	
Skewness	-0.076 left skewed	
Kurtosis	-1.020	



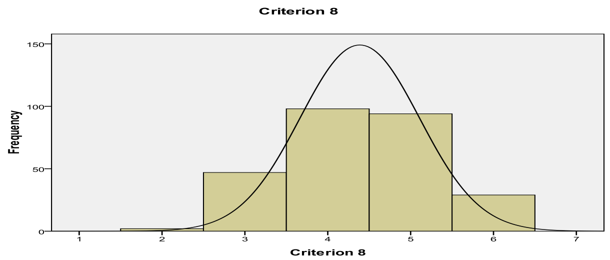
Item ID: Criterion 7
Survey question: SPEKS has no problem.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	3.55	
Std. Dev.	1.230	
Skewness	-0.157 left skewed	
Kurtosis	-0.517	



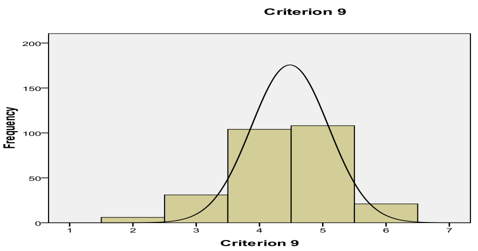
Item ID: Criterion 8
Survey question: I have received many advantages from SPEKS.

Statistic		Normality
Valid	253	
Min	2	
Max	6	
Mean	4.38	
Std. Dev.	0.898	
Skewness	-0.052 left skewed	
Kurtosis	-0.538	



Item ID: Criterion 9
Survey question: Overall, how would you rate SPEKS?

Statistic		Normality
Valid	252	
Min	2	
Max	6	
Mean	4.41	
Std. Dev.	0.844	
Skewness	-0.451 left skewed	
Kurtosis	0.346	



5.8.3 Descriptive report for the satisfaction measures

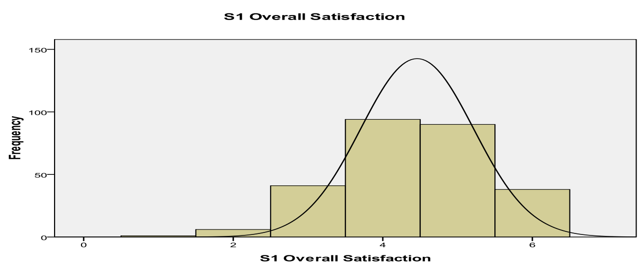
Table 5.16 depicts the distributions and statistics for the Satisfaction measures. As illustrated in the table, all Satisfaction measures indicate similar patterns of dispersion. The distributions are negatively skewed and data are more scattered, with the mean scores between 4.34 and 4.42. This provides evidence that most of the respondents expressed medium satisfaction with SPEKS.

Table 5.16

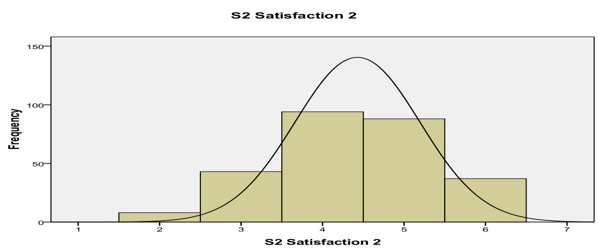
Distribution and Statistics of the Satisfaction Measures

Satisfaction

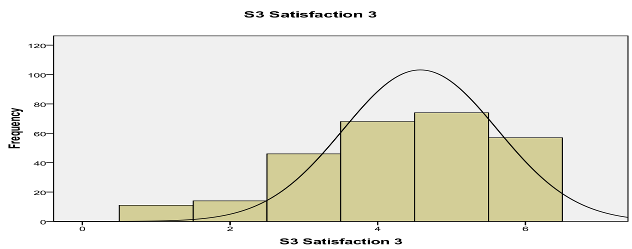
Item ID: S1 Overall Satisfaction
Survey question: Overall, SPEKS is satisfactory.

Statistic		Normality
Valid	254	
Min	1	
Max	6	
Mean	4.42	
Std. Dev.	0.994	
Skewness	-0.305 left skewed	
Kurtosis	-0.067	

Item ID: S2
Survey question: I am satisfied with SPEKS.

Statistic		Normality
Valid	254	
Min	2	
Max	6	
Mean	4.39	
Std. Dev.	0.995	
Skewness	-0.214 left skewed	
Kurtosis	-0.386	

Item ID: S3
Survey question: I am not happy with SPEKS.

Statistic		Normality
Valid	251	
Min	1	
Max	6	
Mean	4.34	
Std. Dev.	1.324	
Skewness	-0.557 left skewed	
Kurtosis	-0.278	

Satisfaction		
Item ID: S4 Survey question: I like SPEKS.		
Statistic		Normality
Valid	252	
Min	1	
Max	6	
Mean	4.42	
Std. Dev.	0.988	
Skewness	-0.265 left skewed	
Kurtosis	-0.009	

5.9 COMPARING BETWEEN GROUPS

Further analyses were conducted to investigate if there is a significant difference between groups of interest. The first test is to investigate if there is a difference in the score for the dimensions (the average for each dimension) across the four state governments. An ANOVA test was chosen for this analysis and the results are presented in *Exhibit 5.1*.

Exhibit 5.1 presents the results from the ANOVA test. The Levene's test for equality of variances illustrated in the exhibit is used to test the variance in scores for each of the three groups. This is to meet the assumption that samples are obtained from populations of equal variances; one of the assumptions that have to be met in order to use the ANOVA test (this indicates that the samples can be compared).

If the Levene's significance value is greater than 0.05, data do not violate the assumption of homogeneity of variance. In this test, all significance values are greater than 0.05. Thus, the results from this Levene's test indicate that the variances are equal across the state governments. Therefore, all state governments are fit for comparison. Based on the ANOVA result, there were significant differences (at the level of $p<0.05$) between all state governments when providing scores for each dimension except for System Quality. This means that while some state governments have differing views when evaluating SPEKS in terms of Individual Impact, Organizational Impact, and Information Quality, SPEKS' users at all state governments have a similar view on the quality of the SPEKS system.

Descriptives

						for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Individual Impact	Negeri Sembilan	83	4.4006	.89028	.09772	4.2062	4.5950	1.00	6.00
	Melaka	49	4.9031	.73566	.10509	4.6918	5.1144	3.25	6.00
	Johor	49	4.1990	.85083	.12155	3.9546	4.4434	2.75	5.75
	Kelantan	73	4.6747	.93512	.10945	4.4565	4.8928	2.25	6.00
	Total	254	4.5374	.89745	.05631	4.4265	4.6483	1.00	6.00
Organizational Impact	Negeri Sembilan	83	4.3151	.76955	.08447	4.1471	4.4832	1.88	5.88
	Melaka	49	4.6870	.73839	.10548	4.4749	4.8990	3.00	6.00
	Johor	49	4.1527	.73447	.10492	3.9417	4.3637	2.25	5.88
	Kelantan	73	4.4430	.77851	.09112	4.2614	4.6246	2.50	6.00
	Total	254	4.3923	.77514	.04864	4.2965	4.4881	1.88	6.00
Information Quality	Negeri Sembilan	83	4.3537	.83110	.09122	4.1723	4.5352	1.67	5.78
	Melaka	49	4.7395	.69979	.09997	4.5385	4.9405	2.89	5.89
	Johor	49	4.1338	.76979	.10997	3.9127	4.3549	2.67	5.78
	Kelantan	73	4.4886	.78668	.09207	4.3050	4.6721	2.56	5.89
	Total	254	4.4245	.80233	.05034	4.3253	4.5236	1.67	5.89
System Quality	Negeri Sembilan	83	4.2353	.76948	.08446	4.0673	4.4033	1.54	5.69
	Melaka	49	4.4277	.67154	.09593	4.2348	4.6205	3.00	5.69
	Johor	49	4.0179	.78308	.11187	3.7930	4.2429	2.62	6.00
	Kelantan	73	4.2964	.76779	.08986	4.1172	4.4755	2.38	5.69
	Total	254	4.2480	.76079	.04774	4.1540	4.3420	1.54	6.00

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
Individual Impact	1.071	3	250	.362
Organizational Impact	.164	3	250	.921
Information Quality	.927	3	250	.428
System Quality	.413	3	250	.743

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Individual Impact	Between Groups	15.092	3	5.031	6.666	.000
	Within Groups	188.678	250	.755		
	Total	203.770	253			
Organizational Impact	Between Groups	7.749	3	2.583	4.476	.004
	Within Groups	144.262	250	.577		
	Total	152.011	253			
Information Quality	Between Groups	9.719	3	3.240	5.288	.001
	Within Groups	153.147	250	.613		
	Total	162.866	253			
System Quality	Between Groups	4.359	3	1.453	2.557	.056
	Within Groups	142.076	250	.568		
	Total	146.435	253			

Exhibit 5.1. Comparing the impact score across state governments.

The ANOVA results, however, did not provide any information concerning the differences between the comparison groups. The post hoc test (multiple comparisons) provides more information and tells where the differences among the groups occur (see *Exhibit 5.2*).

Multiple Comparisons

Dependent Variable	(I) The state government where the respondent worksThe state government where the	(J) The state government where the respondent worksThe state government where	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Individual Impact	Negeri Sembilan	Melaka	-.50246	.15651	.008	-.9073	-.0977
		Johor	.20162	.15651	.571	-.2032	.6064
		Kelantan	-.27406	.13940	.204	-.6346	.0865
	Melaka	Negeri Sembilan	.50246	.15651	.008	.0977	.9073
		Johor	.70408	.17551	.000	.2501	1.1580
		Kelantan	.22840	.16044	.486	-.1866	.6434
	Johor	Negeri Sembilan	-.20162	.15651	.571	-.6064	.2032
		Melaka	-.70408	.17551	.000	-1.1580	-.2501
		Kelantan	-.47568	.16044	.017	-.8906	-.0607
	Kelantan	Negeri Sembilan	.27406	.13940	.204	-.0865	.6346
		Melaka	-.22840	.16044	.486	-.6434	.1866
		Johor	.47568	.16044	.017	.0607	.8906
Organizational Impact	Negeri Sembilan	Melaka	-.37184	.13685	.035	-.7258	-.0179
		Johor	.16242	.13685	.636	-.1915	.5164
		Kelantan	-.12789	.12189	.721	-.4431	.1874
	Melaka	Negeri Sembilan	.37184	.13685	.035	.0179	.7258
		Johor	.53426	.15347	.003	.1373	.9312
		Kelantan	.24395	.14029	.306	-.1189	.6068
	Johor	Negeri Sembilan	-.16242	.13685	.636	-.5164	.1915
		Melaka	-.53426	.15347	.003	-.9312	-.1373
		Kelantan	-.29031	.14029	.166	-.6532	.0725
	Kelantan	Negeri Sembilan	.12789	.12189	.721	-.1874	.4431
		Melaka	-.24395	.14029	.306	-.6068	.1189
		Johor	.29031	.14029	.166	-.0725	.6532
Information Quality	Negeri Sembilan	Melaka	-.38576	.14101	.034	-.7505	-.0211
		Johor	.21996	.14101	.404	-.1447	.5847
		Kelantan	-.13484	.12559	.706	-.4597	.1900
	Melaka	Negeri Sembilan	.38576	.14101	.034	.0211	.7505
		Johor	.60573	.15813	.001	.1968	1.0147
		Kelantan	.25093	.14455	.307	-.1229	.6248
	Johor	Negeri Sembilan	-.21996	.14101	.404	-.5847	.1447
		Melaka	-.60573	.15813	.001	-1.0147	-.1968
		Kelantan	-.35480	.14455	.070	-.7286	.0191
	Kelantan	Negeri Sembilan	.13484	.12559	.706	-.1900	.4597
		Melaka	-.25093	.14455	.307	-.6248	.1229
		Johor	.35480	.14455	.070	-.0191	.7286
System Quality	Negeri Sembilan	Melaka	-.15576	.11202	.506	-.4455	.1340
		Johor	.12587	.11202	.675	-.1638	.4156
		Kelantan	-.06602	.09977	.911	-.3241	.1920
	Melaka	Negeri Sembilan	.15576	.11202	.506	-.1340	.4455
		Johor	.28163	.12562	.115	-.0433	.6065
		Kelantan	.08974	.11483	.863	-.2072	.3867
	Johor	Negeri Sembilan	-.12587	.11202	.675	-.4156	.1638
		Melaka	-.28163	.12562	.115	-.6065	.0433
		Kelantan	-.19188	.11483	.341	-.4889	.1051
	Kelantan	Negeri Sembilan	.06602	.09977	.911	-.1920	.3241
		Melaka	-.08974	.11483	.863	-.3867	.2072
		Johor	.19188	.11483	.341	-.1051	.4889

Exhibit 5.2. Post Hoc Test.

The results from the post hoc test (*Exhibit 5.2*) indicate that:

a. Individual Impact: There is a significant difference in the dimension mean scores between Melaka and Negeri Sembilan, between Melaka and Johor, and between Kelantan and Johor.

b. Organizational Impact: There is a significant difference between Negeri Sembilan and Melaka, and between Johor and Melaka.

c. Information Quality: There is a significant difference in the dimension mean scores between Negeri Sembilan and Melaka, between Johor and Melaka, and between Johor and Kelantan.

d. System Quality: There is no significant difference with the dimension mean scores between the state governments.

Although some differing views were demonstrated by the state governments, the actual differences in the mean scores between these groups were quite small (based on the mean value depicted in the 'Descriptive' table in *Exhibit 5.1*. See also *Exhibit 5.3* where the mean scores were plotted and each of the IS-Impact dimensions were similar). This may suggest that all the respondents at all four state governments have similar opinions of SPEKS. Generally, based on these comparative results, the users across these four state governments are experiencing a similar impact from SPEKS.

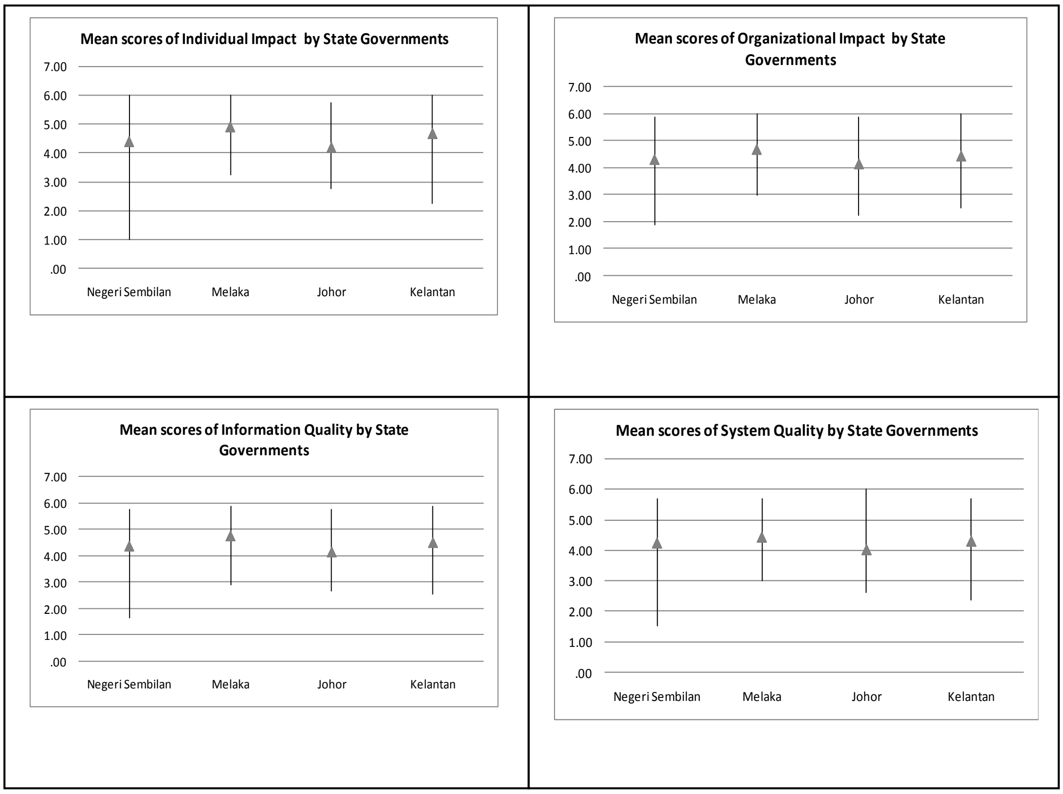


Exhibit 5.3. Mean scores for each dimension grouping by state government.

The second comparative test was conducted to investigate if there is a difference in the scores for the dimensions (the average for each dimension) for different types of cohort. This test was conducted based on the assumption that different cohorts may have a different perception of the impact and quality of the information systems. Therefore, a different mean score for each dimension is expected from these cohorts. Due to the small sample size for the Managerial and Technical cohorts, a non-parametric alternative to ANOVA, the Kruskal-Wallis test, was conducted. The results from this test are presented in *Exhibit 5.4*.

Ranks

	Employment cohort	N	Mean Rank
Individual Impact	Managerial	17	112.35
	Operational	222	122.35
	Technical	5	163.70
	Total	244	
Organizational Impact	Managerial	17	140.62
	Operational	222	120.21
	Technical	5	162.70
	Total	244	
Information Quality	Managerial	17	109.82
	Operational	222	122.58
	Technical	5	162.00
	Total	244	
System Quality	Managerial	17	107.15
	Operational	222	121.67
	Technical	5	211.40
	Total	244	

Test Statistics a,b

	Individual Impact	Organizational Impact	Information Quality	System Quality
Chi-square	2.092	2.988	2.119	8.779
df	2	2	2	2
Asymp. Sig.	.351	.225	.347	.012

a. Kruskal Wallis Test

b. Grouping Variable: Employment cohort

Exhibit 5.4. Comparing the Impact Score across Cohorts.

The results show that there were no significant differences ($p > 0.05$) in the mean scores for Individual Impact, Organizational Impact and Information Quality, as given by the three cohorts. However, there was a significant difference in the mean score for the System Quality ($p < 0.05$) as given by the three cohorts. The mean rank table indicates that the Technical cohort has the highest mean score compared to the Managerial and Operational cohorts. Therefore, this demonstrates that the Technical cohort has provided a higher score for the System Quality measures when evaluating SPEKS. This result may suggest that while all cohorts demonstrate similar perceptions on the Individual Impact, Organizational Impact and Information Quality, they may have different perceptions on the System Quality of SPEKS.

Although the results from the Kruskal-Wallis test indicated no significant differences of the mean scores for the dimensions (except for System Quality) given by the three cohorts, a closer look at the mean scores separated according to employment cohorts displayed in *Exhibit 5.5* shows that a certain cohort has scored higher on a certain dimension as compared to the rest of the dimensions. The managerial cohort has scored Organizational Impact higher and System Quality lower as compared to the Technical and Operational cohorts. However, the Operational and Technical cohorts have scored the Individual Impact slightly higher than the Managerial cohort. Therefore, although the Kruskal-Wallis test did not indicate any significant differences (because the variance in the mean scores of the three non-significant dimensions are small), the bar charts clearly demonstrate that a certain cohort may have different opinions on the impact of SPEKS based on their experience with the system. It may also suggest that a certain cohort may have a closer experience with the measures in the dimension (for example, the Managerial cohort who may have more knowledge on the Organizational Impact measures) indicating that the respondents in this group are experiencing the impact of SPEKS on the organisation more. This may also suggest that the Operational and Technical cohorts were less agreed on the impact of SPEKS to the organisation but experienced more on the individual impact.

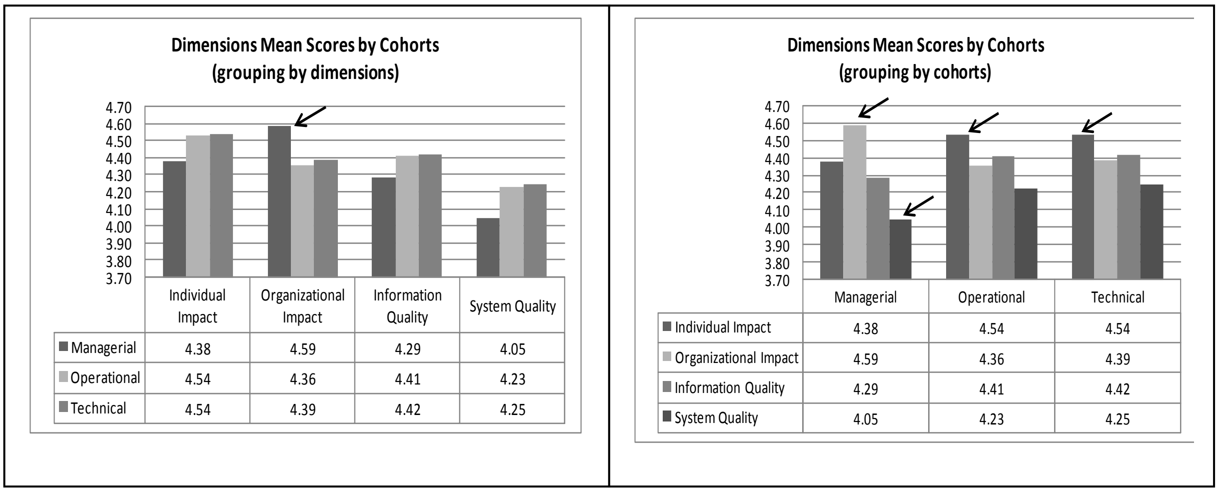


Exhibit 5.5. Dimensions mean scores.

Furthermore, the mean scores provided in *Exhibit 5.5* show that the mean scores for the dimensions of the Operational and Technical cohorts were relatively the same for all dimensions. This may suggest that the Operational and Technical cohorts may have similar opinions on the impact of SPEKS based on their experienced with the financial system.

The third comparative test was conducted to identify whether there is a significant difference between two groups of respondents who were completing two different sets of questionnaires. As mentioned in section 5.2.3, two sets of questionnaires were designed to identify whether a common method has an effect on how items are measured in the IS-Impact model. The first questionnaire was designed by blocking items according to the dimension, while the other questionnaire was designed by randomized the items. If there is significant different between these two groups of respondent, it indicates that the instrument design (block versus random) has an influence on how the respondents score the items in the IS-Impact model.

These two sets of questionnaires were only administered at the State Government of Negeri Sembilan.

Table 5.17 provides the number of respondents for each type of questionnaire; 57 respondents completed the block designed questionnaire while 26 respondents completed the randomized designed questionnaire.

Table 5.17

Number of Respondents According to Two Types of Questionnaire

	Frequency	Percent
Block	57	68.7
Random	26	21.3
Total	**83**	**100.0**

The Mann-Whitney, a non-parametric test, was conducted to compare the mean score for every item to identify whether there is a significant difference between the two groups of respondents when providing a score for each item in the IS-Impact model. In this test, missing data were excluded by pairwise deletion. *Exhibit 5.6* and *Exhibit 5.7* show the results from the Mann-Whitney test. In *Exhibit 5.6*, the significance or t-value for each item is presented. Based on these t-values, except for SQ6, there is no significant difference between the two groups when providing scores for each item in the IS-Impact model. From *Exhibit 5.7*, it can be seen that higher mean scores were observed from the 'block' type group compared to the 'random' type group. However, the mean score differences between these two groups of respondents were small for each item.

	II1	II2	II3	II4
Mann-Whitney U	726.500	681.500	668.000	630.500
Wilcoxon W	2379.500	1032.500	2321.000	2283.500
Z	-.151	-.616	-.759	-1.142
Asymp. Sig. (2-tailed)	.880	.538	.448	.253

	OI1	OI2	OI3	OI4	OI5	OI6	OI8	OI7
Mann-Whitney U	688.500	708.000	663.000	666.000	678.000	732.000	693.000	628.000
Wilcoxon W	2341.500	2248.000	2259.000	2319.000	2331.000	1083.000	2289.000	2224.000
Z	-.555	-.076	-.698	-.779	-.652	-.094	-.376	-1.066
Asymp. Sig. (2-tailed)	.579	.940	.485	.436	.515	.925	.707	.286

	IQ1	IQ5	IQ2	IQ3	IQ4	IQ6	IQ7	IQ8	IQ9	IQ10
Mann-Whitney U	572.500	719.000	695.500	704.000	728.000	684.000	652.500	654.000	637.500	695.500
Wilcoxon W	923.500	1070.000	1046.500	2357.000	2381.000	1035.000	2305.500	2250.000	2290.500	1046.500
Z	-1.737	-.229	-.472	-.384	-.136	-.591	-.905	-.791	-1.081	-.467
Asymp. Sig. (2-tailed)	.082	.819	.637	.701	.891	.555	.365	.429	.280	.640

	SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9	SQ10	SQ11	SQ12	SQ13	SQ14	SQ15	SQ16
Mann-Whitney U	726.000	721.000	592.000	624.000	699.000	455.000	683.000	633.000	725.000	608.000	630.500	710.500	722.000	688.000	673.000	663.000
Wilcoxon W	1077.000	1072.000	2245.000	2277.000	1050.000	2051.000	2336.000	984.000	2378.000	2261.000	2283.500	1061.500	1073.000	2341.000	2326.000	1014.000
Z	-.153	-.207	-1.503	-1.211	-.437	-2.796	-.621	-1.015	-.166	-1.382	-1.137	-.315	-.196	-.555	-.693	-.806
Asymp. Sig. (2-tailed)	.879	.836	.133	.226	.662	.005	.535	.310	.868	.167	.256	.752	.845	.579	.488	.420

Exhibit 5.6. Results from the Mann-Whitney test.

The Mann-Whitney test also indicates that there is a significant difference between these two groups of respondents when scoring the SQ6 (Convenience to access) item. This further demonstrates a large mean score difference for this item between these two groups of respondents (see *Exhibit 5.7*). Overall, it can be concluded that even though these two groups were completing different sets of questionnaires, there is no significant difference between the two sets of questionnaires. Thus, the design of the instrument did not have an effect on how the items were scored by these respondents.

Ranks

	Type of questionnaire	N	Mean Rank	Sum of Ranks
II1	Block	57	41.75	2379.50
	Random	26	42.56	1106.50
	Total	83		
II2	Block	57	43.04	2453.50
	Random	26	39.71	1032.50
	Total	83		
II3	Block	57	40.72	2321.00
	Random	26	44.81	1165.00
	Total	83		
II4	Block	57	40.06	2283.50
	Random	26	46.25	1202.50
	Total	83		

Ranks

	Type of questionnaire	N	Mean Rank	Sum of Ranks
OI1	Block	57	41.08	2341.50
	Random	26	44.02	1144.50
	Total	83		
OI2	Block	55	40.87	2248.00
	Random	26	41.27	1073.00
	Total	81		
OI3	Block	56	40.34	2259.00
	Random	26	44.00	1144.00
	Total	82		
OI4	Block	57	40.68	2319.00
	Random	26	44.88	1167.00
	Total	83		
OI5	Block	57	40.89	2331.00
	Random	26	44.42	1155.00
	Total	83		
OI6	Block	57	42.16	2403.00
	Random	26	41.65	1083.00
	Total	83		
OI8	Block	56	40.88	2289.00
	Random	26	42.85	1114.00
	Total	82		
OI7	Block	56	39.71	2224.00
	Random	26	45.35	1179.00
	Total	82		

Ranks

	Type of questionnaire	N	Mean Rank	Sum of Ranks
IQ1	Block	57	44.96	2562.50
	Random	26	35.52	923.50
	Total	83		
IQ5	Block	57	42.39	2416.00
	Random	26	41.15	1070.00
	Total	83		
IQ2	Block	57	42.80	2439.50
	Random	26	40.25	1046.50
	Total	83		
IQ3	Block	57	41.35	2357.00
	Random	26	43.42	1129.00
	Total	83		
IQ4	Block	57	41.77	2381.00
	Random	26	42.50	1105.00
	Total	83		
IQ6	Block	57	43.00	2451.00
	Random	26	39.81	1035.00
	Total	83		
IQ7	Block	57	40.45	2305.50
	Random	26	45.40	1180.50
	Total	83		
IQ8	Block	56	40.18	2250.00
	Random	26	44.35	1153.00
	Total	82		
IQ9	Block	57	40.18	2290.50
	Random	26	45.98	1195.50
	Total	83		
IQ10	Block	57	42.80	2439.50
	Random	26	40.25	1046.50
	Total	83		

Ranks

	Type of questionnaire	N	Mean Rank	Sum of Ranks
SQ1	Block	57	42.26	2409.00
	Random	26	41.42	1077.00
	Total	83		
SQ2	Block	57	42.35	2414.00
	Random	26	41.23	1072.00
	Total	83		
SQ3	Block	57	39.39	2245.00
	Random	26	47.73	1241.00
	Total	83		
SQ4	Block	57	39.95	2277.00
	Random	26	46.50	1209.00
	Total	83		
SQ5	Block	57	42.74	2436.00
	Random	26	40.38	1050.00
	Total	83		
SQ6	Block	56	36.63	2051.00
	Random	26	52.00	1352.00
	Total	82		
SQ7	Block	57	40.98	2336.00
	Random	26	44.23	1150.00
	Total	83		
SQ8	Block	56	43.20	2419.00
	Random	26	37.85	984.00
	Total	82		
SQ9	Block	57	41.72	2378.00
	Random	26	42.62	1108.00
	Total	83		
SQ10	Block	57	39.67	2261.00
	Random	26	47.12	1225.00
	Total	83		
SQ11	Block	57	40.06	2283.50
	Random	26	46.25	1202.50
	Total	83		
SQ12	Block	57	42.54	2424.50
	Random	26	40.83	1061.50
	Total	83		
SQ13	Block	57	42.33	2413.00
	Random	26	41.27	1073.00
	Total	83		
SQ14	Block	57	41.07	2341.00
	Random	26	44.04	1145.00
	Total	83		
SQ15	Block	57	40.81	2326.00
	Random	26	44.62	1160.00
	Total	83		
SQ16	Block	57	43.37	2472.00
	Random	26	39.00	1014.00
	Total	83		

Exhibit 5.7. Mean ranks from Mann-Whitney Test.

5.10 CHAPTER CONCLUSION

This chapter discussed the design of the confirmation survey, with the purpose of operationalising the measures based on the qualitative analysis outcome and to empirically test and re-validate the IS-Impact model. All the processes from designing and administering the survey instrument have been discussed in detail in this chapter. Much effort has been taken in the design and the distribution methods to ensure the quality of the data. The questionnaire was distributed at four state governments in Malaysia to generalise the findings and at the same time to target a large number of SPEKS users.

The chapter also reported descriptive findings based on the demographic data collected in the survey. Based on the variety of the respondents' working backgrounds, it provides evidence that this research has collected data from three employment cohorts, Managerial, Operational and Technical with multiple job titles and roles. From 310 respondents, a very thorough data cleaning process was conducted and resulted in the removal of 56 respondents. Therefore, 254 respondents were considered valid for analysis. This sample size is adequate for conducting model validation tests using SEM technique. Further analyses were also conducted to observe the distribution of the scores for each item and a comparative test between groups to look for any significant difference. In the following chapter the model testing, test findings and interpretation of results will be discussed in detail.

Chapter 6 : Model Testing

6.1 CHAPTER INTRODUCTION

This chapter reports the validation process of the IS-Impact model, using data that was collected in the confirmation survey, as discussed in Chapter 5. The model consists of thirty-seven items from the original IS-Impact model with an addition of one (1) new item identified from the identification survey. The items were operationalised through a survey at four state governments in Malaysia. In this chapter, the model will be validated following the guidelines for formative construct validation, as suggested by Petter, Straub and Rai (2007) and Diamantopolous and Winklhofer (2001), and a few other researchers.

This chapter begins with a brief introduction and explanation about the tests that were used to validate the model. This is followed by a discussion of the IS-Impact model validation analysis and results. The chapter concludes with a summary of the overall analysis.

6.2 TEST OF VALIDITY

The purpose of validation is to give researchers, their peers, and society as a whole, a high degree of confidence that the instrument and the method being used are useful in the quest for scientific truth (Nunnally, 1978). Researchers should demonstrate that the instruments that they have developed are measuring what they are supposed to be measuring (Straub, 1989). In this research, the validity of the model and instrument is demonstrated through two types of validity.

Content validity

Content validity refers to an instrument that contains a representative set of measures that appropriately capture the interest of what the instrument is trying to measure (Straub et al., 2004). It becomes a mandatory practice in establishing content validity for a formative construct because it is important to capture all aspects of a construct (Petter et al., 2007). This is because a formative construct is determined by its indicators or measures. Failure to capture all aspects of the construct will lead to an exclusion of relevant indicators, thus, excluding part of the construct itself (Diamantopoulos & Winklhofer, 2001). According to Straub et al. (2004), content validity is a judgemental and highly subjective process. Content validity is commonly assessed through literature reviews and expert panels. Another method that can be used is Q-sorting (Boudreau et al., 2001).

In this research, the content validity of the model was demonstrated through the identification survey stage and the qualitative analysis that was discussed in detail in Chapter 4 of this thesis. The original IS-Impact model, in fact, was been subjected to rigorous steps when establishing its content validity. To ensure that the content of the model is comprehensive in the Malaysian context, a qualitative survey was conducted. Employing a deductive approach to analyse the qualitative data from the identification survey, findings from the analysis demonstrated the necessity of most of the items in the original model. It also led to the discovery of one new item. Items were then operationalised at four state governments in Malaysia to further test the validity.

Construct validity

Construct validity is concern about the "fit" of a chosen item for a construct. Typically, construct validity is assessed by both convergent validity and discriminant validity. However, higher correlations between items in a formative construct are not required. Therefore, common factor analysis is ineffective to determine construct validity (Diamantopoulos & Winklhofer, 2001, Petter, et al., 2007). This is because the quality of formative constructs is focus on the unique variance of each items and not just on shared variance among items. Thus, the focuses on common variance do not apply well to formative constructs (Petter et al., 2007). There are a number of methods that can be used to test for construct validity of a formative construct (Diamantopoulos & Winklhofer, 2001, Petter et al., 2007). These will be discussed in detail in the following section.

6.3 CONSTRUCT VALIDITY

Given that the main purpose of this research is to re-validate the IS-Impact model, the appropriate way to test is by means of confirmatory analysis. The basic question answered in this analysis is to confirm a particular pattern of relationships in a measurement model, predicted based on a theory or specified by the researcher (DeVellis, 1991, Straub et al., 2004). Structural Equation Modelling (SEM)-based procedures facilitate this analysis. It is a statistical technique that facilitates testing and estimating causal relationships predicted or specified by the researcher based on statistical data and qualitative causal assumptions (Urbach & Ahlemann, 2010).

SEM-based procedures have substantial advantages over first-generation techniques such as principal components analysis, factor analysis, discriminant analysis, or multiple regression, because of the greater flexibility that a researcher has for interplay between theory and data (Chin, 1998). Using SEM, a researcher is able to (1) model relationships among multiple predictor and criterion variables, (2) construct unobservable latent variables, (3) model errors in measurements for observed variables, and (4) statistically test a priori substantive/theoretical and measurement assumptions against empirical data.

As mentioned earlier, common factor analysis (i.e. discriminant and convergent validity) is ineffective in determining a formative construct. The primary statistic for assessing a formative measure is its weight. Similar to beta weight in multiple regression, the weight provides the unique importance of each item and demonstrates the item's relative contribution to the construct that it directly measures (Cenfetelli & Bassellier, 2009, Götz, Liehr-Gobbers & Krafft, 2010). The weight for each item in a formative construct can be calculated using the Partial Least Squares (PLS) method. However, many IS studies have focused almost exclusively on the assessment of the statistical significance of formative weights. This sole analysis of the significance of these weights is not a sufficient interpretation of formative measurement results (Cenfetelli & Bassellier, 2009).

Several notable papers were referred to for guidelines in identifying, specifying and interpreting formative constructs and the index underlying the constructs. While Diamantopoulos and Winklhofer (2001), and Petter et al. (2007) have provided a clear definition and understanding about the formative construct and its difference from the reflective construct, these authors have also provided guidelines on how to specify a formative construct. However, good papers with an exemplary interpretation of formative measurement results are scarce. More recently, Andreev, Heart, Maoz and Pliskin (2009), Cenfetelli and Bassellier (2009), and Henseler, Ringle and Sinkovics (2009) provided illustrative examples on formative construct validation and how to assess and estimate the construct using PLS softwares. One of the advantages of PLS is that it allows for the use of both formative and reflective measures, which is generally complicated to achieve with covariance-based SEM techniques such as LISREL or EQS (Chin, 1998). Moreover, PLS is primarily used by researchers for causal predictive analysis in a situation where the model is complex (e.g., a multidimensional model or a hierarchical model) with a large number of constructs and items (Urbach & Ahlemann, 2010, Wetzels et al., 2009).

A measurement model is assessed based on the type of item being used. For constructs using reflective measures, one examines the loadings reported by PLS, while, for constructs using formative measures, the weights or path coefficients are used to assess the importance of each item of the related formative construct (Andreev et al., 2009, Cenfetelli & Bassellier, 2009, Mathieson, Peacock & Chin, 2001, Petter et al., 2007). Moreover, in PLS, the quality of the items can be determined from the t-value provided from the bootstrapping results (Henseler et al., 2009).

Following the guidelines suggested by the above authors, generally, the validity of the formative measurement model can be assessed in four steps. This is summarised in Table 6.1.

Table 6.1

Validity Test for Formative Measurement Model

Test	Description
Multicollinearity	Conduct a test to identify the presence of multicollinearity among the items. Excessive collinearity among items is a sign of conceptual redundancy.
External validity	Assess the validity by examine how well the formative items capture the construct by including reflective constructs or indicators that are external to the formative constructs.
Nomological validity (Nomological net)	Assess the validity by linking the items to other constructs that have significant and strong relationship known through prior research. In other words, linking the formative measurement model with the antecedents and/or consequence constructs to which a structural path exists according to prior research.
Significance of weights	Significant weights of formative measurement model are observed.

Note that these validity tests are conducted after establishing the content validity (discussed in the previous section) of the intended measurement model. These tests are elaborated upon in detail in the following sub-sections.

6.3.1 Test for multicollinearity

Multicollinearity refers to a situation when two or more independent variables (IV) (referring to the items of a construct) are highly correlated with each other (Gaur & Gaur, 2006). This means that within a set of IVs, some of the IVs are predicted by the other IVs. Multicollinearity causes inflation in the standard error of regression coefficients, resulting in a reduction of their significance (Götz et al., 2010). Care should be taken in choosing the IVs such that they are not highly correlated with each other.

In a formative construct, higher correlated measures are not appropriate because this may suggest that multiple measures are measuring the same aspect of the construct (Petter et al., 2007). Furthermore, multicollinearity can lead to unstable indicator weights and the influence of each indicator on the latent construct cannot be distinctly determined (Cenfetelli & Bassellier, 2009, Diamantopoulos & Winklhofer, 2001, Petter et al., 2007).

There are a number of ways to identify the presence of multicollinearity among items. First, is by correlating all the items and identifying the presence of multicollinearity based on the correlation coefficients. Multicollinearity exists if there is a high degree of correlation ($r > 0.90$) among items (Tabachnick & Fidell, 2001). Second, one can observe the presence of collinearity from the "Collinearity Diagnostics" output from a regression test. This regression test was conducted by regressing the items in a formative construct (that is the independent variables in the test) with a dependent variable. The Tolerance and Variance Inflation Factor (VIF) values provided in the "Coefficients" table will indicate the presence of multicollinearity.

Tolerance is an indicator of how much of the variability of the specified independent variable is not explained by the other independent variables in the model and is calculated using the formula, 1-R^2 for each variable. If the tolerance value is less than 0.10, it indicates that the multiple correlations with other variables are high, thus, suggesting the possibility of multicollinearity. This may suggest that a number of items are tapping into the same aspect of the construct (Petter et al., 2007).

The second value, VIF, is the inverse of the tolerance value (that is $\frac{1}{Tolerance}$). A VIF value that is greater than 10 indicates the critical level of multicollinearity (Mathieson et al., 2002, Pallant, 2005). Meanwhile, Diamantopoulos and Siguaw (2006) suggested a lower acceptable VIF value, that is: VIF < 3.3, for the absence of multicollinearity.

If multicollinearity is observed, it may be appropriate to remove the overlapping items (Diamantopoulos & Winkhlofer, 2001). However, items should never be removed simply on the basis of statistical evidence because removing these overlapping items can have an effect on the content coverage (Jarvis et al., 2003). Thus, whether an item is significant or not, it should be preserved as long as this is conceptually justified (Diamantopolous & Winkhlofer, 2001, Henseler, et al., 2009), unless removal of the insignificant items will not alter the conceptual meaning of the construct it is trying to measure. Likewise, if there is a presence of multicollinearity, Cenfetelli and Bassellier (2009, p. 692) recommend to (1) evaluate the array of formative indicators employed to measure the construct to determine if there is any conceptual overlap among the chosen indicators; (2) if there is conceptual overlap, remove one of the collinear indicators and retest for collinearity, always ensuring that the conceptual meaning of the construct is not affected, and (3) if removal would alter the meaning of the construct, guidance and discussion of the conceptual overlap and on how to improve measurement should be provided, knowing that despite the presence of multicollinearity, researchers can still proceed with the evaluation of the structural model.

6.3.2 External validity

Diamantopolous and Winklhofer (2001) suggest that the quality of the formative measures can be identified by observing the relationship of the items with another variable that is external to the index. Only items that have a significant relationship with the variable are retained. This indicates that the formative measures' weights can only be identified by placing the formative model within a larger model that incorporates consequences (i.e., effects) of the related construct (Franke, Preacher & Ringdon, 2008).

The formative construct needs to emit at least two paths to other (reflective) constructs or measures, also known as the 2+ emitted path rules (Diamantopolous et al., 2008). Jarvis et al. (2003) discussed three approaches to this 2+ emitted path rule, which are: (1) identify formative model by adding two reflective indicators (MIMIC model), (2) adding two reflectively measured constructs as outcome variables, and (3) a mixture of number 1 and 2 approaches, that is, adding a single reflective indicator and a reflectively-measured construct as an outcome variable. The formative model in approach (2) or (3) can only be identified if the reflective constructs exist in a nomological network. *Figure 6.1* and *Figure 6.2* below provide an illustration of these model identification approaches.

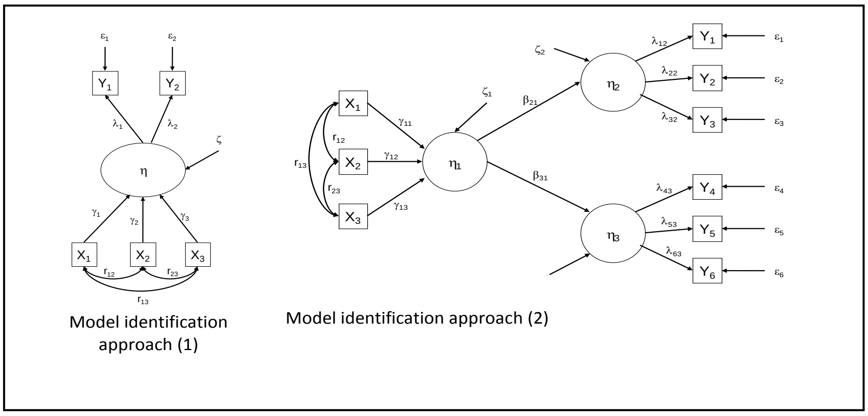


Figure 6.1. Formative model identification approaches (1) and (2).

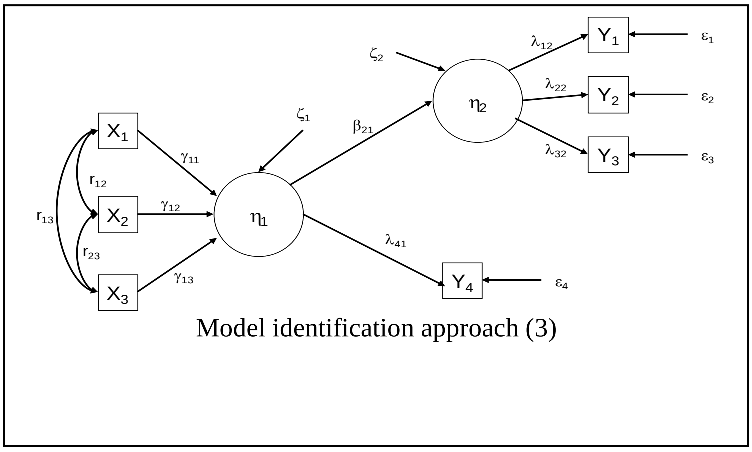


Figure 6.2. Formative model identification approaches (3).

To employ any of these approaches, there must be solid theoretical reasons why the items should be related to the external variables (or constructs), which is often not always feasible to find. Thus, to employ approach (1), Diamantopolous and Winklhofer (2001) suggested using a criterion item that summarises the essence of the construct that the items are expected to measure. They refer to this criterion item as a “global item”.

6.3.3 Nomological validity

The last approach for testing the validity of a formative construct is through a nomological network validity. This approach assesses the formative construct in a nomological network by linking the measures to other constructs that can be either an antecedent or consequence of the construct (Diamantopolous & Winklhofer, 2001). This approach tests the strength of relationship between a theoretically-derived construct, to examine whether the constructs behave in a similar way with prior studies (Straub et al., 2004). The validity of the construct is demonstrated when the hypothesized linkages (the structural paths) between the unobserved variables are found to be significantly greater than zero and their signs are in the expected causality direction (positive or negative relationship as hypothesized). See models 2 and 3 in *Figure 6.1* for illustrative examples.

6.3.4 Explanatory power

Explanatory power involves assessing the R-Square and exploring the effect size of the model constructs (Andreev et al., 2009). This technique, which was introduced by Cohen (1988), explores the changes in R-square to investigate the substantive impact of each independent construct on the dependent construct. The strength of the substantive effect of an independent construct is calculated using the following formula:

$$\text{Effect size, } f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

Exhibit 6.1. Effect size formula.

The $R^2_{included}$ is the explained variance of the dependent construct, when the particular independent construct whose effect is investigated is included in the model. The $R^2_{excluded}$ is the explained variance of the same dependent construct when the independent construct is removed from the model (Andreev et al., 2009). To interpret the effect size, Cohen (1988) suggests f^2 values of 0.02, 0.15 or 0.35 to indicate small, medium and large effects, respectively.

6.4 THE IS-IMPACT CONSTRUCT VALIDITY

The validation process of the IS-Impact model was undertaken using several statistical tests. The first test was conducted to identify the presence of multicollinearity. This was done through a collinearity diagnostic test by regressing the items within a construct with a reflective measure (a criterion measure) in SPSS to calculate the Tolerance and Variance Inflation Factor (VIF). Based on the VIF value, items with VIF larger than 10 (VIF > 10) would be removed from the model.

In the survey instrument, nine (9) criterion measures were included for validation purposes (see chapter 5 for the details). Four (4) of these criterion measures summarised each of the dimensions or constructs in the IS-Impact model. Another five (5) measures summarised the IS-Impact dimension or construct as the over-arching construct that is composed of the four dimensions (Individual Impact, Organizational Impact, Information Quality and System Quality). Thus, these five measures are reflective measures that present an overall measurement of the impact of the IS being evaluated. The nine criterion measures are:

a. Criterion 1 (C1): Overall, the impact of SPEKS on the department/agency has been positive.
b. Criterion 2 (C2): Overall, the impact of SPEKS on me has been positive.
c. Criterion 3 (C3): Overall, the System Quality of SPEKS is satisfactory.
d. Criterion 4 (C4): Overall, the Information Quality of SPEKS is satisfactory.
e. Criterion 5 (C5): SPEKS is good.
f. Criterion 6 (C6): SPEKS has negatively affected the organisation performance.
g. Criterion 7 (C7): SPEKS has no problem.
h. Criterion 8 (C8): I have received many advantages from SPEKS.

i. Criterion 9 (C9): Overall, how would you rate SPEKS?

Following the collinearity diagnostic test, correlation analysis was conducted to examine the relationships of all the items with the criterion measure. The results from this correlation analysis provide information about significant relationships between items with specific criterion measures. Finally, the final set of items was further tested in SmartPLS to identify the validity of the model through the structural relationship.

Factor analysis was used to test the convergent validity of the Satisfaction measure. Satisfaction is a reflective construct and it is used to test the validity of the IS-Impact model through nomological validity. It is hypothesized that there is a strong and significant relationship between the IS-Impact and Satisfaction constructs (Gable et al., 2008). Thus, if the estimated result meets the hypothesis, this demonstrates the validity of the IS-Impact model as a multidimensional formative construct.

6.4.1 Multicollinearity test

The multicollinearity test of the 38 items was first conducted by calculating the Tolerance and VIF score to examine the presence of multicollinearity. This was done by conducting multiple regression analysis using SPSS 17.0, in which the 38 items were taken as independent variables and a criterion measure as the dependent variable. Since the focus of this analysis is to produce a collinearity diagnostic index, any of the criterion measures can be chosen as the dependent variable because the collinearity diagnostic result is not affected by the dependent variable. In this analysis, a missing value is excluded from analysis, following pairwise deletion of the missing values. Table 6.2 presents the Tolerance Value and Variance Inflation Factor (VIF) for each item extracted from the collinearity diagnostic test.

From the table, no item has a VIF value more than the multicollinearity cut-off point of 10 (VIF > 10) and a tolerance value of less than 0.10. VIF values from the collinearity diagnostic test are range from 1.549 to 8.027. This result indicates that there is no presence of collinearity, therefore, ruling out any redundancy among the 38 items. This means that all the items in the model represent different aspects of the dimensions (that they directly measure), hence, demonstrating the uniqueness of each of the measures within a dimension.

Table 6.2

VIF and tolerance values for the 38 IS-Impact measures

Items	Tolerance	VIF	Items	Tolerance	VIF
II1 Learning	.276	3.752	SQ1 Data Accuracy	.646	1.549
II2 Awareness/Recall	.194	5.148	SQ2 Data Currency	.374	2.675
II3 Decision Effectiveness	.125	8.027	SQ3 Database Content	.508	1.970
II4 Individual Productivity	.182	5.493	SQ4 Ease of Use	.247	4.047
OI1 Organisational Costs	.330	3.032	SQ5 Ease of Learning	.225	4.439
OI2 Staff Requirements	.303	3.298	SQ6 Access	.552	1.810
OI3 (Operating) Cost Reduction	.305	3.281	SQ7 User Requirements	.285	3.508
OI4 Overall Productivity	.219	4.560	SQ8 Systems Features	.214	4.679
OI5 Improved Outcome/Output	.258	3.879	SQ9 System Accuracy	.238	4.201
OI6 Increased Capacity	.235	4.254	SQ10 Flexibility	.351	2.852
OI8 Business Process Change	.265	3.776	SQ11 Reliability	.373	2.684
OI7 E-Government	.293	3.418	SQ12 Efficiency	.375	2.664
IQ1Importance	.353	2.830	SQ13 Sophistication	.362	2.761
IQ5 Relevance	.258	3.870	SQ14 Integration	.210	4.756
IQ2 Availability	.254	3.942	SQ15 Customisation	.404	2.478
IQ3 Usability	.189	5.294	SQ16 Security	.317	3.152
IQ4 Understandability	.200	5.012			
IQ6 Format	.219	4.574			
IQ7 Content Accuracy	.645	1.551			
IQ8 Conciseness	.291	3.440			
IQ9 Timeliness	.266	3.757			
IQ10 Uniqueness	.486	2.058			

6.4.2 The correlation analysis

Following the multicollinearity test, correlation analysis was conducted to identify non-significant items. This correlation analysis is used as an initial screening for non-significant item, with the non-significant items being removed (if the item does not affect the content of the construct) from further analysis. Only items that are significantly correlated with the variable of interest (a criterion measure or dependent variable) are retained as this indicates that the items are significant predictors of the dependent variable (Diamantopolous & Winklhofer, 2001). In addition to the validity of each model dimension, this analysis is appropriately done at the dimension level where a 'global item' represents a dependent variable to the dimension. According to Diamantopoulos and Winkhlofer (2001), "A global item summarises the essence of the construct that the index purports to measure," (Diamantopolous & Winkhlofer, 2001, p. 272).

Table 6.3 and Table 6.4 show the correlation matrices of the 38 items by correlating them with the respective criterion measures (or global items) that were listed at the start of this section.

Table 6.3

Correlation Matrix of Items in Individual and Organizational Impact with the Respective Criterion Measure

Individual Impact	Criterion 2	Organizational Impact	Criterion 1
II1 Learning	.571**	OI1 Organisational Costs	.481**
II2 Awareness/Recall	.585**	OI2 Staff Requirements	.514**
II3 Decision Effectiveness	.609**	OI3 (Operating) Cost Reduction	.508**
II4 Individual Productivity	.574**	OI4 Overall Productivity	.570**
		OI5 Improved Outcome/Output	.541**
		OI6 Increased Capacity	.565**
		OI8 Business Process Change	.615**
		OI7 E-Government	.590**

**p<0.01 (2-tailed)

Table 6.4

Correlation Matrix of Items in Information and System Quality with the Respective Criterion Measure

Information Quality	Criterion 4	System Quality	Criterion 3
IQ1Importance	.527**	SQ1 Data Accuracy	-.177**
IQ5 Relevance	.640**	SQ2 Data Currency	.569**
IQ2 Availability	.633**	SQ3 Database Content	.021
IQ3 Usability	.636**	SQ4 Ease of Use	.532**
IQ4 Understandability	.528**	SQ5 Ease of Learning	.524**
IQ6 Format	.555**	SQ6 Access	.067
IQ7 Content Accuracy	-.048	SQ7 User Requirements	.628**
IQ8 Conciseness	.580**	SQ8 Systems Features	.630**
IQ9 Timeliness	.637**	SQ9 System Accuracy	.686**
IQ10 Uniqueness	.490**	SQ10 Flexibility	.519**
		SQ11 Reliability	.485**
		SQ12 Efficiency	.456**
		SQ13 Sophistication	.617**
		SQ14 Integration	.711**
		SQ15 Customisation	.449**
		SQ16 Security	.618**

**p<0.01 (2-tailed)

Referring to Table 6.3, all items in both Individual Impact and Organizational Impact dimensions have significant correlation with the respective criterion measures at the level of 0.01 (2-tailed). All items in the Individual Impact dimension show large correlations with the criterion measure (the lowest coefficient is r = 0.571) based on Cohen’s (1988) guidelines, as shown in Table 6.5. Meanwhile, for the Organizational Impact dimension, all items (except one item) show large correlations with the criterion measure. One Organizational Impact item (OI1) has a medium correlation with the criterion measure, with the coefficient being r = 0.481.

Table 6.5

Correlation Coefficients Guidelines (Cohen (1988))

The r value	Strength
.50 to 1.00 or .-50 to -1.00	Large
.30 to .49 or -.30 to -.49	Medium
.10 to .29 or -.10 to -.29	Small

Table 6.4 presents the correlation results for all items in the Information Quality and System Quality dimensions. From the results, all Information Quality items (except one) have medium to large correlations with the criterion measure, with the lowest coefficient being r = 0.490. However, IQ7 Content Accuracy (highlighted in the table) has a non-significant correlation with the criterion measure at the level of 0.01 (2-tailed).

Meanwhile, two of the 16 items of System Quality (highlighted in the table), SQ3 Database Content and SQ6 Access, have a non-significant correlation with the criterion measure at the level 0.01 (2-tailed). The rest of the items have significant correlations with the criterion measure. However, there are four from those significant items that demonstrated medium to small correlation with the criterion measure (with $r<0.50$). The lowest coefficient is depicted by SQ1 Data Accuracy with r = -0.177. Three other items that have medium correlations are SQ11 Reliability (r = 0.485), SQ12 Efficiency (r = 0.456) and SQ15 Customisation (r = 0.449). Based on these correlation results, two items of System Quality, SQ3 and SQ6 are considered unfit for the model because of their non-significant correlation with the criterion measure.

Overall, three (3) items (IQ7, SQ3 and SQ6) are found to have non-significant correlations with the respective criterion measures. This may indicate that these three items may not be strong predictors for measuring Information Quality and System Quality because they failed to demonstrate status as valid predictors to the respective dimensions. These items can be subject to removal if they continue to demonstrate unfit results in the following analysis.

Meanwhile, six (6) items (OI1, IQ10, SQ1, SQ11, SQ12 and SQ15) are not strongly correlated with the respective criterion measures, with Pearson's coefficients, r<0.50. The correlation coefficient of SQ1 is relatively small, with r = -0.177. This indicates that SQ1 has a weak negative relationship with the respective criterion measure and may be subject to removal for further analysis. However, the correlation coefficients of OI1, IQ10, SQ11, SQ12 and SQ15 demonstrate that these five items have medium correlations with the respective criterion measures (with r between 0.449 and 0.49); therefore, these five items will be retained for further analysis, together with the rest of the items.

6.4.3 Assessing the validity through structural relationship

Next, the validity of the IS-Impact model was tested by identifying the relationships between the (i) latent variables and the observed or manifest variables (measurement model or outer model) and between (ii) unobserved latent variables (structural model or inner model) (Andreev et al., 2009, Henseler et al., 2009, Tenenhaus, Vinzi, Chatelin & Lauro, 2005). The first test was carried out to identify the validity of the measurement model by including at least two reflective measures that summarised the IS-Impact construct as a higher-order formative construct[2] that consists of four dimensions[3]. A selection of criterion measures that were previously introduced at the start of this section was employed in this analysis.

A second test was done by placing the model in the nomological net. This test was carried out by employing the Satisfaction construct as the consequence of the IS-

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[2] Higher-order order construct also refers to hierarchical construct or multidimensional construct which can be defined as a construct involving more than one dimension (Jarvis et al., 2003, Petter et al., 2007, Wetzels et al., 2009)
[3] IS-Impact is a multidimensional construct with four dimensions: Individual Impact, Organizational Impact, Information Quality and System Quality. These dimensions are composites of the IS-Impact construct. In the model identification these dimensions are specified as the underlying lower-order latent variables for the IS-Impact.

Impact construct. Both of these tests were carried out using SmartPLS, a software application for (graphical) path modelling with latent variables that uses the Partial Least Squares (PLS) method for the latent variables analysis (Ringle, Wende, & Will, 2005).

6.4.3.1 Model identification by employing reflective measures (outer model assessment)

As mentioned in the beginning of section 6.4, nine (9) criterion measures were included in the questionnaire for the purpose of model validation. Four of these nine criterion measures include reflective measures that summarised each of the dimensions of the IS-Impact model. In section 6.4.2, all the items were tested for criterion related validity in which the relationships between the items (as predictors) and the criterion measures (as dependent variables) were investigated and have been discussed. The remaining five criterion measures are used as reflective measures (labelled as C5 to C9) that summarise the IS-Impact construct as over-arching dimension for Individual Impact, Organizational Impact, System Quality and Information Quality, thus, the IS-Impact construct is a hierarchical second-order construct. These remaining five criterion measures will be used to estimate the IS-Impact model in the path analysis using SmartPLS. *Figure 6.3* below depicts the conceptual model that was tested in SmartPLS. This model is similar to Jarvis et al. (2003) Type IV model because IS-Impact is conceptualised as a formative construct with four dimensions – Individual Impact, Organizational Impact, Information Quality and System Quality - and has formative measures for both the first and second order constructs (Jarvis et al., 2003). Employing a multidimensional model, according to some researchers, can reduce model complexity and improve parsimony because such models treat each dimension as an important component of a construct (Ruiz, Gremler, Washburn & Carrion, 2008, Wetzels et al., 2009). Bruhn, Georgi, and Hadwich (2008), Rai et al. (2006) and Wetzels et al. (2009) have provided examples of how a multidimensional model can be identified using PLS approach.

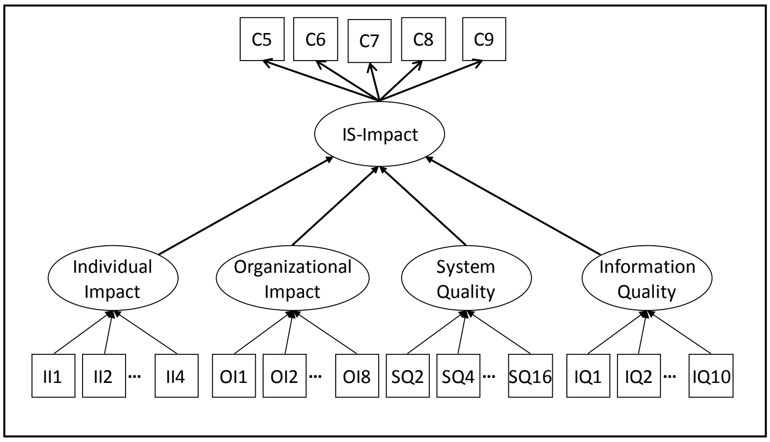


Figure 6.3. Model validation employing reflective measures.

Correlation analysis was first conducted to identify the relationships of the 38 items with these five criterion measures. These correlations analyses will demonstrate the ability of the items to predict the overall IS-Impact phenomenon as measured by these criterion measures, and at the same time test for for related validity. The following tables, Table 6.6, Table 6.7, Table 6.8 and Table 6.9, show the correlation matrices between the 38 items with each of the criterion measures.

Table 6.6

Correlation Matrix of Individual Impact Items and the Criterion Measures

Items	**Pearson Correlations**				
	C5	C6	C7	C8	C9
II1 Learning	.526**	-.103	.307**	.591**	.486**
II2 Awareness/Recall	.500**	-.108	.282**	.571**	.474**
II3 Decision Effectiveness	.567**	-.113	.368**	.636**	.526**
II4 Individual Productivity	.581**	-.039	.327**	.592**	.486**

**p<0.01 (2-tailed)

Table 6.7

Correlation Matrix of Organizational Impact Items and the Criterion Measures

Items	Pearson Correlations				
	C5	C6	C7	C8	C9
OI1 Organisational Costs	.521**	.042	.371**	.545**	.465**
OI2 Staff Requirements	.525**	-.066	.390**	.513**	.497**
OI3 (Operating) Cost Reduction	.479**	-.034	.396**	.518**	.451**
OI4 Overall Productivity	.579**	-.051	.423**	.604**	.526**
OI5 Improved Outcome/Output	.561**	-.020	.356**	.579**	.474**
OI6 Increased Capacity	.514**	.028	.280**	.564**	.467**
OI8 Business Process Change	.560**	.000	.398**	.587**	.548**
OI7 E-Government	.617**	-.019	.437**	.606**	.561**

**p<0.01 (2-tailed)

Table 6.8

Correlation Matrix of Information Quality Items and the Criterion Measures

Items	Pearson Correlations				
	C5	C6	C7	C8	C9
IQ1Importance	.537**	-.039	.338**	.525**	.425**
IQ5 Relevance	.614**	-.035	.455**	.569**	.560**
IQ2 Availability	.616**	-.080	.502**	.561**	.580**
IQ3 Usability	.606**	-.090	.459**	.584**	.573**
IQ4 Understandability	.627**	-.074	.437**	.578**	.533**
IQ6 Format	.629**	-.010	.408**	.607**	.546**
IQ7 Content Accuracy	-.112	.126	.030	-.086	-.021
IQ8 Conciseness	.619**	-.088	.440**	.565**	.550**
IQ9 Timeliness	.573**	-.092	.497**	.561**	.524**
IQ10 Uniqueness	.423**	-.153	.379**	.441**	.365**

**p<0.01 (2-tailed)

The correlation results show that all but one criterion measure have significant correlations with the 38 items at a significance level of 0.01 and 0.05. As highlighted in Table 6.6, Table 6.7, Table 6.8 and Table 6.9, criterion 6 (C6) has a non-significant correlation with most of the items. These non-significant correlation results demonstrate that C6 is not suitable as a reflective measure for estimating the formative model because the results indicate that there are no significant relationships between C6 and most of the items. This might be an indication that the items in the IS-Impact model are not able to predict C6 well. Moreover, the coefficient indicated that almost all the items in the IS-Impact model have weak and inverse relationships with C6 when a positive relationship was expected. Therefore, based on the correlation results, C6 is considered unfit and is removed from further analysis.

Table 6.9

Correlation Matrix of System Quality Items and the Criterion Measures

Items	Pearson Correlations				
	C5	C6	C7	C8	C9
SQ1 Data Accuracy	-.199*	.116	-.092	-.224**	-.161*
SQ2 Data Currency	.581**	-.121	.494**	.608**	.554**
SQ3 Database Content	.084	.318**	-.032	.067	.097
SQ4 Ease of Use	.594**	-.005	.396**	.557**	.529**
SQ5 Ease of Learning	.512**	-.039	.356**	.547**	.465**
SQ6 Access	.124**	.300**	-.055	.054	.101*
SQ7 User Requirements	.611**	-.097	.423**	.607**	.577**
SQ8 Systems Features	.544**	-.146	.405**	.580**	.555**
SQ9 System Accuracy	.586**	-.113	.431**	.608**	.560**
SQ10 Flexibility	.526**	-.094	.403**	.499**	.453**
SQ11 Reliability	.483**	-.160	.481**	.453**	.481**
SQ12 Efficiency	.530**	-.117	.429**	.500**	.494**
SQ13 Sophistication	.522**	-.150	.345**	.526**	.502**
SQ14 Integration	.703**	-.097	.517**	.653**	.628**
SQ15 Customisation	.455**	-.077	.411**	.484**	.427**
SQ16 Security	.546**	-.120	.530**	.598**	.519**

From the correlation results it is observed that all of the significant criterion measures depicted small to large relationships with most of the 38 items, with the smallest significant coefficient being -0.161 (the correlation between criterion 9 (C9) and SQ1 Data Accuracy) and the largest coefficient being 0.703 (the correlation between criterion 5 and SQ14 Integration). Moreover, the correlation results depicted that criterion 7 has a large number of significant medium correlation coefficients (0.3 < r < 0.5) with all items. Although the relationships between criterion 7 with most of the items are not strong, they are, nonetheless significant. Thus, criterion 7 can still be used as a valid criterion measure in the model test.

Three items (IQ7, SQ3 and SQ6) that were found to have non-significant correlation with the criterion measures at the dimension level (see discussion at section 6.4.2) are found to have non-significant correlation with most of the criterion measures (C5, C7, C8 and C9). The correlation coefficients of IQ7 with all criterion (except criterion 6) measures displayed a negative relationship. However, none of these relationships are significant. Similar results are depicted for SQ3 and SQ6. Here, a mixed relationship (positive and negative relationships) was observed between SQ3 and SQ6 and the criterion measures. There are a few significant correlations depicted between these two items with some criterion measures, however, the correlations are small (with $r < 0.3$), thus, these relationships are considered weak. Meanwhile, SQ1 is observed to have a weak but significant negative relationship with all criterion measures (except criterion 6 and criterion 7). With these correlation results, this further suggests that these four items, IQ7, SQ1, SQ3 and SQ6 may not be strong predictors for IS-Impact because of non-significant and weak relationships with the respective IS-Impact dimensions at both the dimension and over-arching level.

The next step is to assess the internal reliability of the criterion measures. From the scale reliability analysis (*Exhibit 6.2*), the Cronbach's coefficient alpha is 0.870, exceeding the recommended value of 0.7. This result indicates the reliability of the criterion measures, which means that scores for all criterion measures are in the same range, thus, demonstrating the internal consistency among these criterion measures. Internal consistency among the reflective items is important as it explained that these items correspond highly with each other, and therefore, these items can be used interchangeably.

Reliability Statistics

Cronbach's Alpha	N of Items
.870	4

Item Statistics

	Mean	Std. Deviation	N
Criterion 5	4.29	.997	249
Criterion 7	3.55	1.237	249
Criterion 8	4.37	.899	249
Criterion 9	4.40	.847	249

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Criterion 5	12.32	6.703	.769	.816
Criterion 7	13.06	6.194	.640	.890
Criterion 8	12.23	7.139	.775	.819
Criterion 9	12.20	7.349	.784	.820

Exhibit 6.2. Criterion measures reliability test.

The model was then assessed in SmartPLS (Ringle, et al. 2005). PLS does not generate a ‘Goodness-of-Fit’ result; therefore, the model fit relies on the strength of the paths connecting the second order latent variable to the first order latent variables. Chin (1998, p. xii-xiii) explains:

> “[the] goodness of fit measures are related to the ability of the model to account for the sample covariances and therefore assume that all measures are reflective. SEM procedures that have different objective functions and/or allow for formative measures (e.g. PLS) would not be able

to provide such fit measures. In actuality, model with good fit indices may still be considered poor based on other measures such as R-square and factor loadings. The fit measures only related to how well the parameter estimates are able to match the sample covariances. They do not relate to how well the latent variables or item measures are predicted.... Therefore closer attention should be paid to the predictiveness of the model, the substantial strength of the structural path and loadings as opposed to just statistically significant."

Chin (1998) further provides some requirements for a model with formative measures to be meaningful. Loadings for most of the measures should be at least 0.60 and ideally at 0.70 or above. This indicates that each measure accounts for 50% or more of the variance of the underlying latent variables. Standardized paths should be at least 0.20, and ideally above 0.30 in order to be considered meaningful. *Figure 6.4* presents the structural results with the estimation results for each of the items displayed in Table 6.10.

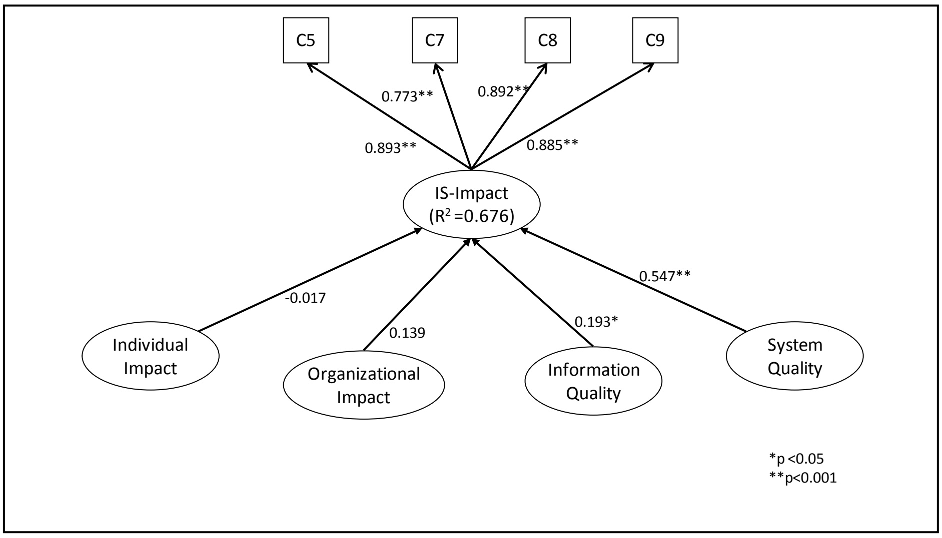


Figure 6.4. PLS results for model 1.

Table 6.10

Item weight, VIF score, Mean, Std. Dev. for 34 Items and Loadings for Criterion Measures Model 1

Items	Mean	Std. Dev	VIF	Weights	Items	Mean	Std. Dev	VIF	Weights
II1	4.47	0.974	3.752	0.315*	SQ2	4.37	0.947	2.675	0.202*
II2	4.47	0.974	5.148	-0.041	SQ4	4.57	1.002	4.047	0.277*
II3	4.60	0.968	8.027	0.504*	SQ5	4.56	0.988	4.439	-0.099
II4	4.61	1.023	5.493	0.296	SQ7	4.57	0.883	3.508	0.166
OI1	4.32	0.922	3.032	0.126	SQ8	4.34	0.915	4.679	-0.077
OI2	4.30	0.959	3.298	0.178	SQ9	4.15	0.935	4.201	0.131
OI3	4.27	0.970	3.281	-0.008	SQ10	4.11	0.978	2.852	-0.018
OI4	4.39	0.929	4.560	0.29*	SQ11	3.85	1.129	2.684	0.06
OI5	4.48	0.918	3.879	0.027	SQ12	3.99	1.039	2.664	0.069
OI6	4.49	0.880	4.254	-0.154	SQ13	4.11	0.959	2.761	0.025
OI8	4.42	0.883	3.776	0.287*	SQ14	4.27	0.976	4.756	0.319 **
OI7	4.46	0.929	3.418	0.424**	SQ15	3.98	1.117	2.478	0.008
IQ1	4.96	0.936	2.830	-0.049	SQ16	4.35	1.028	3.152	0.172*
IQ5	4.59	0.972	3.870	0.198					
IQ2	4.33	1.135	3.942	0.264*					
IQ3	4.47	0.927	5.294	0.089					
IQ4	4.54	0.872	5.012	0.032					
IQ6	4.48	0.951	4.574	0.199*					
IQ8	4.32	0.886	3.440	0.204*					
IQ9	4.06	1.035	3.757	0.193*					
IQ10	4.06	1.137	2.058	0.057					

Criterion	Mean	Std. Dev	Loadings
C5	4.29	0.994	0.893
C7	3.55	1.230	0.773
C8	4.38	0.898	0.892
C9	4.41	0.844	0.885

* $p < 0.05$
** $p < 0.01$

The results from the PLS estimate test presented in *Figure 6.4* is the first model tested that includes 34 items with all significant criterion measures (missing values were replaced by the mean in the PLS algorithm). The PLS result shows that System Quality (SQ) provides the strongest contribution to IS-Impact (β = 0.547) while Individual Impact (II) is the least contributor in explaining the IS-Impact with β = -0.017 (ignoring the negative sign). Information Quality (IQ) is the second strongest contributor to the IS-Impact with β = 0.193, followed by Organizational Impact (OI) (β = 0.139).

An adjusted R-square of 0.676 was reported from the analysis. This indicates that 67.6% of the variance in IS-Impact is explained by Individual Impact, Organizational Impact, Information Quality and System Quality. As suggested by Henseler et al. (2009), following a recommendation from Chin (1998), R-square values of 0.67, 0.33 and 0.19 in PLS path models can be regarded as substantial, moderate and weak, respectively. Therefore, this path analysis indicates that the IS-Impact model is a substantial model in explaining the impact of an IS. However, only two structural paths in this model, that is, between System Quality and IS-Impact, and between Information Quality and IS-Impact, are significant at $\alpha = 0.001$ and $\alpha = 0.05$ respectively (estimated by bootstrapping procedure with 254 bootstrapping samples). Thus, the results indicate that only System Quality and Information Quality dimensions are significant for explaining the impact of an IS.

Table 6.10 presents the mean score, standard deviation, VIF value and the weights (gamma parameter) for each of the items in the model. According to Chin (1998), the desirable weights should be at least 0.2 and ideally above 0.3 in order to be considered meaningful. From the results, it is observed that a number of items demonstrated non-significance with low item weights, while some have negative weights. However, there are several possible reasons for these occurrences, which will be discussed further in section 6.5.

The PLS estimate tests were repeated a number of times, with different selections of reflective measures (the criterion measures) and different sets of samples (for example separating samples according to employment cohorts) in order to observe changes in the path coefficients between the items and the construct, and between the first order construct to the higher order construct, to identify the best model. During the analysis, criterion 8 was removed from the model because the wording closely refers to the 'Individual Impact' dimension. Thus, criterion 8 is not considered as a global item that is able to summarise IS-Impact as the second-order construct. From the repeated PLS estimate test, using a combination of two or three criterion measures (of C5, C7 and C9), the outcomes indicate that using the combination of two criterion measures; Criterion 5 and Criterion 7 led to the improvement of one non-significant path (that is between the Organizational Impact and IS-Impact). This indicates that the Organizational Impact (along with System Quality and Information Quality) measures can better explained the variance in the model by identifying the model with the combination of Criterion 5 and Criterion 7. The results from the analysis are shown in *Figure 6.5* and Table 6.11.

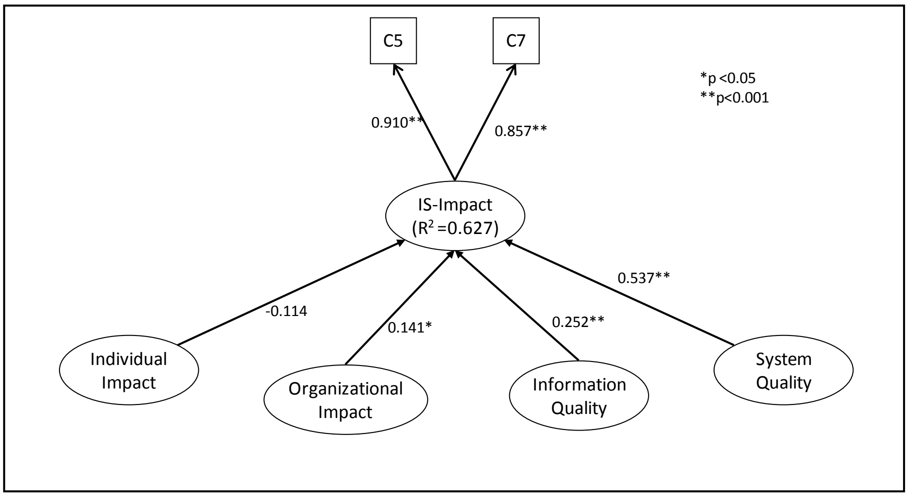


Figure 6.5. PLS results for model 2.

The PLS results for the second model indicate a small decrease in the R-square, but it is still close to being a substantial model, with an adjusted R-square of 0.627 being reported from the analysis. This indicates that 62.7% of the variance in the IS-Impact is explained by Individual Impact, Organizational Impact, Information Quality and System Quality.

The path estimates for model 2 depicted three significant structural paths between System Quality and IS-Impact, Information Quality and IS-Impact, and Organizational Impact and IS-Impact. By using two reflective measures (C5 and C7) there is an improvement in the structural path between Organizational Impact and IS-Impact. This estimation result indicates that the three dimensions, System Quality, Information Quality and Organizational Impact, contributes significantly to the IS-Impact. It was also noted that there was no change to the order of contribution in which System Quality is the strongest contributor to the change of IS-Impact, followed by Information Quality, Organizational Impact and Individual Impact.

The Individual Impact, however, depicted a non-significant contribution to IS-Impact. This does not mean that Individual Impact does not contribute to IS-Impact because based on the correlation results between the Individual Impact items with the reflective measures (C5 and C7), there are strong and significant relationships between the items and these reflective measures. One possible explanation that may have caused the Individual Impact dimension to become insignificant is because of a suppressor effect. This will be discussed further in section 6.5.

Table 6.11 below presents the mean score, standard deviation, VIF value and path weights (gamma parameter) for each of the items in the model. Similar to the findings of the Model 1 estimated test, a number of items demonstrated non-significance with low item weights, while some have negative path weights. Based on these two models (Model 1 and Model 2), it can be concluded that the results are consistent, based on the contribution order of the first order constructs (the IS-Impact dimensions) and the weights of the indicators, even with different selections of reflective measures. However, it should be noted that the R-square value is lower in Model 2 compared to Model 1.

Table 6.11

Item weight, VIF score, Mean, Std. Dev. for 34 Items and Loadings for Criterion Measures Model 2

Items	Mean	Std. Dev	VIF	Weights	Items	Mean	Std. Dev	VIF	Weights
II1	4.47	0.974	3.752	0.292	SQ2	4.37	0.947	2.675	0.195*
II2	4.47	0.974	5.148	-0.143	SQ4	4.57	1.002	4.047	0.298*
II3	4.60	0.968	8.027	0.503*	SQ5	4.56	0.988	4.439	-0.163*
II4	4.61	1.023	5.493	0.407	SQ7	4.57	0.883	3.508	0.163
OI1	4.32	0.922	3.032	0.125	SQ8	4.34	0.915	4.679	-0.16
OI2	4.30	0.959	3.298	0.197	SQ9	4.15	0.935	4.201	0.093
OI3	4.27	0.970	3.281	0.002	SQ10	4.11	0.978	2.852	0.047
OI4	4.39	0.929	4.560	0.313*	SQ11	3.85	1.129	2.684	0.113
OI5	4.48	0.918	3.879	0.062	SQ12	3.99	1.039	2.664	0.079
OI6	4.49	0.880	4.254	-0.292*	SQ13	4.11	0.959	2.761	-0.037
OI8	4.42	0.883	3.776	0.235*	SQ14	4.27	0.976	4.756	0.385**
OI7	4.46	0.929	3.418	0.487**	SQ15	3.98	1.117	2.478	-0.002
IQ1	4.96	0.936	2.830	-0.058	SQ16	4.35	1.028	3.152	0.202*
IQ5	4.59	0.972	3.870	0.19*					
IQ2	4.33	1.135	3.942	0.330*					
IQ3	4.47	0.927	5.294	0.006					
IQ4	4.54	0.872	5.012	0.096					
IQ6	4.48	0.951	4.574	0.121					
IQ8	4.32	0.886	3.440	0.219*					
IQ9	4.06	1.035	3.757	0.214*					
IQ10	4.06	1.137	2.058	0.072					

Criterion	Mean	Std. Dev	Loadings
C5	4.29	0.994	0.91
C7	3.55	1.230	0.857

* p < 0.05
** p < 0.01

This analysis indicates that the combination of Criterion 5 and Criterion 7 are the most suitable criterion measures to be used in the analysis. Based on this finding, the following nomological net validation will only employ these criterion measures.

Another approach in identifying the IS-Impact model is by employing a MIMIC model or what some researchers call redundancy analysis (Cenfetelli & Bassellier, 2009, Mathieson et al., 2001). A MIMIC model is a model that consists of a construct with both formative and reflective measures (Bruhn et al., 2008, Fornel & Bookstein, 1982) and allows simultaneous estimation of the measurement model and the incorporation of formative items in the structural model for IS-Impact (Lester, 2008). This MIMIC model approach is employed for identifying IS-Impact as the second-order hierarchical construct (Bruhn et al., 2008). Following Rai and friends

(2006) the summated average of the items for each dimension serve as the formative items and the same two criterion measures that were used in the outer model assessment (Model 2) serve as reflective items in this MIMIC model (see *Figure 6.6*).

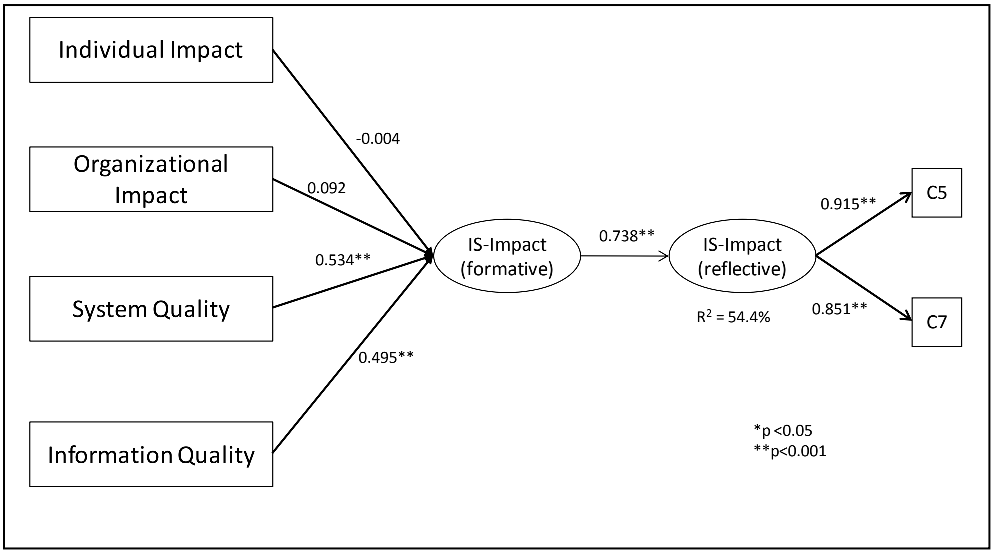


Figure 6.6. PLS estimates for the MIMIC model.

The estimated MIMIC model indicates a strong path coefficient (β = 0.738 and significant at α = 0.001) between the two constructs, which demonstrate a strong degree of formative measure validity (Cenfetelli & Bassellier, 2009) and adequate coverage of formative measures to explain the IS-Impact (Mathieson, 2001). The R-square value describes that the measurement model can explain 54.5% of the variance in the IS-Impact. Since the MIMIC model is estimated using the aggregated value of each dimension, some reduction in the R-Square is expected compared to previous model estimations. Nonetheless, the four dimensions account for more than 50% of the variance of the IS-Impact construct, meeting the recommendation given by Chin (1998). Moreover, the results further indicate that the Individual Impact and

Organizational Impact maintained low path weights even in this redundancy analysis, thus, depicting a consistent result.

Another alternative for testing IS-Impact construct as the second-order construct is through repeated use of items following the suggestions given by Wetzels and friends (2009). This is done by repeating the same items of the underlying first-order construct, which is the 34 items in this case, as the items for the second-order construct, that is, the IS-Impact construct (see *Figure 6.7*). In this way, the model accounts for the hierarchical component of the model, and will result in an R-square value of the higher-order construct of unity (R-square of 1.0) (Wetzels et al., 2009). The PLS estimate result is shown in *Figure 6.8*.

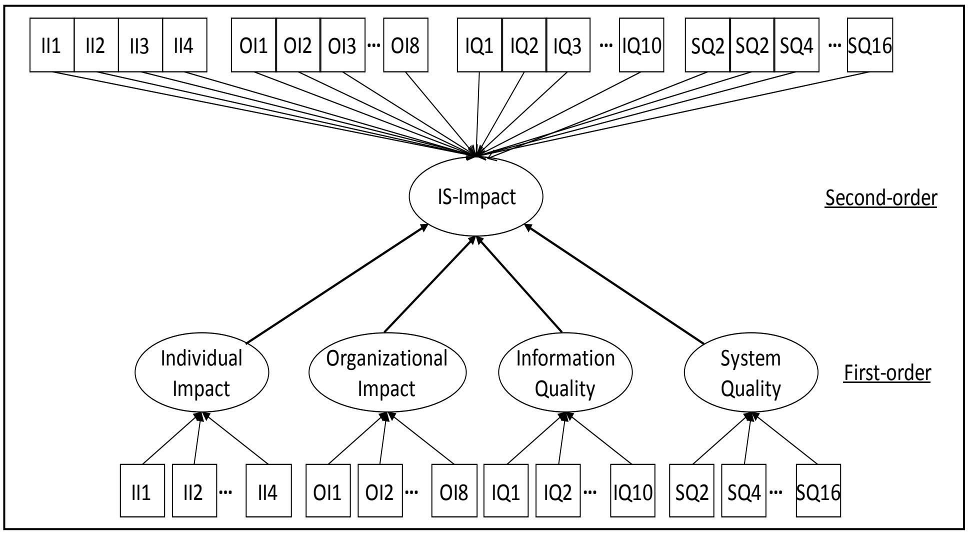


Figure 6.7. Estimating higher-order construct using repeated measures.

The PLS estimate result (*Figure 6.8*) for the model with repeated measures indicates an adjusted R-square of 1.000 for the second-order construct. According to Wetzels and friends (2009), when specifying a hierarchical model using repeated measures the R-square should yield 1.000. Therefore, based on this PLS estimate result, the validity of the IS-Impact construct as the second-order construct is demonstrated.

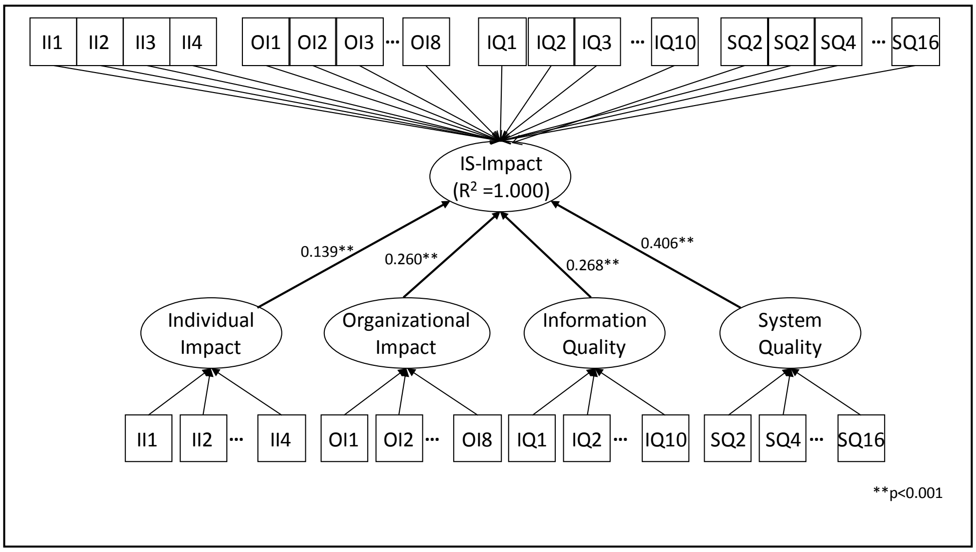


Figure 6.8. PLS estimate using repeated measures.

6.4.3.2 Explanatory power of the model

Following the PLS tests, a change in R-Square was explored to investigate the impact of each dimension, Individual Impact, Organizational Impact, Information Quality and System Quality, on the over-arching IS-Impact construct. This is done through repeated PLS estimate tests and calculating the effect size when one dimension is excluded in each of the PLS estimate runs. The effect size is calculated using the following formula (refer to section 6.3.2 for further explanation of this formula):

$$\text{Effect size, } f^2 = \frac{R^2_{included} - R^2_{excluded}}{1 - R^2_{included}}$$

Table 6.12

Effect Size

Run	R-square include Removed	0.627 R-square exclude	Effect size	Interpretation
1	SQ	0.553	0.198	Medium effect
2	IQ	0.609	0.043	Small effect
3	OI	0.611	0.013	Small effect
4	II	0.613	0.008	Small effect

This analysis was based on Model 2. The result shows (Table 6.12) that Individual Impact, Organization Impact, and Information Quality have a small effect on IS-Impact, with all effect sizes of f^2<0.15 (Cohen (1988) suggests that f^2 values of 0.02, 0.15 or 0.35 indicate small, medium and large effects, respectively). The effect of System Quality is medium (with f^2>0.15), and is as expected, based on the largest path weight being between System Quality and the IS-Impact construct. The rest of the dimensions have a small effect on the IS-Impact construct. This finding demonstrates how the number of items within a construct has greater explanatory power. As more items are included in the dimension the R-square increases (Triola, 2001).

This effect size result further demonstrates the additivity of the four dimensions as a complete measurement model. This means that the IS-Impact construct is composed of these four dimensions. This summary is made based on the effect size for each dimension to explain the impact of IS. Therefore, by combining the dimensions, the explanatory power of the model increases as depicted in the incremental change of the R-square, hence, combining all the dimensions in a model will provide a strong contribution. Furthermore, the medium effect given by the

System Quality dimension may be influenced by the type of respondents involved in the survey, as will be discussed further in the conclusion of this chapter.

6.4.3.3 Nomological validity (inner model assessment)

The final approach to test the validity of the IS-Impact model is by linking the model with an antecedent or consequence construct that it has been hypothesised to have a significant and strong relationship with. When validating the IS-Impact model, Gable et al. (2008) employed Satisfaction as the consequence of IS-Impact (this conceptualisation is explained in detail in Chapter 5). They hypothesised that "a higher level of IS-Impact yields a higher level of Satisfaction". From the analysis, they found a strong positive relationship between IS-Impact and Satisfaction with $\beta = 0.854$, and significance at the level $\alpha = 0.001$.

Replicating this approach, this research employed Satisfaction by including the same item used in Gable et al. (2008) and adding three new measures (see Chapter 5 for discussion). The Satisfaction measures employed in this validation process are:

a. Satisfaction 1 (S1): Overall, SPEKS is satisfactory.
b. Satisfaction 2 (S2): I am satisfied with SPEKS.
c. Satisfaction 3 (S3): I am happy with SPEKS.
d. Satisfaction 4 (S4): I like SPEKS.

Factor analysis was first conducted to investigate the convergent validity of these Satisfaction measures. *Exhibit 6.3* shows the results of the analysis.

Correlation Matrix

	S1 Overall Satisfaction	Satisfaction 2	Satisfaction 3	Satisfaction 4
S1 Overall Satisfaction	1.000			
S2 Satisfaction 2	.876	1.000		
S3 Satisfaction 3	.422	.401	1.000	
S4 Satisfaction 4	.740	.723	.311	1.000

Communalities

	Initial	Extraction
S1 Overall Satisfaction	1.000	.883
S2 Satisfaction 2	1.000	.857
S3 Satisfaction 3	1.000	.339
S4 Satisfaction 4	1.000	.730

Extraction Method: Principal Component Analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	658.833
	Df	6
	Sig.	.000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.809	70.225	70.225	2.809	70.225	70.255
2	.763	19.076	89.301			
3	.306	7.650	96.951			
4	.122	3.049	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
S1 Overall Satisfaction	.940
S2 Satisfaction 2	.926
S3 Satisfaction 3	.582
S4 Satisfaction 4	.854

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Exhibit 6.3. Factor analysis results for satisfaction measures.

The first table in *Exhibit 6.3* presents the correlation results of the four Satisfaction measures. All Satisfaction measures indicate a large correlation with each other, except for Satisfaction 3. The correlations between Satisfaction 3 with the rest of the measures are below 0.5, with the smallest correlation, r = 0.311 between Satisfaction 3 and Satisfaction 4. The Kaiser-Meyer-Oklin value of 0.765 exceeds the recommended threshold of 0.6 (Pallant, 2005) and the Bartlett's Test of Sphericity reached statistical significance (p=0.000), thus, supporting the factorability of the correlation matrix.

Principal components analysis with a varimax rotation revealed the presence of one component with the eigenvalues exceeding 1, and explaining 70.2% of the variance in the construct. This result provides the evidence that these four Satisfaction measures loaded onto one construct. However, the correlation between Satisfaction 3 and the other Satisfaction measures is very small compared to the interrelationship between the rests of the Satisfaction measures. Based on this evidence, Satisfaction 3 is omitted from further analysis.

The next step is to assess the internal reliability of these Satisfaction measures. Cronbach's coefficient alpha is 0.827 exceeding the recommended value of 0.7 (see *Exhibit 5.6*). This result indicates that these measures are reliable as measures for the Satisfaction construct, and, thus, can be used to test the relationship between IS-Impact and Satisfaction.

Item Statistics

	Mean	Std. Deviation	N
S1 Overall Satisfaction	4.40	.997	264
S2 Satisfaction 2	4.38	.998	264
S3 Satisfaction 3	4.33	1.307	264
S4 Satisfaction 4	4.40	.989	264

Reliability Statistics

Cronbach's Alpha	N of Items
.827	4

Item Statistics

	Mean	Std. Deviation	N
S1 Overall Satisfaction	4.40	.997	264
S2 Satisfaction 2	4.38	.998	264
S3 Satisfaction 3	4.33	1.307	264
S4 Satisfaction 4	4.40	.989	264

Exhibit 6.4. Satisfaction measures reliability test.

The model was then tested in SmartPLS. The results from this analysis are presented in *Figure 6.9*. The PLS result supports the hypothesis, by depicting a strong positive relationship between IS-Impact and Satisfaction, with $\beta = 0.793$ and significant at $\alpha = 0.001$. Furthermore, the structural model indicates that the IS-Impact model can explain 63% of the variance in Satisfaction, thus, only 37% of the variance in Satisfaction is explained by other factors.

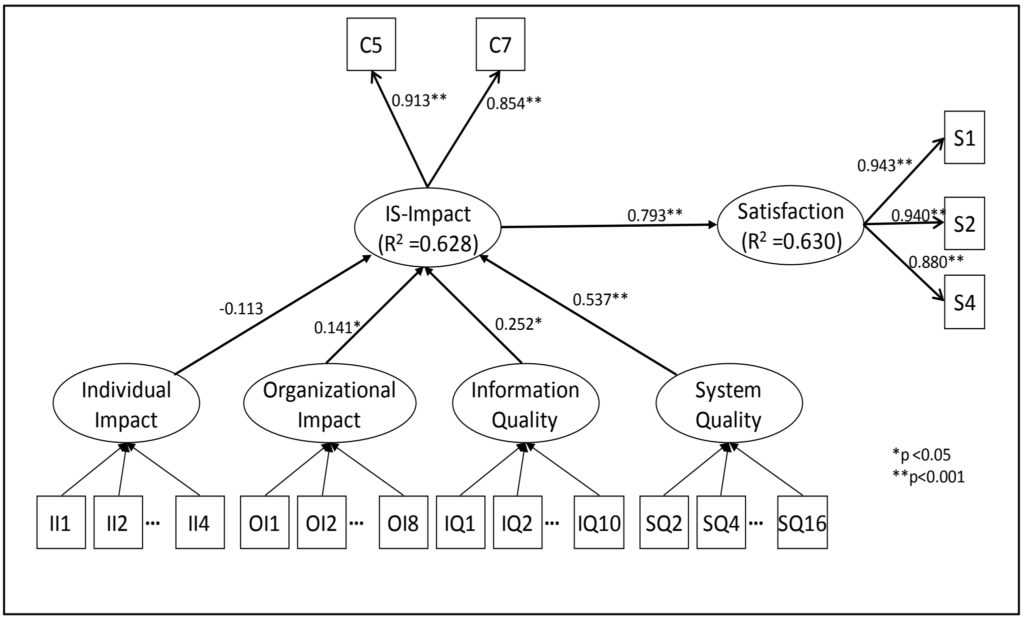


Figure 6.9. Test of nomological validity.

Another PLS estimate test was done, this time the repeated measures method is used as suggested by Wetzels and friends (2009) (similar to the model shown in *Figure 6.7*, but this time a consequence construct, Satisfaction, was added). The IS-Impact model was tested again in nomological net with the inclusion of repeated items of IS-Impact for the second-order construct (*Figure 6.10*).

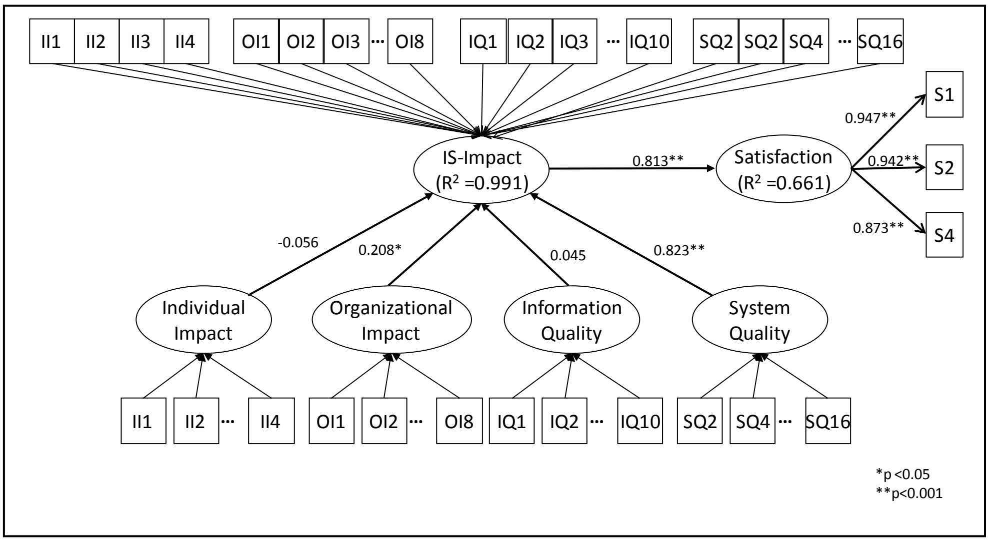


Figure 6.10. Test of nomological validity using repeated measures.

The results from this estimate test support, the hypothesis, with $\beta = 0.813$ and significant at $\alpha = 0.001$. Thus, based on these two nomological net validity tests, data supports the hypothesis that there is a strong and positive relationship between IS-Impact and Satisfaction. Therefore, the validity of the IS-Impact model with its 34 measures through nomological net or structural relationship assessment has been established.

6.5 TEST OF ALTERNATIVE MODELS

The PLS results for both the measurement model (outer model assessment) and the structural model (inner model assessment) have demonstrated the validity of the IS-Impact model that consisting of four dimensions with 34 items. Six tested models (model 1, model 2, a MIMIC model, a model with repeated measures and two nomological net models) have provide the evidence of the validity of the IS-Impact measurement model and it measures based on the R-square, path weights, item weights and VIF values, following Chin (1998), Diamantopolous and Winkhlofer (2001) and others recommendation. Beginning with 38 items, the multicollinearity diagnostic test indicated no presence of collinearity among the items. However, four items were removed from the model due to low and non-significant correlations with the criterion measures, violating the predictive validity assessment; thus, these four measures were regarded as not valid predictors.

It is notable from the PLS estimate results that a number of items have path coefficients smaller than 0.2, so are statistically non-significant based on the t-values from bootstrapping analysis. These findings raise an issue regarding the significance of the items in the model, whether removing or modifying the model would result in a better model fit. According to Cenfetelli and Bassellier (2009), the number of items has implications for the statistical significance and the magnitude of each item’s path coefficient. There is a probability that many of the items weights will be low in the magnitude and statistically non-significant with a greater number of items. This situation can occur even though these items had explicitly test for and exclude the possibility of multicollinearity. This is because formative measures essentially “compete” with one another to be explanatory of their targeted construct (Cenfetelli & Bassellier, 2009).

The PLS estimate results also indicate the co-occurrence of both negative and positive item weights. This occurrence is particularly difficult to interpret when an item has a positive bivariate correlation with the other items in the same construct and with the construct itself (Cenfetelli & Bassellier, 2009). One can misinterpret the result, for example by concluding that the negatively weighted indicator has an overall negative effect on its associated construct, when it is likely not the case. One possible reason for this occurrence is the involvement of suppression effects. A suppression effects occur when one of the predictors shares more variance with another indicator than with the formatively measured construct. This effect may occur even if collinearity is not a threat.

Cenfetelli and Basselier (2009) suggest three alternative approaches to deal with these limitations:

a. Create separate formatively measured constructs of distinct sets of items that are conceptually aligned.
b. Create a second order construct that does provide an overall conceptual relation among the identified array of formative indicators. This second order construct is itself formed by first order formatively measured constructs.

c. Remove indicators to increase the likelihood that the remaining indicators are statistically significant in explaining variance in the construct (a likely option taken by researchers based on the literature). However, the choice of this option should be taken carefully to avoid changing the conceptual meaning of the construct (Petter et al., 2007).

Based on the strong VIF scores, correlation results and the PLS estimates, no further items will be removed, thus option (c) suggested by Cenfetelli and Basselier will not be considered. This is because results provide evidence for retaining 34 items of the IS-Impact. However, to investigate the presence of suppressor affecting the contributions of items, and the effect of large number of items, three additional alternative models were tested following suggestions (a) and (b) above (*Figure 6.11*, *Figure 6.12* and *Figure 6.13*).

d. Model 3: Items with negative weights and small path coefficients in Organizational Impact are combined to create a sub-construct.

e. Model 4: Items with negative weights and small path coefficients in System Quality are combined to create a sub-construct.

f. Model 5: A combination of model 3 and model 4.

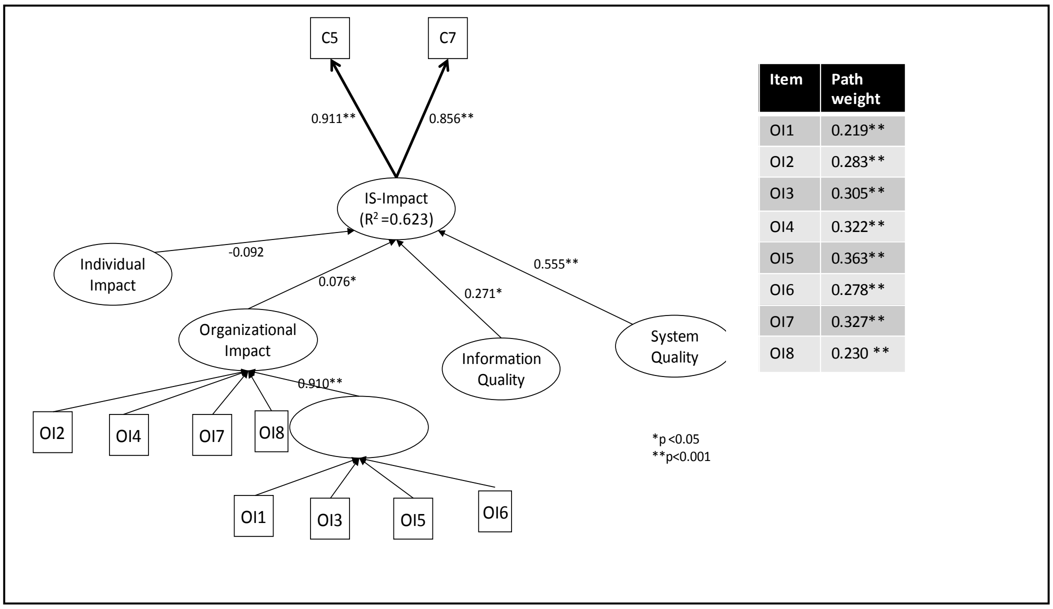
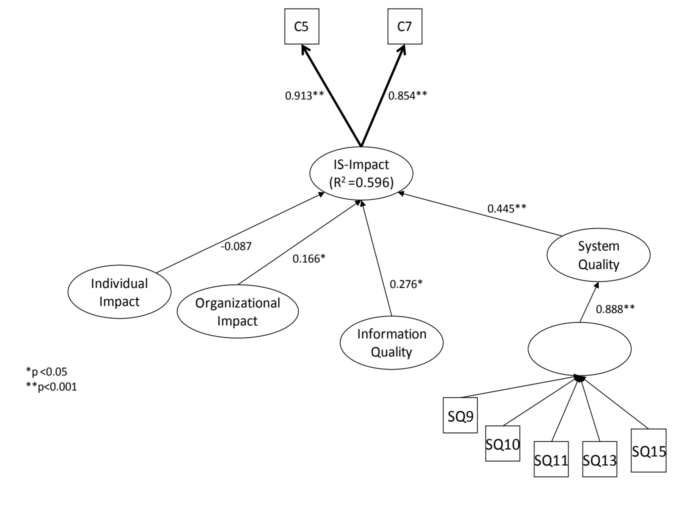


Figure 6.11. PLS results for model 3.



Item	Path weight	Item	Path weight
SQ2	0.076	SQ12	0.192*
SQ4	0.0142*	SQ13	0.272**
SQ5	-0.001	SQ14	0.338**
SQ7	0.133*	SQ15	0.213*
SQ8	0.191**	SQ16	0.163*
SQ9	0.466**		
SQ10	0.085*		
SQ11	0.205*		

Figure 6.12. PLS results for model 4.

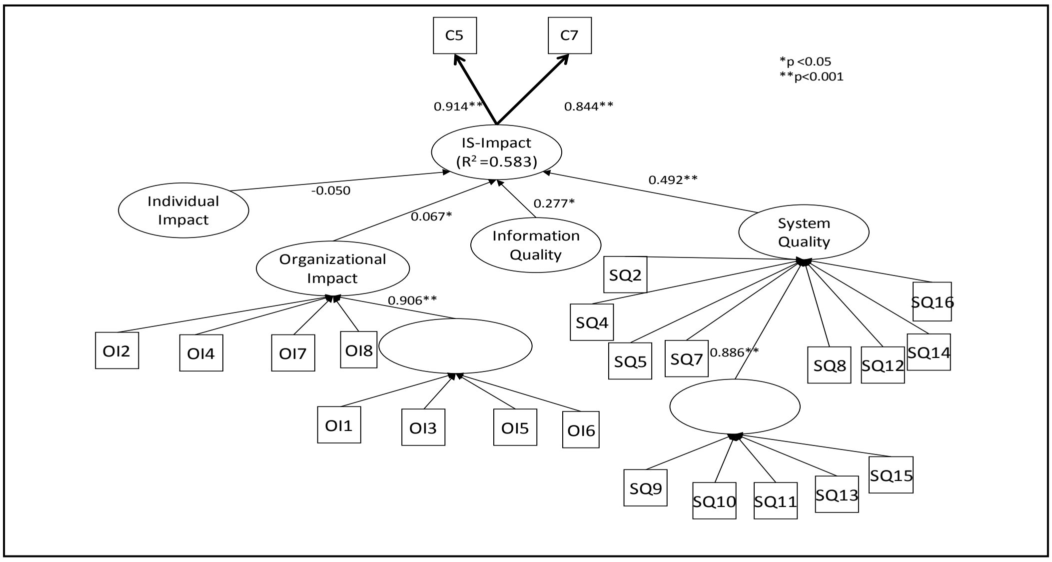


Figure 6.13. PLS results for model 5.

Model 3 through 5 are alternative models created to observe changes when sub constructs are created to combine non-significant items with negative path weights (please note that some items of System Quality and Organizational Impact are hidden to simplify the representation of these models). These two dimensions were tested because these two dimensions have more non-significant items with low weight than the rest of the dimensions. The PLS estimate results demonstrate improvement in the path weights so that items became significant. However, it was observed that the R-square value decreased from model 3 to model 5. Thus, it can be concluded that the explanatory power of the IS-Impact construct decreases when sub-constructs are created. Furthermore, this conceptualization increases the complexity of the IS-Impact construct by promoting the original construct to a second-order construct and the IS-Impact as a third-order construct, thus producing a third-order hierarchy model.

These PLS tests support the claim that a larger number of items in a construct can cause the co-occurrence of negative weight and non-significant items. Although creating sub-construct will improve the contributions of the items, the purpose of doing so needs to be justified (Chin, 1998). By creating several PLS models to examine the changes in the path weights and overall contributions of the items to the measurement model, it can be concluded that the original specification of the model (i.e. model 2) provides a better fit with the data based on R-square values, the significance of the path weights and the effect size given by each dimension in the model. Thus, model 2 explains IS-Impact better than any of the alternative models tested.

Another PLS test was conducted to observe whether the presence of other dimensions are affecting the contribution power of the Individual Impact dimension to the IS-Impact construct. As presented in all PLS estimated tests (from Model 1 to Model 5) the path weight between the Individual Impact and IS-Impact has a negative sign. This becomes an issue when the items for Individual Impact (the predictors) are all positively correlated with the Individual Impact dimension (the criterion measures) and with the IS-Impact construct (please refer to Table 6.3 and Table 6.6).

The PLS estimate results depicted in *Figure 6.14* demonstrates that the Individual Impact (II) contribution to the change of IS-Impact (IS-I) is affected by the presence of other dimensions. Model A shows the structural model with only the Individual Impact dimension. In the model, the path between Individual Impact and IS-Impact is positive, with β = 0.577 and significant at α = 0.001. However, when placing the Individual Impact with other dimensions, the path weight became non-significant.

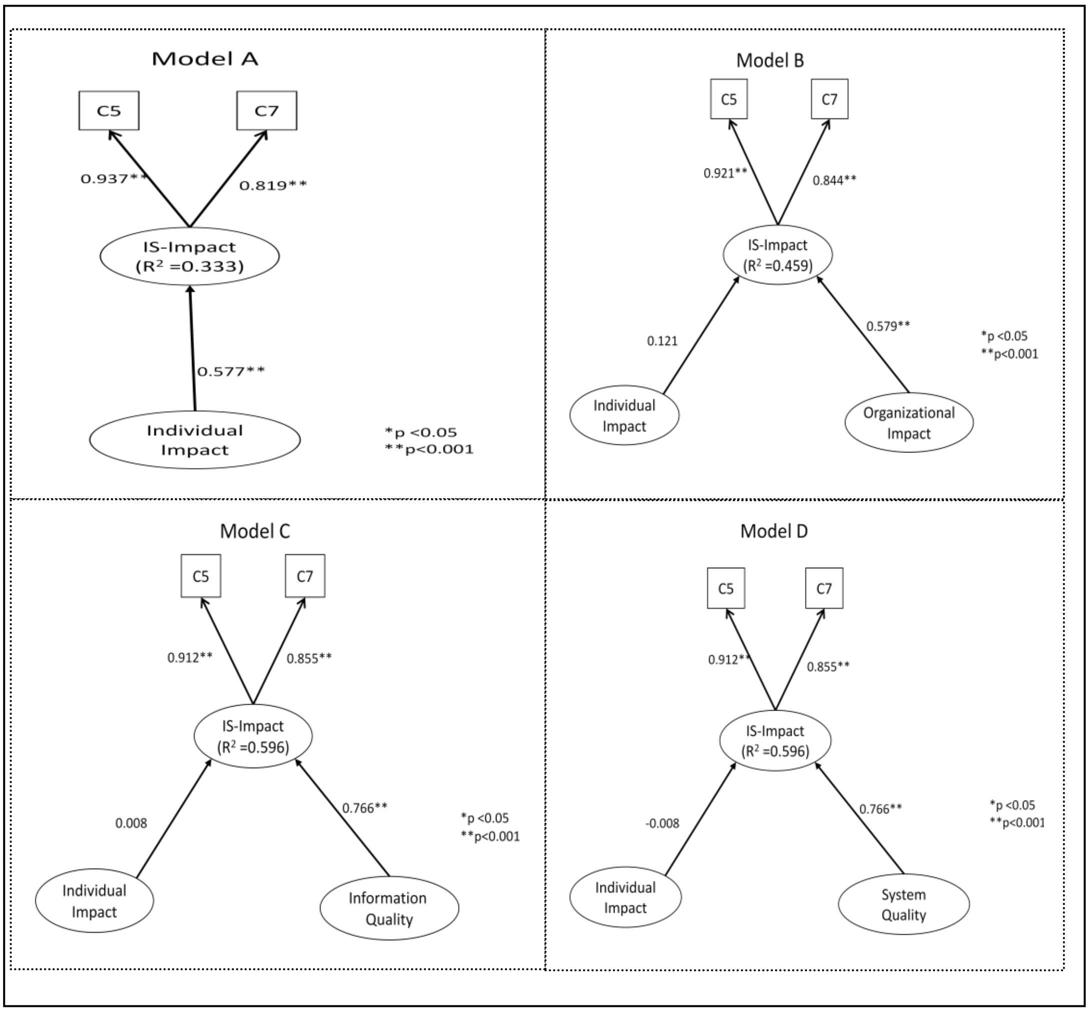


Figure 6.14. PLS results for observing the suppressor effect.

The PLS result in model D demonstrates that the magnitude is reversed (becoming negative) with the presence of System Quality. This may suggest that System Quality is suppressing the contribution of Individual Impact to the IS-Impact construct. However, Model E, F and G (*Figure 6.15*) show that with the presence of any two dimensions, the path weights are negative and non-significant (but significant in Model F).

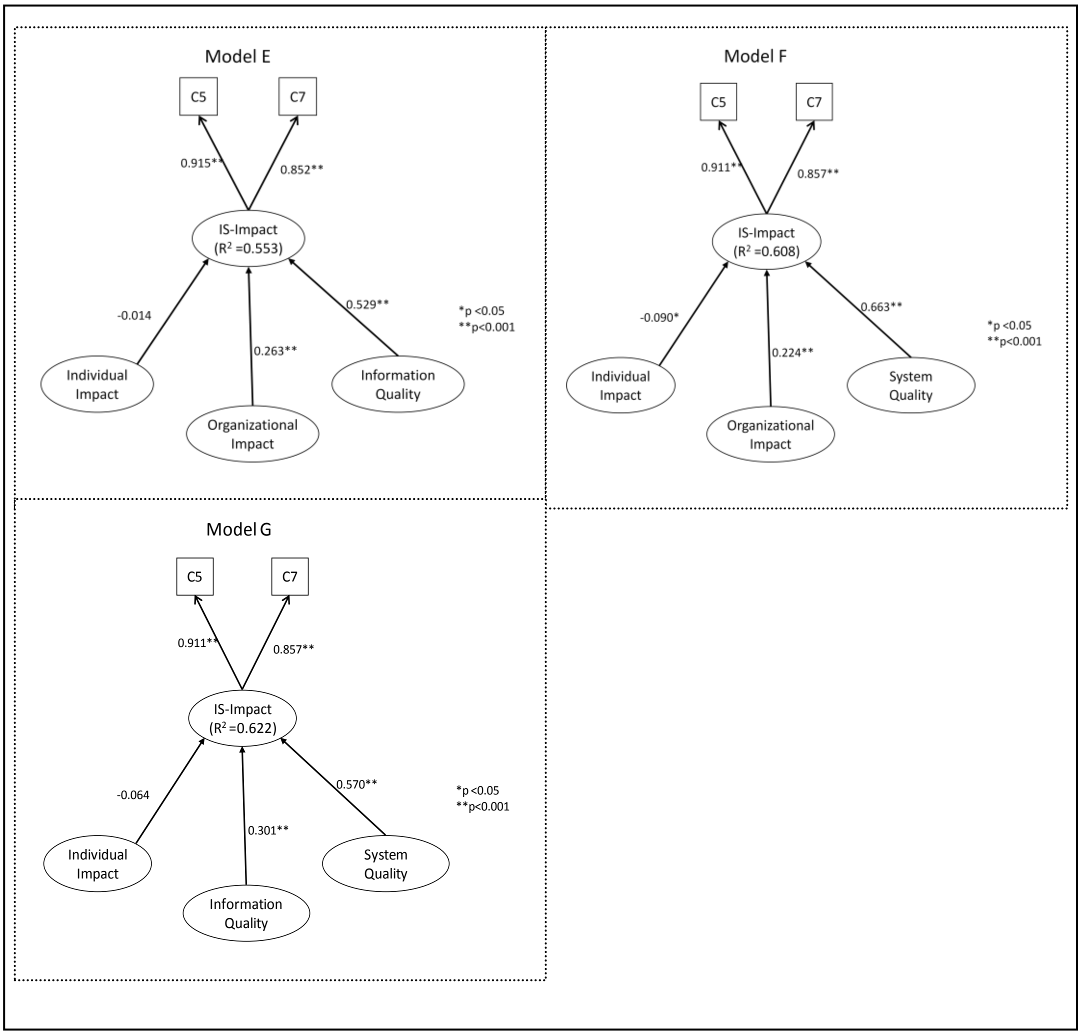


Figure 6.15. PLS results for observing the suppressor effect.

Overall, the PLS tests demonstrate that the Individual Impact dimension by itself explains a full 33% of IS-Impact; however, when placing the Individual Impact dimension with other dimensions, the path weight becomes statistically non-significant, with a negative value. In other word, while significantly related to IS-Impact, the Individual Impact dimension does not provide additional explanatory power once other dimensions have been taken into account. However, Individual Impact is still an important aspect of IS-Impact of its own accord. Thus, it is strongly advice that one should carefully interpret the results from the model (Cenfetelli & Bassellier, 2009) and one should focus primarily on the magnitude when interpreting the result and ignore the sign (negative or positive) (Chin, 2000).

A further model was tested by including only the 27 items retained by Gable et al. (2008). The structural result and path estimates for the 27 items are show in *Figure 6.16* and Table 6.13. The results indicate that 62.1% of variance of the original model is explained by Individual Impact, Organizational Impact, Information Quality and System Quality. Referring to Model 2 (*Figure 6.5*), the four dimensions explain 62.7% of variance in IS-Impact. This indicates that with inclusion of more measures, Model 2 explains better than the 27-measures model. In both models, the PLS estimate result depicts that System Quality is the highest contributor to IS-Impact, followed by Information Quality, Organizational Impact and Individual Impact. This demonstrates consistent results regarding to the explanatory power of the IS-Impact constructs as compare with previous tested models.

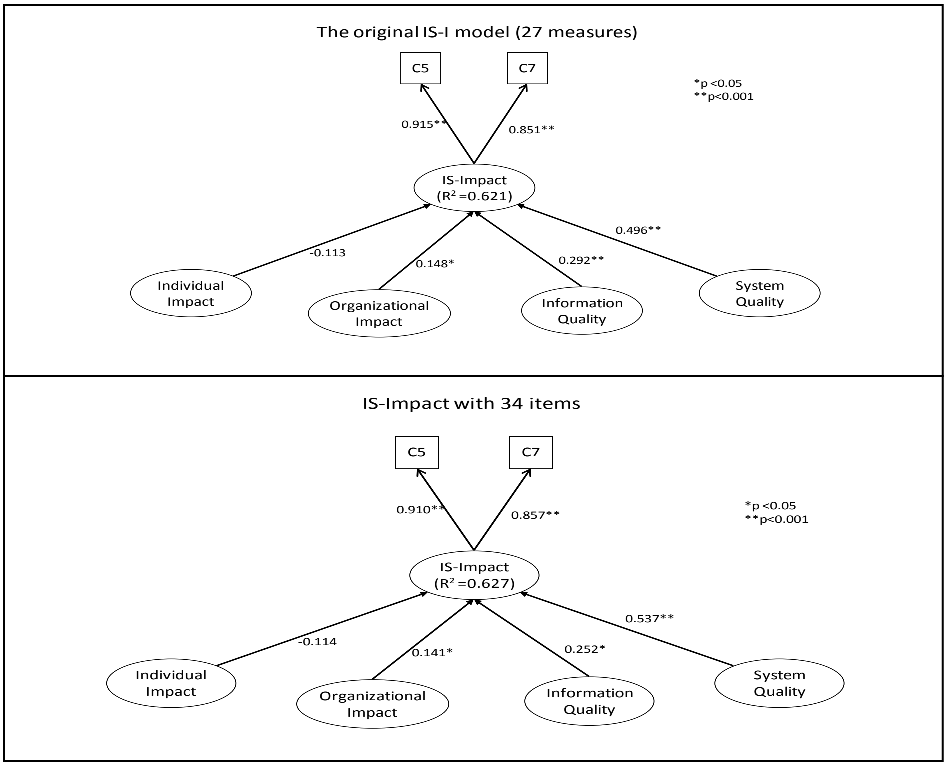


Figure 6.16. PLS results of the 27 vs. 34 items IS-Impact model.

Table 6.13

Item weight, VIF score, Mean, Std. Dev. for 27 Items and Loadings for Criterion Measures

Items	Mean	Std. Dev	VIF	Weights	Items	Mean	Std. Dev	VIF	Weights
II1	4.47	0.974	3.752	0.296	SQ4	4.57	1.002	4.047	0.354*
II2	4.47	0.974	5.148	-0.14	SQ5	4.56	0.988	4.439	-0.188
II3	4.60	0.968	8.027	0.497*	SQ7	4.57	0.883	3.508	0.207
II4	4.61	1.023	5.493	0.411	SQ8	4.34	0.915	4.679	-0.15
OI1	4.32	0.922	3.032	0.125	SQ9	4.15	0.935	4.201	0.125
OI2	4.30	0.959	3.298	0.198	SQ10	4.11	0.978	2.852	0.092
OI3	4.27	0.970	3.281	0.002	SQ13	4.11	0.959	2.761	0.001
OI4	4.39	0.929	4.560	0.312*	SQ14	4.27	0.976	4.756	0.475**
OI5	4.48	0.918	3.879	0.064	SQ15	3.98	1.117	2.478	0.012
OI6	4.49	0.880	4.254	-0.287	SQ16	4.35	1.028	3.152	0.249*
OI8	4.42	0.883	3.776	0.234*					
OI7	4.46	0.929	3.418	0.486**					
IQ5	4.59	0.972	3.870	0.230					
IQ2	4.33	1.135	3.942	0.378*					
IQ3	4.47	0.927	5.294	0.013					
IQ4	4.54	0.872	5.012	0.133					
IQ6	4.48	0.951	4.574	0.139					
IQ8	4.32	0.886	3.440	0.269*					

Criterion	Mean	Std. Dev	Loadings
C5	4.29	0.994	0.91
C7	3.55	1.230	0.857

* p < 0.05

** p < 0.01

6.6 DISCUSSION

Thus far, this chapter has reported the analysis conducted to test the validity of the measurement model. Data were analysed by employing the SEM approach with the guidelines of formative construct validation. The analysis also included criterion-related validity and factor analysis for Satisfaction measures, as well as the reliability test for the reflective measures that were employed for construct validation purposes. In summary, the following observations and conclusions are made based on the results from various measurement model assessments, as discussed previously.

6.6.1 Removal of non-significant items

Four (4) items (IQ7, SQ1, SQ3 and SQ6) were considered unfit due to weak and non-significant correlations with the criterion measures (the dependent variables) at both the dimension level and the over-arching (or second order construct) level. Thus, the data is unable to support these four items as valid predictors for the IS-Impact construct. The model is re-estimated by including and excluding these four items where a slight increase of the R-square was observed every time an item was included in the model. However, the calculated effect size with all four items included in the model indicates a small effect ($f^2 = 0.03$).

Recalling the work of Gable et al. (2008), the same four items were also removed from the model due to small correlations with the dependent variables. This indicates a recurring issue. On closer observation of the wording of the items, these four items are negatively worded items, thus, it may suggest that the wording of these items is one possible reason why these items have weaker correlations with the dependent variables while the rest of the items demonstrate medium to strong positive relationships with the same dependent variables.

Referring to the distribution of scores for these four items (as discussed in Chapter 5), scores were more scattered, thus, demonstrating a larger range of scores. This can be an indication that the respondents were confused with the statements representing these four items and had difficulty in expressing their agreement with the statements. Based on the literature, some problems relating to negatively reworded items were also reported by many researchers. According to DeVellis (2003), items that are negatively worded have become an issue (especially in social science studies) with many researchers reporting poor performance for items that were worded negatively; this has often occurred in attitudinal and perception surveys (Colosi, 2005).

However, it is far from conclusive to suggest that these negatively reworded questions did not work well in this context. It is difficult to determine at this stage whether this problem may be due to the respondents not reading the questions carefully, thus, overlooking the negative statements in the questionnaire, or whether they have actually provided true scores for these negatively worded items. Due to the evidence of a large range of scores, it is believed that although many respondents recognized the difference between these negatively worded items with the positively worded items, some respondents did not.

Data were collected one time. This limits further observation regarding the quality of the responses. Nonetheless, the data underwent a number of filtering and rounds of testing (as discussed in section 5.6.1 Data Cleaning). However, similar results were observed (i.e., System Quality is still the strongest contributor and co-occurrence of significant and non-significant items) from this effort.

Further investigation through a longitudinal survey by employing the right methods (for example, by administering two sets of questionnaires, one contains positive wording while the other has negative wording, with the same sample set at two different times) can help in determining whether it is a measurement artefact (for example, the respondents being unable to identify negative statements of the items) or it is actually the outcome of the respondents' attitudes towards the system being evaluated.

6.6.2 The contribution of the 34 items and the four dimensions to the IS-Impact construct

The remaining 34 items provide a strong contribution to the IS-Impact construct based on the R-square value that demonstrates a near substantial model (this argument is based on the PLS estimate results for Model 2 (see *Figure 6.5*). A comparative analysis was conducted to identify the incremental change in the R-square value between two models: a model that replicates the original IS-Impact model (with 27 measures) and a model that consists of the 34 items. The results demonstrate that the 34 measures model has provides a stronger contribution to the change of IS-Impact, whereby the model explains about 62% of the variance in the model. Thus, only 38% of the variance is explained by other predictors that are not in the model.

The new item, 'Security', was found to be a valid and strong predictor for System Quality based on the VIF score, correlation coefficients and the path weight. Overall, some measures may not be a strong predictor for the construct; however, it is still significantly relevant with no indication of redundancy.

The results also demonstrate the presence of non-significant and negative weights of some items in the model. Several models were created and tested by grouping non-significant items into some new constructs to reduce the number of items in a construct. The results support the claim that a large number of items within a construct caused some items to become non-significant, for example, items within the Organizational Impact and System Quality dimensions. However, all items in these two dimensions are appropriate and have relevance to the IS-Impact model based on the statistical evidence and content validity (as discussed in Chapter 4 in section 4.6, almost all items in these two dimensions are cited by respondents in the qualitative survey). Moreover, the presence of a suppressor has decreased the contribution power of other constructs or items. However, because there is no theoretical reason to support the newly created constructs, no new constructs were introduced to the model.

The validity of the model is further demonstrated using nomological net validity, by employing Satisfaction as a consequence to IS-Impact. The results support the hypothesis that there is a strong positive relationship between IS-Impact and Satisfaction, thus confirming the validity of the items and dimensions of the IS-Impact model.

6.6.3 The contextual effect on the explanatory power of the IS-Impact model

The PLS estimate results also indicate that System Quality is the highest contributor to the IS-Impact construct. This may suggest that the respondents are experiencing the quality of the system more than the rest of the information system aspects in terms of the quality of the information through the output of the system and the impact that the users received both at the individual and the organization level.

However, the Individual Impact dimension has a small effect on the measurement model. This provides an indication that the Individual Impact dimension may not be a strong contributor to the impact of an information system, as explained by the data. This finding is different from what the original work of Gable et al. (2008) identified with their model. In their study, the data indicated that Information Quality is the smallest contributor to IS-Impact. This may suggest that the research context is influencing the explanatory power of the model.

One obvious factor that may contribute to this is the nature of the respondents involved in this survey. Within the context of Malaysia, the respondents may not have perceived that the impact that they will get as an individual is more important than the quality of the system, the quality of the information and the impact of the system to the organisation. Generally, the data demonstrates that the respondents are more concerned with the **quality** of the information system rather than the **impact** that they are receiving from the information system. This is evident from the effect size and the ranking of the dimensions, whereby System Quality, as the highest contributor, is followed by Information Quality, Organizational Impact and Individual Impact. Furthermore, since the majority of the respondents involved in this study came from the Operational cohort (87.5% of the total respondent), their manner of using the system, which is mandatory, may have influenced the outcome of the effect size. These respondents have to use the system to perform their task on a day-to-day basis. Therefore, what they are expecting mostly from the information system is performance and how the system helps them in completing their tasks every day.

Another possible reason why the **impact** dimensions were not strong contributors in the Malaysian context may be that the respondents were not experiencing the impact that the items were trying to measure. The items may not be relevant to the respondents, and may have caused them difficulty in relating the items in the impact dimensions, based on their experiences. Evidence from the qualitative analysis (discussed in Chapter 4) further supports this claim, where only two items in the Individual Impact dimension (II3 Decision Effectiveness and II4 Individual Productivity) were instantiated in the analysis. Furthermore, because of a large number of the respondents are Operational staff, they may have no opinion on some items in relation to Organizational Impact (for example Organizational Cost, Cost Reduction, and Staff Requirements).

Moreover, further observation of the score pattern demonstrates that a large number of respondents had given the same score for all items in Individual Impact, and half of these respondents had also given the same score for all items in Organizational Impact. This may suggest that these items are related, based on the perceptions of these respondents and that all items are uniformly having an impact on the individual and the organisation. In addition, because the respondents were requested to answer all questions in the questionnaire, they may have completed those items reflectively. According to Gable and Sedera (2009), there is a possibility of the respondents scoring items reflectively if they are less expert in answering the question items or where they may be distant from the items. Therefore, instead of providing a true score, the respondents may score the items based on their understanding, or from anyone else's experience, rather than what they have actually experienced. In relation to this, items with uniform scores within a dimension are expected, and less variance was observed than had been demonstrated by the data.

However, the design of the instrument did not have an influence on the way respondents were scoring the Individual Impact or Organizational Impact items. A similar pattern was found among those respondents who completed the randomized questionnaire. Items were randomized, mixing with other items from other dimensions. Thus, it would be difficult for the respondent to associate the items with each other. This has certainly ruled out common method variance affecting the score for these two dimensions. Furthermore, based on a comparative analysis between two sets of respondents that were separated according to the type of questionnaire (discussed in Chapter 5, section 5.9), there were no significant differences in the mean scores provided by these two groups of respondents for both types of questionnaire. This indicates that the uniform score provided by these respondents is unlikely to have been caused by the design of the instrument.

6.7 CHAPTER CONCLUSION

This chapter discussed the model testing of the IS-Impact model. The results have demonstrated the validity of the IS-Impact model and the instrument, with 34 significant measures (based on the VIF score, correlation coefficients and item weight). The findings further demonstrate the contextual influence on the explanatory power of the model. This finding helps in understanding how the study context (e.g., type of respondents, type of system) affects the contribution power of each dimension in the IS-Impact model. Moreover, with the validity of the model established, the validity of the Bahasa Malaysia instrument has also been demonstrated. With the identification of the IS-Impact measurement model through two different types of survey, qualitative and quantitative analysis, and a number of model validation tests, this research has provided a number of significant contributions to practice and knowledge that will be discussed in the following chapter.

Chapter 7 : Research Contributions and Future Works

7.1 CHAPTER INTRODUCTION

In the preceding chapters, the extension work in re-validating the IS-Impact model in four Malaysian public organisations was demonstrated and discussed. Based on the findings, a comprehensive and up-to-date model of IS-Impact was presented. This concluding chapter summarises the research contributions and limitations and provides some suggestions for future work.

This chapter begins by re-visiting the research questions and providing a brief discussion on how each of the research questions was addressed. Next, the contributions of this research to knowledge and practice are discussed. Following the research contributions, the limitations of the research are summarised. This chapter concludes with an outline for possible future work.

7.2 RE-VISITING THE RESEARCH QUESTIONS

The main goal of this research was to test the generalisability of the IS-Impact Model by extending the model to a new context. Moreover, this research addressed limitations identified from both the measurement model and validation work from previous study. Employing the top-down approach suggested by Cooper and Emory (1995), the research questions were designed starting with a single overarching question, moving down to more specific questions that had been discussed in Chapter 1 (section 1.4). This section describes how each of the research questions was addressed by this research.

To meet the main goal of this research, Malaysia was chosen as the new context in order to test the external validity of the IS-Impact model that was developed and tested in Australia. In this study, the Malaysian context is different from the Australian context in terms of nationality, the type of system that was evaluated, and the language employed in the survey. These differences are for improving and testing the robustness of the model in order to produce a standard measurement instrument that can be used by Malaysian and Australian organisations. Thus, an overarching research question was designed, "**How can public sector organisations in Malaysia measure the impact of information systems systematically and effectively?"** which had two specific research questions, as follows:

1. *Is the IS-Impact model complete for measuring the impact of IS in Malaysian public sector organisations?*
2. *Is the IS-Impact model valid as a multidimensional formative construct?*

The focus of the first research question is twofold: (1) To test the applicability of all dimensions and measures in the IS-Impact model, and (2) to find a potential new measure that emerged from the new context. The first objective is to test the generalisability of the model, while the second objective is to address the completeness of the model in the new context. Taken together, the purpose of the first research question is to see if the context has an influence on how the impact of information system is measured in public sector organisations in Malaysia.

The IS Success in Malaysia is still under research. Only a small number of empirical research studies that relate to IS success in the Malaysian context can be found from a review of the literature. Moreover, a very minimal number of studies focus on post-implementation evaluation. Therefore, a qualitative survey was employed for identifying relevant new measures that could be added to the IS-Impact model.

The first research question is addressed in chapter 4, in which the process of conducting a qualitative survey was discussed. A total of 278 impact citations were collected from 77 valid respondents. Using a deductive approach, a qualitative analysis was then conducted by mapping the impact citations to the 37 IS-Impact measures. This process is described in detail in Chapter 4. At the end of the analysis, 24 IS-Impact measures were instantiated and a new measure was identified. The new measure, "Security" was added to the model with the 37 original measures of the IS-Impact model. Following the qualitative analysis, the model was operationalised in the second survey to empirically test the measures and dimensions.

The second question addressed in this research was to test the validity of the dimensions and measures of the IS-Impact model in the new context. The design of the instrument and the conduct of the survey were discussed in Chapter 5. The instrument consists of 38 measures (from the measurement model) and 13 reflective variables (as dependent variables) for model testing. Data was gathered from a paper-based survey. A total of 254 valid responses were used to statistically test the validity of the IS-Impact model following guidelines for formative construct validation.

Chapter 6 presents in detail a series of tests that were conducted to address the validity of the 38 measures and the contributions of each dimension to the higher-order construct IS-Impact. The test results indicated that 34 measures (including the new measure) are significant for measuring the impact of information systems in Malaysia. Overall, the findings demonstrated the validity of the dimensions and measures in the model, based on the VIF score, correlation coefficients, items weight, the contribution power and the effect size of the dimensions. *Figure 7.1* below presents the IS-Impact model with 34 measures, based on the findings in this research.

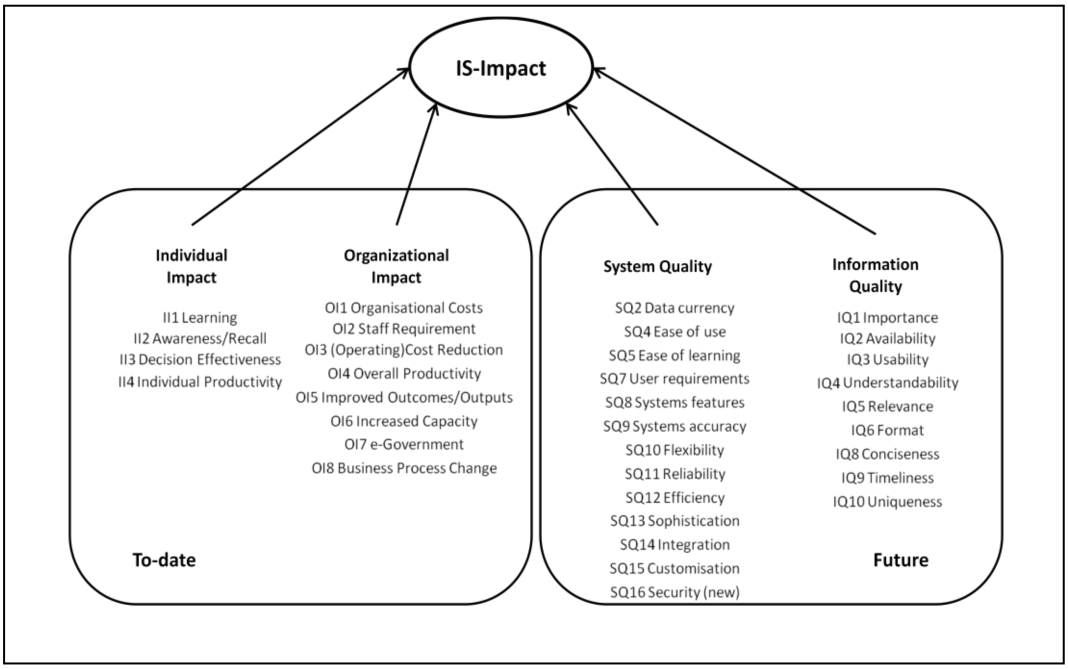


Figure 7.1. The validated IS-Impact model.

7.3 RESEARCH CONTRIBUTIONS AND IMPLICATIONS

This research has made significant contributions to both knowledge and practice. Knowledge contributions are those that can be used by IS researchers or researchers from other disciplines that have an interest in IS evaluation. Contributions to practice are those that can be applied directly by a practitioner and organisations, in evaluating their IS investment.

7.3.1 Contributions to knowledge

This research is the first to both qualitatively and quantitatively re-validate the IS-Impact model outside Australia, thereby extending the generalisability of the model and approach to Malaysia and at the same time yielding a validated Malaysian language IS-Impact instrument. Although information system users in Australia may have different views when measuring the impact of the IS than those in Malaysia due to the differences in cultural norms, belief and behaviour, it is not the interest of this research to address or investigate cultural influences on the model, but to test the external validity of the model. Moreover, the construction of the IS-Impact model in the original study did not take into account the cultural aspects of Australia when developing the model, but emphasised on the type of system (integrated application-software packages vs traditional application) and addressed the gaps identified from previous IS Success studies. Therefore, no theory of culture was used in this research. However, rigorous steps were taken to test the applicability of the model across multiple phases: a qualitative survey to identify relevant new measures to present a complete measurement model, demonstrate the necessity of the IS-Impact measures using a deductive approach, operationalise the model by conducting a quantitative survey and test the validity of the model following formative construct validation techniques. The results and the process of extending the model in Malaysia were documented in detail in this thesis.

The findings of the study uphold the validity of the model in a new context, with the addition of one new measure. Interestingly similar outcomes were observed between these two studies, for example, in the qualitative survey, 91% of the citations were coded to the IS-Impact measures, and only 9% of the citations could not relate to any of the IS-Impact measures. This means that the IS-Impact model can measure what the respondents in Malaysia are experiencing. A number of similarities between this study and the previous study may have contributed to this important outcome, for example, the same type of application (Financial application), the same type of users (intra-organisational users) and the same type of organisation (public organisations). Moreover, the construct validation results supported previous findings based on the significance of the majority of the items and through the nomological net validity although different dependent measures were employed in this study. This indicates that the model is robust, and can be used across multiple contexts (from package to custom, Australia to Malaysia, English to Bahasa Malaysia) even though some differences between the contexts and method were applied.

This study and the model make a significant contribution in IS evaluation research particularly in the context of IS Success/Impact by confirming the necessity of the 34 measures and the four dimensions of the IS-Impact model as a multidimensional formative measurement model and as an index for measuring IS Impact (based on the results from the content analysis and model testing). This study has also made a significant contribution to the existing research with the identification of a new measure ‘Security’ as one important measure of System Quality. Given that the IS-Impact model was validated and works in two different contexts, IS researchers who have an interest in IS Success/IS Impact studies should employ this model and extend it to any relevant IS evaluation phenomena to accumulate knowledge. Using a validated instrument is recommended by many IS researchers (e.g., Boudreau, 2001, DeLone and McLean, 2004 and Straub et al., 2004). DeLone and McLean (2004) have also suggested that IS researchers should look at existing and validated success measures that can be applied in a new environment (i.e., e-commerce) and not to assume that in a new and changing environment new success measures are required.

The model and the instrument can be of assistance to (1) an IS researcher who plans to conduct an IS success study in a different context, for example, e-commerce/e-business, and use the model as the theoretical framework to identify relevant measures for the intended context; (2) an IS researcher who has an interest in cross-cultural study, for example a comparative study of the performance of an IS used by an organisation that conducts business globally (has several branch offices in different countries); and (3) an IS researcher who seeks to understand IS Impact in Malaysia.

The IS-Impact construct may serve as a dependent variable in understanding the IS Success phenomena by identifying the relationship between IS Impact and any other antecedent or consequence construct. The IS-Impact construct can be represented by employing the two reflective measures (the criterion measures) for the purpose of validation. Furthermore, this research provides empirical evidence for conceiving Satisfaction as the consequence of IS Impact, and in this sense extends the work by Gable et al. (2008) and other studies in the marketing literature.

The literature indicates a paucity of IS Success studies in Malaysia that focus on the performance of IS in the post-implementation stage, in which the implementation of the system is completed and the system has been utilized for more than 2 years. IS researchers in Malaysia should now conduct more research in this area to help organisations realise the benefits of their IS. The model and the applied research procedures can be adapted by IS researchers in Malaysia to identify where gaps exist.

This research has also made significant methodological improvements to prior work including:

1. Use of different criterion measures (dependent variables) for testing the validity of the formative measures and the dimensions of the IS-Impact model (outer model assessment);

2. Use of additional ‘Satisfaction’ measures to identify the IS-Impact model through nomological network validity (inner model assessment);
3. Derivation of two sets of instrument (randomised items vs. non-randomised items) to identify common method variance in the IS-Impact model;
4. Testing the presence of suppressor effects that influence the significance of some measures and dimensions in the model; and
5. Demonstrating the effect of an imbalanced number of measures within a construct to the contribution power of each dimension in the IS-Impact model.

Moreover, this research has provided examples of:

- How qualitative and quantitative research can be conducted to test an existing theory or model in a new context for external validity beyond culture.
- How replication research can contribute to cumulative knowledge by confirming existing findings and at the same time address existing gaps to expand the knowledge.
- How to translate and localise the instrument, and consider any context influence so that the instrument is meaningful to the context.
- How to validate a measurement model that contains formative indicators using component-based SEM technique (PLS).

7.3.2 Contributions to practice

This research re-validates a measurement model in Malaysia that was developed in an Australian context, and provides the evidence that the measurement model and its instrument are valid in measuring the impact of information systems in the Malaysian context. The validity was confirmed even though there were some differences between the previous study and this current research. The IS-Impact model has been statistically tested for validity and reliability with 254 users of an integrated financial system across multiple departments at four state governments. Using validated and systematic tools, such as the IS-Impact model, helps ensure a highly consistent, reliable and valid result. When applied over time, this tool can help organisations to measure the performance of their information system and keep track of its performance to ensure the continual alignment of the information system between its operational goals and the underlying business objectives. At the same time, the measurement model can help practitioners and organisations predict the probable future impact of the information system to help them in making future investments based on a Quality evaluation (from the System Quality and Information Quality dimensions scores) of the information system. If the quality dimension score is high, it is to be expected that the users will receive a positive impact from the system in the future. However, if the quality dimension score is low, the IT department and management need to work together to improve the performance or make decisions to either continue using it or to change the system.

The instrument presented in this research was adapted and redesigned (by changing some of the wording used in the original research) and translated to the national language of Malaysia, Bahasa Malaysia, for the benefit of users that are less conversant in English. Furthermore, the wording is simple and easy to understand and tested across multiple phases (pilot testing and the actual survey). Thus, the instrument is easy to administer, with little supervision. A hardcopy version of the instrument is included in Appendix E for the English version and F for the Bahasa Malaysia version.

The model and the instrument consist of multiple measures, within four dimensions. Each dimension represents different and unique aspects of the information systems impact phenomena. The findings from this research demonstrate that each dimension has different contribution power when measuring the impact of information systems in the Malaysian context. Thus, organisations and practitioners should evaluate the information system by employing the complete set of measures to arrive at a holistic score. The instrument uses a meaningful and straightforward scale. Practitioners can easily identify areas that need improvement to increase the performance of the information system and to realise the benefits that the information systems can provide to the organisation.

The model and instrument employ perceptual measures that are answerable by multiple levels of employment cohorts. By using this instrument, organisations can evaluate their IS based on the experience of the users and not just rely on objective or financial parameters. Such a standardised instrument will allow organisations to evaluate their IS investment systematically and the results can be compared across time (for the same system), versions/upgrades, departments, or organisations (in the same region or across different regions).

7.4 RESEARCH LIMITATIONS

There are a number of limitations identified in this research. However, it should be noted that some of the limitations were controlled to minimize the differences between contexts. This section discusses the limitations of this research and explains how these limitations have been addressed.

7.4.1 Limitations of the research method

This research employed the survey method in two phases. The researcher is aware that the survey method may impose some restrictions for collecting evidence.

For example, in the first phase of this research, a qualitative survey was employed to identify new relevant measures for measuring the impact of information systems from the new context. At the same time, this survey was used to test the applicability of the IS-Impact model in Malaysia. One may argue that using the survey method to collect qualitative evidence may limit the way information can be captured about the IS impact phenomena in Malaysia. However, this study draws heavily on the previous study to replicate the method and to re-validate the model, for testing the external validity of the model. If a different method was used, the method may have influenced the outcome of this research. Thus, if the outcome of this research was different from that of the previous study, it would be difficult to justify whether the outcome was because of the different context or the change in the method. Therefore, in the first phase survey, this research employed the same survey instrument (with minor modification to fit the context) so that the respondents in Malaysia were asked the same questions as those respondents in the previous study. In this way, the respondents in Malaysia were looking at the same thing as the respondents in the previous study.

Data from the qualitative survey were analysed by the researcher. It is acknowledged that this could have introduced researcher bias. The findings from the qualitative analysis that employed a deductive method could, theoretically, be biased to the researcher’s individual opinion. However, considerable effort was taken to ensure that less bias was involved in the coding of the qualitative responses to the IS-Impact measures and dimensions. This was done by producing guidelines and keywords that helped in locating and mapping the measures to the responses (see appendix D). The guidelines were designed with the help of a research colleague, by using a sample of responses extracted from the pilot test. The guidelines ensure that the coding and mapping of the responses are reliable, by using standard rules and keywords. Furthermore, since this research is adapting a validated model, the keywords were established based on the instrument used in the previous study. Hence, the coding process was restricted by the definitions, terms, and wording used in the previous study. With these guidelines, if one repeated the coding process, similar results might be achievable.

Another obvious limitation from the method employed in this research is the selection of the sample. Non-probability sampling methods were used for selecting the respondents. Although this may introduce sampling bias, this research needed to identify appropriate respondents - users of SPEKS -, to complete the questionnaire.

7.4.2 Limitations of the research context

The findings presented in this research may be limited to public sector organisations and the financial systems being evaluated. As mentioned in the introduction of this section, these two variables were controlled to ensure similarity with the previous study. The results can be triangulated and compared and differences can be easily related to the difference between the contexts. Moreover, meeting the appropriate sample size and requirements given by certain statistical tests has influenced the choice of the information systems and the type of organisation involved in this research. A financial system (SPEKS) was chosen because it is a commonly used type of system with a large number of users, across multiple government agencies or departments and used by different levels of user.

Another restriction relating to the research context was avoiding the culture issue when addressing the applicability and validity of the IS-Impact model in Malaysia. It should be noted that, taking into careful consideration given to a well specified goal for this particular research (that is to come up with a standard measurement model that can be used across different contexts), attention to culture is beyond the scope of this study. Moreover, in light of many confounding issues of culture, for example; 1) unclear definition of culture (Goeschl & Doherty, 2000, Jones & Aloy, 2007, Myers & Tan, 2002, Straub, Loch, Evaristo, Karahanna & Srite 2002), 2) the complexity of culture (Dasgupta, Agarwal, Ioannidis & Gopalakrishnan, 1999, Karahanna et al., 2005, Myers & Tan, 2002, Samaddar & Kadiyala, 2006, Straub et al., 2002, Umanath & Campbell, 1994), and, 3) shortcomings of available models of culture (i.e., Hofstede's model of national culture), as discussed by other researchers (e.g., Jones and Alony, 2007, Samaddar and Kadiyala, 2006, Tayeb, 1994) there is support for the approach of not addressing the culture issue in this research. Additionally, the fact that the IS-Impact model was developed without considering Australian cultural aspects is given a strong reason why this current study should avoid addressing culture.

On close observation of the findings from this research, it can be seen that relying on culture can be too simplistic and broad when justifying the choice of measures that may be relevant to a certain level of users, certain types of system or certain types of organisation. At the same time, culture can be complicated, especially in Malaysia, which has multiple ethnicities, customs and beliefs. Since the context of this research is restricted to only one type of information system and one type of organisation, the outcomes may only be attributed to these contexts, and cannot be generalised to other types of system, different types of sector, or Malaysia in general. However, much effort was taken to minimise the cultural influence when extending the IS-Impact model from Australia to Malaysia, which is different in many aspects, including culture. For example, identifying measures that are relevant to the context through the qualitative survey, and translating and localising the instrument used in this research.

7.4.3 Limitations of the model testing

Another limitation of this research is in the guidelines and methods used in the model testing. Formative measurement validation has only recently received more attention by IS researchers. Although conceptual papers on formative measurement are many, guidelines on how to interpret formative measurement results are scarce. More recent articles (for example, Kim et al., (2010) demonstrate that there is still a lack of consensus on what is comprise appropriate tools and techniques to validate a formative model). Thus, the researcher has relied heavily on the existing guidelines, methods and procedures suggested by Chin (1998), Diamantopoulos and Winklhofer (2001), and Petter et al. (2007), who have been widely cited by researchers who have sought to validate their models formatively. In addition, a number of recently published papers (i.e., Andreev et al., 2009, Bruhn et al., 2008, Cenfetelli and Bassellier, 2009, Henseler et al., 2009, Rai et al., 2006, Wetzels et al., 2009) were referred to. Although the tests that were carried out in this research are sufficient for testing the validity of a formative measurement model, there is an additional method that can be applied to test a formative model (i.e., multitrait-multimethod (MTMM) to test the convergent and discriminant validity of formative measurement). However, due to the single data collection method employed in this research, it was not possible to use this additional method in this research.

7.5 RECOMMENDATIONS FOR FUTURE WORK

Notwithstanding the limitations identified in this research, a number of recommendations for future works are proposed. Follow-on research can improve this research and the measurement model by addressing the limitations discussed in the previous section. Future research can employ the IS-Impact model and replicate this research (where possible) by:

1. Extending the model to other contexts in Malaysia, for example different types of organisations (i.e., private sector, small to medium enterprises), different types of organisational systems (beyond Financial systems, for example Human Resource system, Executive Information Systems, a complete ERP package, etc.) or different technology (for example, e-commerce). A comparative study can be conducted to investigate if the context differences have an influence on the choice of measure. Further extension studies can identify limitations and improve the reliability of the model, to yield a standard measuring tool for gauging the impact of information systems across different contexts in Malaysia.
2. Identifying factors that can influence the success of IS, in which the IS-Impact serves as the dependent variable to facilitate cumulative research on IS success/IS impact and at the same time can help organisations to better prepare before implementing IS in their organisations or making future IS investment.
3. Conducting comparative cross-cultural studies on the impact of a specific IS that is implemented in two or more national or societal cultures. This is to measure and compare performance and understand how the IS is measured in these different contexts. This study can further investigate if national or societal cultures have an influence on how IS impact is measured in these different contexts.

4. Although the model has been extensively validated using SEM and following the guidelines of the formative construct validation technique, further testing to identify discriminant and convergent validity of the construct using MTMM technique (suggested by Straub et al., (2004) and Andreev et al. (2009)) can be an additional method to further validate the model. Moreover, future research can further investigate the effect of an imbalanced number of indicators/items/measures for each dimension in a multidimensional model on the explanatory power of the model. As observed in this research, System Quality is the highest contributor for explaining the impact of IS compared to the other dimensions in the model. This may be related to the larger number of System Quality items, making the System Quality dimension explain a larger part of the IS-Impact compared to the rest of the dimension. Thus far, only one study has discussed the effect of a larger number of items on the significance of the other items (see Cenfetelli and Bassellier, 2009); however, this study did not provide any explanation beyond that (for example, on how to determine a balanced number of items and what is the appropriate number of items for a construct/dimension).

5. Improving formative construct validation, by employing two dependent constructs as outcomes to the IS-Impact construct, as suggested by Jarvis et al. (2003). These two constructs, however, need to have theoretical reasons to be related to the IS-Impact construct. This research has identified Satisfaction as a consequence to the IS-Impact construct. Another reflective construct that may relate to the IS-Impact construct is Use (based on the IS-Impact Nomological Net, see Figure 5.1, Chapter 5). A follow-on study can further investigate if the relationship between IS-Impact and Use exists, thus, further demonstrating the validity of the IS-Impact measures and constructs through structural relationships.

Furthermore, the following investigations can be made by collecting additional data and employing more than one method:

1. Investigate if negatively reworded questions are causing a measurement artefact in the context of Malaysia. This can be conducted by administering two sets of questionnaires by separating positive wording from negative wording for the same sample set (see Colosi (2005) for example).
2. Investigate the presence of common method bias (CMB) or common method variance (CMV). Initially, this research tried to address this issue by employing two sets of questionnaire (randomised items vs. non-randomised items), but these sets of questionnaire were administered at the same time; hence, the questionnaires were answered by different respondents. Although, the presence of common method variance can be tested by using Harman's single-factor (one-factor) test, this test has been criticised for its limitations (Malhotra, Kim & Patil, 2006, Podsakoff, MacKenzie, Lee & Podsakoff, 2003). MTMM is generally the most accepted and used technique by researchers (Podsakoff et al., 2003, Sharma, Yetton & Crawford, 2009), however, more than one method must be employed to use this technique. Otherwise, a single method is appropriate, however, data needs to be collected at two different points in time (Straub et al., 2004).
3. Employing a different approach, for example interview, for understanding the impact of an information system from the perspective of the Strategic cohort, since the survey method employed in this study was unable to collect data from this type of employment cohort.

7.6 CHAPTER CONCLUSION

This research is the first study that has attempted to test the validity of the IS-Impact model in Malaysia. The research has addressed the research questions, and meets the research goal. Moreover, the research demonstrates the validity of the IS-Impact model through a combination of qualitative and quantitative surveys, content validity and Structural Equation Modelling technique, following the guidelines for formative construct validation. Every stage in this research has been discussed in detail in this thesis. This research makes significant contributions to research and practice. Furthermore, the limitations identified in this research provide the platform for future research and continual effort in IS evaluation studies.

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Appendices

Appendix A
Qualitative Survey Instrument (Identification Survey)

Impacts of SPEKS at
State Government of Malacca
a survey conducted by
IT Professional Service Research Program at
Queensland University of Technology
General Instructions for Completion

Introduction: Over the past few years, Malacca State Government has invested significant resources in **The State Government's Standard Computerised Accounting System (SPEKS).** The impact of SPEKS is now being experienced across all levels of most departments in the State Government. ***All employees at State Government of Malacca who either use SPEKS directly or receive its output are being contacted and encouraged to participate in this survey***.

Purpose of the Survey: The purpose of this survey is to identify the impacts of SPEKS in your organisation. This survey is being conducted by IT Professional Service Research Program (ITPS) at Queensland University of Technology (QUT).

We seek to learn from your experience with SPEKS in your organisation. Insights into your experiences with SPEKS will be valuable in highlighting where your organisation should be focusing their attention, today and in future. Analysis of negative impacts will provide the basis of strategies for improvements. Positive impacts may be replicated or extended in your own or other organisation.

Conduct of the Survey – This survey will involve two main rounds. The 1st round aimed at collecting a list of impacts of SPEKS in your organisation. You are encouraged in this round to be creative in your responses. In the 2nd round, we will present to you a summary set of impacts derived from round 1 responses, and seek your assistance in gauging their relative importance.

Confidentiality - Detailed results of the survey will be confidential to ITPS. No names will be entered into the ITPS database. Respondents are assigned a sequential number and findings are never attributed to any individual. Only aggregated results are reported. The State Government will not receive a copy of the study database.

Concerns / complaints regarding the conduct of the project – If you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Officer on +617 3138 2340 or email ethicscontact@qut.edu.au. The Research Ethics Officer is not connected with the research project and can facilitate a resolution to your concern in an impartial manner.

General Instructions for Completing and Returning the Questionnaire – It will take you approximately 10-15 minutes to complete this questionnaire. Please answer all questions and return the completed questionnaire **by 20 February 2009.** Please return your completed survey instrument as an email attachment to impactmalaysia@qut.edu.au. If you have any questions concerning the questionnaire, please do not hesitate to contact me.

Research Assistant's information
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Impacts of SPEKS at
State Government of Malacca
a survey conducted by

IT Professional Service Research Program at
Queensland University of Technology

Section One	Personal Details

This is a ***CONFIDENTIAL, NON-ANONYMOUS SURVEY***. For data analysis purposes, the IT Professional Service Research Centre (ITPS) must be able to associate your demographic details (Title, Agency, and Duration of employment) with your responses in both rounds of the survey. Respondents are assigned a sequential number and no names will be entered to our database. Your responses should be sent directly to the research team at ITPS by emailing the completed form to impactstudy@qut.edu.au

Please enter the following demographic data.

Name	
Business Title	
Department	
Duration with your current department	
Duration with the State Government	

Please describe your current job role, and where applicable, any involvement you have had with SPEKS.

Please go to section two

Impacts of SPEKS at
State Government of Malacca
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IT Professional Service Research Program at
Queensland University of Technology

Section Two	IMPACTS OF SPEKS IN YOUR ORGANISATION

This question is intentionally left open ended to encourage you to identify as many impacts as possible. We are interested in whatever impacts you are aware of, be they strategic/operational, major/minor, positive/negative, etc.

SPEKS has been installed in your department/organisation for some time. What do you consider has been the impact* of SPEKS to you and your organisation since its implementation?

*the word impact herein is similar to effect, influence, outcome, result or consequence.

(Please use the space below to list and describe the impacts of SPEKS in your agency. Use as much space as you require. Feel free to add rows to the table or to overflow onto another page.)

Thank you for your participation!
Please save this completed document and send as an email attachment to
impactmalaysia@qut.edu.au

END OF SURVEY – ROUND ONE

Appendix B
Qualitative Survey Instrument (Identification Survey-Bahasa Malaysia version)

Impak SPEKS
di Kerajaan Negeri Melaka
soal selidik yang dijalankan oleh

Program "IT Professional Service Research" di
Queensland University of Technology

ARAHAN

<u>Pengenalan:</u> Kerajaan Negeri Melaka telah membuat pelaburan yang besar dalam mengimplementasi **Sistem Perakaunan Berkomputer Standad Kerajaan Negeri (SPEKS)** semenjak beberapa tahun yang lalu. Keberkesanan SPEKS kini dirasai oleh semua penggunanya di jabatan-jabatan yang terlibat di Kerajaan Negeri Melaka. **Semua kakitangan di Kerajaan Negeri Melaka yang menggunakan sistem ini mahupun yang menerima output daripada sistem ini akan dihubungi dan digalakkan untuk menyertai soal selidik ini.**

<u>Tujuan soal selidik:</u> Tujuan soal selidik ini adalah untuk mengenalpasti kesan/impak yang diperolehi daripada SPEKS di organisasi anda. Soal selidik ini dikendalikan oleh Pusat "IT Professional Service" (ITPS) di Queensland University of Technology (QUT), Australia.

Kami berharap untuk memahami pengalaman anda dengan SPEKS di organisasi anda. Pengalaman anda sangat berharga bagi membantu organisasi anda dalam memahami serta memberi tumpuan kepada keadaan semasa SPEKS dan pada masa hadapan. Kesan negatif daripada SPEKS akan menjadi asas bagi mengatur strategi untuk memperbaiki SPEKS. Manakala kesan positif yang anda perolehi, dapat dikongsi dengan pengguna SPEKS yang lain, di organisasi anda mahupun organisasi yang lain.

<u>Pengendalian kaji selidik:</u> Kaji selidik ini akan dilaksanakan secara dua peringkat. Peringkat pertama bertujuan untuk mengumpulkan sebarang maklumat yang berkaitan dengan kesan/impak SPEKS di organisasi anda. Anda digalakkan memberi maklumat atau jawapan secara kreatif (berkongsi maklumat secara terbuka). Di peringkat kedua, anda akan diberikan senarai kesan/impak, hasil rumusan maklumat yang dikumpulkan pada peringkat pertama. Kami memohon anda menilai kepentingan senarai tersebut.

<u>Sulit:</u> Maklumat atau hasil yang diperoleh daripada kajian ini adalah dianggap sulit oleh ITPS. Nama anda tidak akan disimpan di dalam pangkalan data ITPS. Setiap responden akan diberi nombor giliran dan sebarang keputusan yang di dapati daripada kajian ini tidak akan dikaitkan dengan mana-mana individu. Hanya keputusan keseluruhan akan dilaporkan. Kerajaan Negeri Melaka tidak akan menerima sebarang salinan maklumat ataupun data daripada pangkalan data kami. Jika anda mempunyai sebarang keraguan berkenaan pengendalian etika dalam kajian ini, anda boleh menghubungi Setiausaha Jawatankuasa Etika Kajian Manusia, Queensland University of Technology di +617 3138 2340 atau email ethicscontact@qut.edu.au.

Arahan bagi melengkapkan serta mengembalikan borang soal selidik ini: Borang soal selidik ini hanya mengambil masa lebih kurang 10 hingga 15 minit untuk dilengkapkan. Sila jawab semua soalan dan kembalikan borang yang telah lengkap **pada 26 January 2009** dengan mengepilkan borang ini pada email yang dialamatkan kepada impactmalaysia@qut.edu.au. Jika anda mempunyai sebarang soalan berkenaan dengan borang soal selidik ini, sila hubungi saya seperti di bawah.

Pembantu Penyelidik (*Research Assistant*)
Nur Fazidah Elias
Workstation 15, Level 3,
126 Margaret Street, Brisbane, Australia 4001
Tel: +614 208 11629
Email: nur.elias@student.qut.edu.au

Impak SPEKS
di Kerajaan Negeri Melaka
soal selidik yang dijalankan oleh

Program "IT Professional Service Research" di Queensland University of Technology

Bahagian 1

Soal selidik ini adalah sulit. Untuk tujuan analisis, Pusat "IT Professional Service" (ITPS) perlu mendapatkan maklumat peribadi anda (Jawatan, Jabatan serta tempoh bekerja) supaya dapat dikaitkan dengan jawapan anda. Responden akan diberikan nombor giliran tetapi nama anda tidak akan disimpan di dalam pangkalan data. Borang yang telah lengkap hendaklah dihantar terus kepada kumpulan penyelidik di ITPS melalui email kepada impactstudy@qut.edu.au.

Sila lengkapkan maklumat berikut:

Nama	
Jawatan	
Jabatan	
Tempoh bekerja dengan Jabatan	
Tempoh bekerja dengan Kerajaan Negeri	

Terangkan tugas atau tanggungjawab anda di jabatan, serta penglibatan anda dalam SPEKS.

Sila ke bahagian 2

Impak SPEKS
di Kerajaan Negeri Melaka
soal selidik yang dijalankan oleh

Program "IT Professional Service Research" di Queensland University of Technology

Bahagian 2	**IMPAK/KESAN SPEKS DI ORGANISASI ANDA**

Soalan ini berbentuk terbuka untuk menggalakan anda memaklumkan kesan/impak sebanyak yang mungkin. Kami berminat dengan sebarang kesan/impak yang anda tahu, sama ada ianya strategik/pengoperasian, major/minor, positif/negatif, dan sebagainya.

SPEKS telah diimplementasi di jabatan/organisasi anda untuk beberapa tahun. Apakah impak* yang anda peroleh daripada SPEKS pada anda serta organisasi anda semenjak ia diimplementasikan.

*Perkataan impak di sini adalah sama erti dengan kesan, pengaruh, hasil atau keputusan

(Sila guna ruang di bawah ini untuk menyenaraikan serta menerangkan impak SPEKS di organisasi anda. Gunakan sebanyak mungkin ruang yang anda perlukan. Jika ruang tidak mencukupi, anda boleh menggunakan di sebelah belakang muka surat ini.)

Terima kasih di atas penglibatan anda!

Tolong simpan (save) borang yang telah lengkap dan hantarkan dengan mengepil (attachment) pada email yang di alamatkan kepada

impactmalaysia@qut.edu.au

TAMAT SOAL SELIDIK PERINGKAT PERTAMA

Appendix C
Ethical Clearance for Identification Survey Instrument

Dear Ms Fazidah Elias

Re: Validating IS-impact model in Malaysia

This email is to advise that your application has been reviewed and confirmed as meeting the requirements of the National Statement on Ethical Conduct in Human Research. Your ethics approval number is 0800000966.
Please quote this number in all future correspondence.

Whilst the data collection of your project has received ethical clearance,the decision to commence and authority to commence may be dependant on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or permissions from other organisations to access staff. Therefore the proposed data collection should not commence until you have satisfied these requirements.

If you require a formal approval certificate, please respond via reply email and one will be issued.

Decisions related to Low Risk ethical review are subject to ratification at the next available Committee meeting. You will only be contacted again in relation to this matter if the Committee raises any additional questions or concerns.

This project has been awarded ethical clearance until 24/12/2011 and a progress report must be submitted for an active ethical clearance at least once every twelve months. Researchers who fail to submit an appropriate progress report may have their ethical clearance revoked and/or the ethical clearances of other projects suspended. When your project has been completed please advise us by email at your earliest convenience.

Please do not hesitate to contact the unit if you have any queries.

Regards

Research Ethics Unit | Office of Research
O Block Podium | Gardens Point Campus
p +61 7 3138 5123 | f +61 7 3138 1304
e ethicscontact@qut.edu.au
w http://www.research.qut.edu.au/ethics/

Appendix D
Guidelines for mapping

Introduction

The purpose of this guideline is to help the candidate with the mapping activity that was conducted to test the applicability and necessity of the measures and dimensions of the IS-Impact model. This guideline contains a step-by-step procedure of the mapping process, designed based on the responses or the information that was collected from the pilot test. Although the purpose of the pilot test is to test for face validity of the instrument, the information or responses given by the volunteers in the pilot test can be used as a testing bed (pre-mapping activity) in performing qualitative analysis because no changes are made to the question in the questionnaire after the pilot test. Moreover, the process of producing this guideline and performing the pre-mapping activity can help the candidate identify potential problems that may arise when conducting the actual qualitative analysis. Furthermore, with the advantage of having a research colleague who is doing to same activity (mapping citation to the IS-Impact model), the candidate have the opportunity to sit down with the colleague and design the guidelines. Both the candidate and the research colleague were working together using data from both study, and experimenting the mapping activity in order to come up with a clear guideline.

This activity resulted with two outcomes: (1) A keyword dictionary and (2) a step-by-step procedure for mapping the responses to the IS-Impact model. Both of these outcomes are discuss in detail in the following sections.

Keyword dictionary

1. A keyword dictionary is some sort of index of words that is use in keyword searching for the mapping activity. When performing the mapping, the candidate will search for relevance keywords from the citation given by the respondent that is suitable or closer in describing the item/measure of the IS-Impact model.
2. The initial keyword dictionary is establish based on IS-Impact measures, that is taken from the name of the measure, for example, cost reduction, system feature, efficiency, etc., are consider as keywords. Gradually, new keyword is identified and added to the dictionary based on the citation given by respondents that can describe or related to any of the IS-Impact measures. However, this new keyword must clearly reflect or have similar meaning to the original questionnaire item, in other words, the new keyword must match the original meaning of the measure. This is done by comparing the keyword with the questionnaire item from the original survey and find out if the keyword is a description of the questionnaire item. A keyword does not have to be a single word. It can be for example; ‘paper reduction’ (that can be associated to cost reduction), ‘easy to use’ (associated to ease of use measure).
3. Some measures/items of IS-Impact model are straightforward. The measure can match the citation easily without any doubt, however, there are a number of measures/items that are difficult to map. This is usually because of the mix understanding of the citation, which explicitly means one thing, but implicitly can be another thing. Establishing keywords for this measure/item can help in making the decision when conducting the analysis.

4. The candidate and a research colleague have come up with own keyword dictionary based on each other pilot test responses. At the end of the process, these two sets of dictionary are compared to produce a standard keyword dictionary. We have found several contradictions, mainly due to the translation issue. Through a number of discussions, looking back at the data, remapped, we managed to resolve most of the ambiguity and satisfied with the final list of keyword.

As mentioned in the introduction section, a guideline was prepared to help with the mapping process. Again, with the help of the research colleague, we designed the guidelines that was based on the guidelines or procedure from previous study (Darshana, 2006, Wassana, 2007).

The guidelines for mapping activity
Approach: Deductive approach
Framework: IS-Impact model

<u>The guidelines contain several key activities:</u>

1. Creating nodes:
    a. Prepare framework: Start with the 37 measures. Prepare 37 nodes in Nvivo.
    b. Use tree nodes: The dimensions of the IS-Impact act as the parent nodes, and each of the measure is created as child node under its respective parent.
    c. When creating a node, each node is given a description:
        i. For the dimension @ parent, the description is the meaning of the dimension based on 2008 JAIS paper.
        ii. For the measure, the description is the question item that was used in the survey instrument. Based on 2008 JAIS paper.
2. Decompose/breakdown the citation, looking for the keyword:
    a. Decompose the text/citation from the identification survey into meaningful single citation. Each citation should carry a single keyword and should be describing a single measure. However, some citations are compressed, meaning it was describing more than one measure, thus containing more than one keyword that pertaining in more than one measure. Breaking down this citation would make it loose the meaning (or meaningless). When this happened, leave the citation as it is, and mapped the keyword instead.
    b. When the citation is read for the first time, an initial assumption of where the citation should belongs to (is it Quality or Impact citations; then is it SQ, IQ, II or OI?) is made.
    c. Then locate the keyword. Used the keyword dictionary as a reference to map the citation.
    d. Each citation was given a code/label to indicate its source.

3. Mapping activity

a. Using the keyword as a reference, map the citation that contains the keyword into relevant nodes that represent the IS-Impact measure. Find the best or closest node that fit the citation.

b. Make a note when it is difficult to decide the mapping of the citation to any of the IS-Impact measure.

c. Map the unclear citation into the best possible node (or nodes, if decision can be made at this stage). This citation will need further review.

d. However, if it is still difficult to map this unclear citation into any of the 37 measures, the citation will be coded into "unknown" node, a free node that is created to collect "difficult-to-map-citation" and will need further citation mapping review.

4. Revisit the "unknown" node

    a. Citations that could not be mapped into any of the 37 measures are grouped in a free node named "unknown".

    b. After all the citations have mapped completely into the possible measures, revisit the citations that were grouped under the "unknown" node to make the 2nd review.

    c. If the citation still could not be mapped into any of the measures, make a note about this difficulty. This unmapped citation may lead to the discovery of a new measure for any of the available dimension, or maybe a new dimension. However, the decision to add must be resolve after the discussion with the supervisory team, and other research students.

5. Revisit the "unclear" citation

    a. A review was made to decide which best measure/node should the citation fit-in to. Try to establish a 1 to 1 relationship (1 citation to 1 measure). If possible, try decompose the citation into meaningful single citation.

Further thoughts/suggestion on the mapping activity

1. Make a note if you are confuse or can't decide where to map the citation into the appropriate measures.
2. During mapping activity, one must clearly understand what the dimension represents, and what does the item/measure tries to measure. It is a difficult task, because sometimes you find at one point, the respondent is referring to one issue, but the next time you look at it, you find the respondent is talking about another issue. So this ambiguity can only be solved if each measure has distinct definition and clearly exclusive from other measure.

Appendix E
Quantitative Survey Instrument (Confirmation Survey)

Impacts of SPEKS at
State Government in Malaysia
a survey conducted by

IT Professional Services Research Program at
Queensland University of Technology

General Instructions for Completion

Introduction: Over the past few years, eleven State Governments in Malaysia have invested significant resources in **The State Government's Standard Computerised Accounting System (SPEKS).** The impact of SPEKS is now being experienced across all levels of most departments in these State Governments. ***All employees at selected States Governments in Malaysia, who either use SPEKS directly or receive its output are being contacted and encouraged to participate in this survey***.

Purpose of the Survey: The purpose of this survey is to validate a model and instrument for evaluating the impacts of Information Systems in your organisation. This survey is being conducted by the IT Professional Services Research Program (ITPS) at Queensland University of Technology (QUT).

We seek to learn from your experience with SPEKS in your organisation. Insights into your experiences with SPEKS will be valuable in highlighting where your organisation should be focusing their attention, today and in future. Analysis of low impacts will provide the basis of strategies for improvements while high impacts may be replicated or extended in your own or other organisations.

Confidentiality – This is a confidential survey. Detailed results of the survey will be confidential to ITPS. Responses will be assigned a sequential number and findings are never attributed to any individual. Only aggregated results will be reported. The State Government (your organisation) or any other group will not receive a copy of the study database.

Concerns/complaints regarding the conduct of the project – If you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Officer on +617 3138 2340 or email ethicscontact@qut.edu.au. The Research Ethics Officer is not connected with the research project and can facilitate a resolution to your concern in an impartial manner.

General Instructions for Completing and Returning the Questionnaire – It will take you approximately 10-15 minutes to complete this questionnaire. Please answer **ALL** questions. The completed questionnaire will be collected **by 15 October 2009.** If you have any questions concerning the questionnaire, please do not hesitate to contact me.

Thank you for your participation in this important study.

Nur Fazidah Elias
Researcher/PhD Candidate
Faculty of Science and Technology,
Queensland University of Technology,
Workstation 15, Level 3,
126 Margaret Street, Brisbane, Australia 4001
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E-mail: nur.elias@student.qut.edu.au

Impacts of SPEKS at
State Government in Malaysia
a survey conducted by

IT Professional Services Research Program at
Queensland University of Technology

Section One	Personal Details

This is a ***CONFIDENTIAL, ANONYMOUS SURVEY***. However, for data analysis purposes, the IT Professional Services Research Program (ITPS) needs some information about your job experience.

Please enter the following demographic data.

Job Title			
Service Scheme		**Grade**	
Department/Agency			
Duration with your current department	_______ **year(s) and** ______ **month(s)**		
Duration with current State Government	_______ **year(s) and** ______ **month(s)**		

In one or two sentences, please describe the nature of your current job, and where applicable, any involvement you have had with SPEKS.

Please go to the next page

Impacts of SPEKS at
State Government in Malaysia
a survey conducted by

IT Professional Services Research Program at
Queensland University of Technology

Section Two	Impacts of SPEKS in the state government

IMPORTANT INSTRUCTIONS FOR COMPLETION

The questions in this section are grouped into SIX categories for ease of understanding: A) Individual Impacts, B) Organisational Impacts, C) Information Quality, D) System Quality, E) Satisfaction, and F) Overall. Your answers should relate to your own experiences and perceptions of SPEKS in your department/agency. Please tick the appropriate box which best describes your view for each question. **PLEASE ANSWER EVERY QUESTION**.

Category A: Individual Impact is concerned with how SPEKS has influenced your individual capabilities and effectiveness on behalf of the state government.

		Strongly disagree 1	2	3	4	5	Strongly agree 6
1	I have learnt much through the presence of SPEKS.	☐	☐	☐	☐	☐	☐
2	SPEKS enhances my awareness and helps me recall job related information.	☐	☐	☐	☐	☐	☐
3	SPEKS enhances my effectiveness in the job.	☐	☐	☐	☐	☐	☐
4	SPEKS increases my productivity.	☐	☐	☐	☐	☐	☐

Please go to the next page

Impacts of SPEKS at
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IT Professional Services Research Program at
Queensland University of Technology

<u>**Category B:**</u> **Organizational Impact** refers to impacts of SPEKS at the organizational level; namely improves organizational results and capabilities.

		Strongly disagree 1	2	3	4	5	Strongly agree 6
5	SPEKS is cost effective.	☐	☐	☐	☐	☐	☐
6	SPEKS has resulted in reduced staff costs.	☐	☐	☐	☐	☐	☐
7	SPEKS has resulted in cost reductions (*e.g. inventory holding costs, administration expenses, etc.*).	☐	☐	☐	☐	☐	☐
8	SPEKS has resulted in overall productivity improvement.	☐	☐	☐	☐	☐	☐
9	SPEKS has resulted in improved outcomes or outputs.	☐	☐	☐	☐	☐	☐
10	SPEKS has resulted in an increased capacity to manage a growing volume of activity (*e.g. transactions, population growth, etc.).*	☐	☐	☐	☐	☐	☐
11	SPEKS has resulted in improved organisational processes.	☐	☐	☐	☐	☐	☐
12	SPEKS has helped the organisation to be better prepared for e-government.	☐	☐	☐	☐	☐	☐

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Impacts of SPEKS at State Government in Malaysia

a survey conducted by

IT Professional Services Research Program at Queensland University of Technology

<u>Category C:</u> Information Quality is concerned with the quality of SPEKS outputs; namely the quality of the information the system produces in reports and on-screen.

		Strongly disagree 1	2	3	4	5	Strongly agree 6
13	Information available from SPEKS is important.	☐	☐	☐	☐	☐	☐
14	SPEKS provides output that seems to be exactly what is needed.	☐	☐	☐	☐	☐	☐
15	Information needed from SPEKS is always available.	☐	☐	☐	☐	☐	☐
16	Information from SPEKS is in a form that is readily usable.	☐	☐	☐	☐	☐	☐
17	Information from SPEKS is easy to understand.	☐	☐	☐	☐	☐	☐
18	Information from SPEKS appears readable, clear and well formatted.	☐	☐	☐	☐	☐	☐
19	Though data from SPEKS may be accurate, outputs sometimes are not.	☐	☐	☐	☐	☐	☐
20	Information from SPEKS is concise.	☐	☐	☐	☐	☐	☐
21	Information from SPEKS is always timely.	☐	☐	☐	☐	☐	☐
22	Information from SPEKS is unavailable elsewhere.	☐	☐	☐	☐	☐	☐

Please go to the next page

Impacts of SPEKS at State Government in Malaysia

a survey conducted by

IT Professional Services Research Program at Queensland University of Technology

Category D: System Quality of the SPEKS is a multifaceted construct designed to capture how the system performs from a technical and design perspectives.

		Strongly disagree 1	2	3	4	5	Strongly agree 6
23	Data from SPEKS often needs correction.	☐	☐	☐	☐	☐	☐
24	Data from SPEKS is current enough.	☐	☐	☐	☐	☐	☐
25	Key data is missing from SPEKS.	☐	☐	☐	☐	☐	☐
26	SPEKS is easy to use.	☐	☐	☐	☐	☐	☐
27	SPEKS is easy to learn.	☐	☐	☐	☐	☐	☐
28	It is often difficult to get access to information that is in SPEKS.	☐	☐	☐	☐	☐	☐
29	SPEKS meets department/agency requirements.	☐	☐	☐	☐	☐	☐
30	SPEKS includes all the necessary features and functions.	☐	☐	☐	☐	☐	☐
31	SPEKS always does what it should.	☐	☐	☐	☐	☐	☐
32	SPEKS user interface can be easily adapted to one's personal approach.	☐	☐	☐	☐	☐	☐
33	SPEKS is always up-and-running as necessary.	☐	☐	☐	☐	☐	☐
34	SPEKS responds quickly.	☐	☐	☐	☐	☐	☐
35	SPEKS requires only the minimum number of fields and screens to achieve a task.	☐	☐	☐	☐	☐	☐
36	All data within SPEKS is fully integrated and consistent.	☐	☐	☐	☐	☐	☐
37	SPEKS can be easily modified, corrected or improved.	☐	☐	☐	☐	☐	☐
38	The information in SPEKS is secure.	☐	☐	☐	☐	☐	☐

Please go to the next page

Impacts of SPEKS at State Government in Malaysia

a survey conducted by

IT Professional Services Research Program at Queensland University of Technology

Category E: Satisfaction refers to the feelings you have towards SPEKS.

		Strongly disagree					Strongly agree
39	Overall, SPEKS is satisfactory.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
40	I am satisfied with SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
41	I am not happy with SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
42	I like SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

Category F: Overall

		Strongly disagree					Strongly agree
49	Overall, the impact of SPEKS on the *department/agency* has been positive.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
50	Overall, the impact of SPEKS on *me* has been positive.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
51	Overall, the System Quality of SPEKS is satisfactory.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
52	Overall, the Information Quality of SPEKS is satisfactory.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
53	SPEKS is good.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
54	SPEKS has negatively affected the organisation's performance.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
	SPEKS has no problem.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
56	I have received many advantages from SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

		Poor					Outstanding
57	Overall, how would you rate SPEKS?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

End of Survey – Thank you for your participation

Appendix F
Quantitative Survey Instrument (Confirmation Survey- Bahasa Malaysia version)

Impak SPEKS
di Kerajaan Negeri di Malaysia
soal selidik yang dijalankan oleh

Program "IT Professional Services Research" di Queensland University of Technology
ARAHAN

Pengenalan: Kerajaan-kerajaan negeri di Malaysia telah membuat pelaburan yang besar dalam mengimplementasi **Sistem Perakaunan Berkomputer Standad Kerajaan Negeri (SPEKS)** yang kini sedang digunakan di sebelas buah negeri semenjak beberapa tahun yang lalu. Keberkesanan SPEKS kini dirasai oleh semua pengguna yang terdapat di hampir setiap jabatan di kerajaan-kerajaan negeri yang terlibat. **Semua kakitangan di beberapa buah kerajaan negeri yang terpilih, yang menggunakan sistem ini mahupun yang hanya menerima output daripada sistem ini, akan dihubungi dan digalakkan untuk menyertai soal selidik ini.**

Tujuan soal selidik: Tujuan soal selidik ini adalah untuk menguji model serta alat pengukuran yang direka untuk menilai impak/kesan SPEKS di organisasi anda. Soal selidik ini dikendalikan oleh Pusat "IT Professional Services" (ITPS) di Queensland University of Technology (QUT), Australia.

Kami berharap untuk memahami pengalaman anda dengan SPEKS di organisasi anda. Pengalaman anda sangat berharga bagi membantu organisasi anda memahami serta dapat memberi tumpuan kepada keadaan semasa SPEKS dan juga untuk masa hadapan. Kesan negatif daripada SPEKS akan menjadi asas bagi mengatur strategi untuk memperbaiki SPEKS. Manakala kesan positif yang anda perolehi, dapat dikongsi dengan pengguna SPEKS yang lain, di organisasi anda mahupun organisasi yang lain.

Sulit: Kajian soal selidik ini adalah sulit. Maklumat atau hasil yang diperolehi daripada kajian ini adalah dianggap sulit oleh ITPS. Setiap responden akan diberi nombor giliran dan sebarang keputusan yang di dapati daripada kajian ini tidak akan dikaitkan dengan mana-mana individu. Hanya keputusan keseluruhan akan dilaporkan. Kerajaan Negeri (organisasi anda) tidak akan menerima sebarang salinan maklumat ataupun data daripada pangkalan data kami.

Jika anda mempunyai sebarang keraguan berkenaan pengendalian etika dalam kajian ini, anda boleh menghubungi Setiausaha Jawatankuasa Etika Kajian Manusia, Queensland University of Technology di +617 3138 2340 atau email ethicscontact@qut.edu.au. Walau bagaimanapun, jawatankuasa ini hanya boleh membantu anda di dalam perkara-perkara tertentu sahaja kerana tidak terlibat di dalam kajian ini.

Arahan bagi melengkapkan serta mengembalikan borang soal selidik ini: Borang soal selidik ini hanya mengambil masa lebih kurang 10 hingga 15 minit untuk dilengkapkan. Sila jawab **SEMUA** soalan dan borang yang telah lengkap akan dikumpulkan **pada XXXXXX 2009.** Jika anda mempunyai sebarang soalan berkenaan dengan borang soal selidik ini, sila hubungi saya seperti di bawah.
Terima kasih kerana mengambil bahagian di dalam kajian ini.

Nur Fazidah binti Elias
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Impak SPEKS
di Kerajaan Negeri di Malaysia
soal selidik yang dijalankan oleh

Program "IT Professional Services Research" di Queensland University of Technology

Bahagian Satu	Maklumat Peribadi

Soal selidik ini adalah SULIT. Walau bagaimanapun, untuk tujuan analisis, ITPS perlu mendapatkan maklumat berkenaan tugas serta pengalaman kerja anda.

Sila lengkapkan maklumat berikut.

Jawatan			
Skim perkhidmatan		**Gred**	
Jabatan/Ajensi			
Tempoh bekerja dengan Jabatan	_______ **tahun dan** ______ **bulan**		
Tempoh bekerja dengan Kerajaan Negeri	_______ **tahun dan** ______ **bulan**		

Dengan ringkas, terangkan tugas atau tanggungjawab anda di jabatan, serta penglibatan anda dalam SPEKS.

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Bahagian Dua	Impak/Kesan SPEKS Di Organisasi Anda

ARAHAN

Soalan-soalan di Bahagian Dua dikelompokkan kepada TUJUH kategori bagi memudahkan pemahaman. Kategori-kategori tersebut adalah: A) Impak Individu, B) Impak Organisasi, C) Kualiti Maklumat, D) Kualiti Sistem, E) Kepuasan, dan F) Keseluruhan. Jawapan anda haruslah berdasarkan pengalaman serta persepsi anda terhadap SPEKS di jabatan/ajensi anda. Sila pangkah pada kotak yang sesuai untuk setiap pernyataan/soalan.

SILA JAWAB SEMUA SOALAN

Kategori A: Impak Individu adalah merujuk kepada bagaimana SPEKS mempengaruhi kemampuan serta keberkesanan anda di kerajaan negeri.

		Sangat tidak setuju					Sangat setuju
1	Saya telah mempelajari banyak perkara dengan kehadiran SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
2	SPEKS telah meningkatkan kepekaan serta membantu saya mengingati semula maklumat berkaitan tugas.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
3	SPEKS meningkatkan keberkesanan saya semasa tugas.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
4	SPEKS meningkatkan produktiviti saya.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

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Kategori B: Impak Organisasi adalah merujuk kepada kesan yang diberikan oleh SPEKS di peringkat organisasi, seperti memperbaiki kemampuan serta output organisasi.

		Sangat tidak setuju					Sangat setuju
5	SPEKS adalah efektif dari segi kos.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
6	SPEKS telah berjaya mengurangkan kos yang berkaitan dengan kakitangan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
7	SPEKS berjaya mengurangkan kos (seperti kos pengendalian inventori, perbelanjaan pentadbiran, dsb.).	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
8	SPEKS berjaya meningkatkan produktiviti secara keseluruhan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
9	SPEKS telah berjaya meningkatkan hasil atau output.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
10	SPEKS berjaya meningkatkan kapasiti untuk mengendali kadar aktiviti yang semakin bertambah (seperti transaksi, pertambahan populasi, dsb.).	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
11	SPEKS berjaya memperbaiki proses-proses di organisasi.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
12	SPEKS menghasilkan keadaan yang sesuai untuk perlaksanaan e-Government/Business.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

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Kategori C: Kualiti Maklumat adalah merujuk kepada kualiti output yang dihasilkan oleh SPEKS, seperti laporan, sama ada dicetak atau yang terdapat pada skrin.

		Sangat tidak setuju 1	2	3	4	5	Sangat setuju 6
13	Maklumat yang terdapat pada SPEKS adalah penting.	☐	☐	☐	☐	☐	☐
14	SPEKS menyediakan output seperti yang diperlukan.	☐	☐	☐	☐	☐	☐
15	Maklumat yang diperlukan daripada SPEKS sentiasa ada.	☐	☐	☐	☐	☐	☐
16	Maklumat daripada SPEKS di dalam bentuk yang sedia digunakan.	☐	☐	☐	☐	☐	☐
17	Maklumat daripada SPEKS adalah mudah untuk difahami.	☐	☐	☐	☐	☐	☐
18	Maklumat daripada SPEKS adalah mudah dibaca, jelas dan dalam format yang baik.	☐	☐	☐	☐	☐	☐
19	Walaupun data yang terdapat di dalam SPEKS tepat, tetapi output kadang kala tidak tepat.	☐	☐	☐	☐	☐	☐
20	Maklumat di dalam SPEKS adalah ringkas dan padat.	☐	☐	☐	☐	☐	☐
21	Maklumat dalam SPEKS adalah tepat pada waktunya.	☐	☐	☐	☐	☐	☐
22	Maklumat di dalam SPEKS tidak ada ditempat lain.	☐	☐	☐	☐	☐	☐

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Kategori D: Kualiti Sistem adalah suatu konsep yang melihat bagaimana SPEKS beroperasi dari sudut teknikal dan juga rekabentuk.

		Sangat tidak setuju					Sangat setuju
23	Data yang terdapat dalam SPEKS sering diperbetulkan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
24	Data yang terdapat dalam SPEKS adalah terkini.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
25	Data utama hilang daripada SPEKS.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
26	SPEKS mudah digunakan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
27	SPEKS mudah untuk dipelajari.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
28	Maklumat yang terdapat di dalam SPEKS sering kali susah untuk dicapai.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
29	SPEKS memenuhi keperluan jabatan/ajensi.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
30	SPEKS mempunyai semua ciri-ciri serta fungsi yang diperlukan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
31	SPEKS sentiasa lakukan apa yang patut dilakukan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
32	Antaramuka SPEKS mudah disesuaikan mengikut citarasa pengguna.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
33	SPEKS sentiasa berfungsi apabila diperlukan.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
34	SPEKS bertindakbalas dengan pantas.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
35	SPEKS hanya memerlukan tindakan/operasi yang minimum untuk melaksanakan sesuatu tugas.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
36	Semua data yang terdapat di dalam SPEKS adalah konsisten dan diintegrasi sepenuhnya.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
37	SPEKS mudah untuk diubah, diperbetulkan atau diperbaiki.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
38	Semua maklumat di dalam SPEKS adalah selamat.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

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Kategori E: **Kepuasan** merujuk kepada perasaan anda terhadap SPEKS.

		Sangat tidak setuju 1	2	3	4	5	Sangat setuju 6
39	Secara keseluruhan, SPEKS adalah memuaskan.	☐	☐	☐	☐	☐	☐
40	Saya berpuas hati dengan SPEKS.	☐	☐	☐	☐	☐	☐
41	Saya tidak gembira dengan SPEKS.	☐	☐	☐	☐	☐	☐
42	Saya suka SPEKS.	☐	☐	☐	☐	☐	☐

Kategori F: **Keseluruhan**

		Sangat tidak setuju 1	2	3	4	5	Sangat setuju 6
49	Secara keseluruhan, SPEKS memberi impak positif kepada jabatan/ajensi.	☐	☐	☐	☐	☐	☐
50	Secara keseluruhan, SPEKS memberi impak positif kepada saya.	☐	☐	☐	☐	☐	☐
51	Secara keseluruhan, Kualiti Sistem SPEKS adalah memuaskan.	☐	☐	☐	☐	☐	☐
52	Secara keseluruhan, Kualiti Maklumat SPEKS adalah memuaskan.	☐	☐	☐	☐	☐	☐
53	SPEKS sangat bagus.	☐	☐	☐	☐	☐	☐
54	SPEKS telah menjejaskan pencapaian organisasi.	☐	☐	☐	☐	☐	☐
55	SPEKS tidak ada masalah.	☐	☐	☐	☐	☐	☐
56	Saya menerima banyak kebaikan daripada SPEKS.	☐	☐	☐	☐	☐	☐

		Lemah 1	2	3	4	5	Cemerlang 6
57	Secara keseluruhan, bagaimana anda menilai SPEKS?	☐	☐	☐	☐	☐	☐

Appendix G
Pilot Test Form

Impacts of SPEKS at State Government in Malaysia

a survey conducted by

IT Professional Services Research Program at Queensland University of Technology

INSTRUMENT PILOT TEST

You have been invited to pilot-test the IS-Impact questionnaire, designed by the IT Professional Services Research Program, Queensland University of Technology (QUT). Please read this instruction carefully.

You need to fill in the survey, as you normally would respond to a survey. The purpose of the pilot test is to test of the face validity of the instrument, namely on the structure, format, clarity (visibility and meaning), and timing. Your involvement in this pilot test is important to help us in improving the instrument. When answering this question, please have in mind an IS application (e.g. QUTVirtual, QUT library) to help you in answering the questions. **ALL** questions are mandatory.

In order to assure that you are doing in correct order, please follow the following steps:

1. Read all the questions in Form A before answering the questions.
2. Record your start and end time.
3. Answer all the questions in the questionnaire.
4. Complete the questionnaire in one sitting.
5. Try not to go back and review or change your answers.
6. Fill up Form A, and please provide feedback for improving the questionnaire.

Please return both the completed questionnaire and this document by sending email to nur.elias@student.qut.edu.au. We appreciate your support. Thank you for your cooperation.

Nur Fazidah Elias
Researcher/PhD Candidate
Faculty of Science and Technology,
Queensland University of Technology,
Workstation 15, Level 3,
126 Margaret Street, Brisbane, Australia 4001
Mobile: +61 4 208 11629
E-mail: nur.elias@student.qut.edu.au

QUT

Impacts of SPEKS at State Government in Malaysia

a survey conducted by

IT Professional Services Research Program at Queensland University of Technology

FORM A: PILOT TEST

Start time: End time:

1. Are the instructions on the cover note clear? Yes ☐ No ☐

   Please provide any comments:

2. Are instructions for each section and category clear? Yes ☐ No ☐

   Please provide any comments:

3. Are the questions in each category clear? Yes ☐ No ☐

   Please provide any comments:

4. Are there any ambiguous terms in the questionnaire? Yes ☐ No ☐

   Please provide any comments:

Impacts of SPEKS at
State Government in Malaysia
a survey conducted by

IT Professional Services Research Program at
Queensland University of Technology

5. Are there any spelling or grammatical error? Yes ☐ No ☐

   Please provide any comments:

6. Did you face any difficulty when answering each question? Yes ☐ No ☐

   Please provide any comments:

7. Is the instruction/description for each category helps? Yes ☐ No ☐

   Please provide any comments:

8. Did you rely on the instruction/description for each category to answer each question? Yes ☐ No ☐

   Please provide any comments:

9. What about the scale, is 6-point Likert scale OK to you? Yes ☐ No ☐

   Please provide any comments:

10. If you have comments for specific items/questions, please fill in the table below. Feel free to add a new row.

Question #	Comments

11. Please provide an overall comment of the instrument.

Please provide any comments:

THANK YOU FOR YOUR PARTICIPATION

Appendix H
Ethical Clearance for Confirmation Survey Instrument

Dear Ms Nur Elias

Project Title:
Validating the IS-impact model in Malaysia

Ethics Number: 0900001023
Clearance Until: 13/10/2012
Ethics Category: Human

This email is to advise that your application has been reviewed by the Chair, University Human Research Ethics Committee and confirmed as meeting the requirements of the National Statement on Ethical Conduct in Human Research.

Whilst the data collection of your project has received ethical clearance,the decision to commence and authority to commence may be dependant on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or permissions from other organisations to access staff. Therefore the proposed data collection should not commence until you have satisfied these requirements.

If you require a formal approval certificate, please respond via reply email and one will be issued.

Decisions related to low risk ethical review are subject to ratification at the next available Committee meeting. You will only be contacted again in relation to this matter if the Committee raises any additional questions or concerns.

This project has been awarded ethical clearance until 13/10/2012 and a progress report must be submitted for an active ethical clearance at least once every twelve months. Researchers who fail to submit an appropriate progress report may have their ethical clearance revoked and/or the ethical clearances of other projects suspended. When your project has been completed please advise us by email at your earliest convenience.

For variations, please complete and submit an online variation form:

http://www.research.qut.edu.au/ethics/forms/hum/var/variation.jsp

Please do not hesitate to contact the unit if you have any queries.

Regards

Research Ethics Unit | Office of Research
Level 4 | 88 Musk Ave | Kelvin Grove

p: +61 7 3138 5123 | f: +61 7 3138 1304
e: ethicscontact@qut.edu.au | w:
http://www.research.qut.edu.au/ethics/

Appendix I
Data Codebook

ID

		Value
Standard Attributes	Label	ID given to each respondents
	Type	String
	Format	A8
	Measurement	Nominal

Type

		Value
Standard Attributes	Label	Type of questionnaire
	Type	Numeric
	Format	F8
	Measurement	Scale
Labeled Values	1	Block
	2	Random

State

		Value
Standard Attributes	Label	The state government where the respondent works.
	Type	Numeric
	Format	F8
	Measurement	Nominal
Valid Values	1	Negeri Sembilan
	2	Melaka
	3	Johor
	4	Kelantan

Job

		Value
Standard Attributes	Label	Job title
	Type	Numeric
	Format	F8
	Measurement	Nominal
Valid Values	1	Administrative Assistant (Finance)
	2	Account Clerk
	3	Assistant Accountant
	4	Administrative Assistant
	5	Assistant Director
	6	Assistant Administrative Officer
	7	Deputy Director
	8	Chief Clerk

	9	Technical Assistant
	10	Malaysian Home and Foreign Services
	11	Assistant State Secretary
	12	IT Officer
	13	Accountant
	14	Assistant IT Officer
	15	Assistant District Officer
	16	Assistant Secretary
	17	Administrative Officer
	18	Clerk
	19	Data Processing Machine Operator
	20	Driver
	21	Clerk (audit)
	22	Engineer
	23	Chief Assistant Director
	24	Assistant Engineer

Job_new

		Value
Standard Attributes	Label	Cohorts
	Type	Numeric
	Format	F8
	Measurement	Scale
Labeled Values	1	Management
	2	Operational
	3	Technical
	99	NA

Serv_Scheme

		Value
Standard Attributes	Label	Government service scheme
	Type	Numeric
	Format	F8
	Measurement	Nominal
Valid Values	1	Professional and Management
	2	Support

Grade

		Value
Standard Attributes	Label	Job grade
	Type	String
	Format	A8
	Measurement	Nominal

Department

		Value
Standard Attributes	Label	Respondent's department
	Type	Numeric
	Format	F8
	Measurement	Nominal
Valid Values	1	State Islamic Department
	2	Department of Agriculture
	3	Housing and Local Government Unit
	4	Social Welfare Department
	5	Department of Irrigation and Drainage
	6	Public Works Department
	7	State Secretary Office
	8	Department of Financial and Treasury
	9	Melaka Zoo
	10	Town and Regional Planning Department
	11	Department of Lands and Mines
	12	Land and Regional Office
	13	Department Of Fisheries
	14	Department of Veterinary Services
	15	Melaka Housing Board
	16	Melaka Mufti Department
	17	Tourism Promotion Unit
	18	Melaka Chief Minister's Department
	19	Melaka Chief Minister's Incorporated
	20	Melaka Education Trust Fund (TAPEM)
	21	The Governor of Melaka Office
	22	Accountant General's Department
	23	Sate Development Office
	24	Forestry Department
	25	Department of Syariah Judiciary
	26	State Services Commission

Work_at_Dept

		Value
Standard Attributes	Label	Working duration in the department (in months)
	Type	Numeric
	Format	F8
	Measurement	Scale

Work_dur_dept_inyears

		Value
Standard Attributes	Label	Working duration in department convert to year

	Type	Numeric
	Format	F8
	Measurement	Scale
Labeled Values	1	less than 3 years
	2	between 3 to 10 years
	3	more than 10 years
	9	NA

Work_at_States

		Value
Standard Attributes	Label	Working duration in the State (in months)
	Type	Numeric
	Format	F8
	Measurement	Scale

Work_dur_state_inyear

		Value
Standard Attributes	Label	Working duration in state government convert to year
	Type	Numeric
	Format	F8
	Measurement	Scale
Labeled Values	1	less than 3 years
	2	between 3 to 10 years
	3	more than 10 years
	9	NA

II1

		Value
Standard Attributes	Label	II1 Learning
	Type	Numeric
	Format	F8
	Measurement	Scale

II2

		Value
Standard Attributes	Label	II2 Awareness/Recall
	Type	Numeric
	Format	F8
	Measurement	Scale

II3

		Value
Standard Attributes	Label	II3 Decision Effectiveness

	Type	Numeric
	Format	F8
	Measurement	Scale

II4

		Value
Standard Attributes	Label	II4 Individual Productivity
	Type	Numeric
	Format	F8
	Measurement	Scale

OI1

		Value
Standard Attributes	Label	OI1 Organisational Costs
	Type	Numeric
	Format	F8
	Measurement	Scale

OI2

		Value
Standard Attributes	Label	OI2 Staff Requirements
	Type	Numeric
	Format	F8
	Measurement	Scale

OI3

		Value
Standard Attributes	Label	OI3 (Operating) Cost Reduction
	Type	Numeric
	Format	F8
	Measurement	Scale

OI4

		Value
Standard Attributes	Label	OI4 Overall Productivity
	Type	Numeric
	Format	F8
	Measurement	Scale

OI5

		Value
Standard Attributes	Label	OI5 Improved Outcome/Output
	Type	Numeric

	Format	F8
	Measurement	Scale

OI6

		Value
Standard Attributes	Label	OI6 Incresed Capacity
	Type	Numeric
	Format	F8
	Measurement	Scale

OI8

		Value
Standard Attributes	Label	OI8 Business Process Change
	Type	Numeric
	Format	F8
	Measurement	Scale

OI7

		Value
Standard Attributes	Label	OI7 E-Government
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ1

		Value
Standard Attributes	Label	IQ1Importance
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ5

		Value
Standard Attributes	Label	IQ5 Relevance
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ2

		Value
Standard Attributes	Label	IQ2 Availability
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ3

		Value
Standard Attributes	Label	IQ3 Usability
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ4

		Value
Standard Attributes	Label	IQ4 Understandability
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ6

		Value
Standard Attributes	Label	IQ6 Format
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ7

		Value
Standard Attributes	Label	IQ7 Content Accuracy
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ8

		Value
Standard Attributes	Label	IQ8 Conciseness
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ9

		Value
Standard Attributes	Label	IQ9 Timeliness
	Type	Numeric
	Format	F8
	Measurement	Scale

IQ10

		Value
Standard Attributes	Label	IQ10 Uniqueness
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ1

		Value
Standard Attributes	Label	SQ1 Data Accuracy
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ2

		Value
Standard Attributes	Label	SQ2 Data Currency
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ3

		Value
Standard Attributes	Label	SQ3 Database Content
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ4

		Value
Standard Attributes	Label	SQ4 Ease of Use
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ5

		Value
Standard Attributes	Label	SQ5 Ease of Learning
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ6

		Value
Standard Attributes	Label	SQ6 Access

	Type	Numeric
	Format	F8
	Measurement	Scale

SQ7

		Value
Standard Attributes	Label	SQ7 User Requirements
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ8

		Value
Standard Attributes	Label	SQ8 Systems Features
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ9

		Value
Standard Attributes	Label	SQ9 System Accuracy
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ10

		Value
Standard Attributes	Label	SQ10 Flexibility
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ11

		Value
Standard Attributes	Label	SQ11 Reliability
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ12

		Value
Standard Attributes	Label	SQ12 Efficiency
	Type	Numeric
	Format	F8

SQ12

		Value
Standard Attributes	Label	SQ12 Efficiency
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ13

		Value
Standard Attributes	Label	SQ13 Sophistication
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ14

		Value
Standard Attributes	Label	SQ14 Integration
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ15

		Value
Standard Attributes	Label	SQ15 Customisation
	Type	Numeric
	Format	F8
	Measurement	Scale

SQ16

		Value
Standard Attributes	Label	SQ16 Security
	Type	Numeric
	Format	F8
	Measurement	Scale

S1

		Value
Standard Attributes	Label	S1 Overall Satisfaction
	Type	Numeric
	Format	F8
	Measurement	Scale

S2

	Value

Standard Attributes	Label	S2 Satisfaction 2
	Type	Numeric
	Format	F8
	Measurement	Scale

S3

		Value
Standard Attributes	Label	S3 Satisfaction 3
	Type	Numeric
	Format	F8
	Measurement	Scale

S4

		Value
Standard Attributes	Label	S4 Satisfaction 4
	Type	Numeric
	Format	F8
	Measurement	Scale

C1

		Value
Standard Attributes	Label	Criterion 1 OI
	Type	Numeric
	Format	F8
	Measurement	Scale

C2

		Value
Standard Attributes	Label	Criterion 2 II
	Type	Numeric
	Format	F8
	Measurement	Scale

C3

		Value
Standard Attributes	Label	Criterion 3 SQ
	Type	Numeric
	Format	F8
	Measurement	Scale

C4

		Value
Standard Attributes	Label	Criterion 4 IQ
	Type	Numeric

	Format	F8
	Measurement	Scale

C5

		Value
Standard Attributes	Label	Criterion 5
	Type	Numeric
	Format	F8
	Measurement	Scale

C6

		Value
Standard Attributes	Label	Criterion 6
	Type	Numeric
	Format	F8
	Measurement	Scale

C7

		Value
Standard Attributes	Label	Criterion 7
	Type	Numeric
	Format	F8
	Measurement	Scale

C8

		Value
Standard Attributes	Label	Criterion 8
	Type	Numeric
	Format	F8
	Measurement	Scale

C9

		Value
Standard Attributes	Label	Criterion 9
	Type	Numeric
	Format	F8
	Measurement	Scale

Appendix J
Publications

Conferences:
(ACIS) Australian Conference of Information Systems, December 2007, (paper presentation) (PACIS) Pacific Asia Conference on Information Systems, July 2009 • Doctoral consortium, July 2009 • Paper presentation (ICASEIT) International Conference on Advanced Science, Engineering and Information Technology, January 2011, (paper presentation)
Publications:
"Validating the IS-Impact Measurement Model in Malaysia: A Research-in-Progress Paper", presented at ACIS 2007. Elias, N. F. (2007). Validating the IS-Impact Measurement Model in Malaysia: A Research-in-Progress Paper. *Proceedings of the 18th Australasian Conference on Information Systems (ACIS 2007)*, University of Southern Queensland (USQ), Toowoomba, Queensland. "Validating the IS-Impact model: Two exploratory case studies in China and Malaysia", presented at PACIS 2009. Cao, L., & Elias, N. F. (2009). Validating The IS-Impact Model: Two Exploratory Case Studies In China And Malaysia. *Proceedings of the 13th Pacific Asia Conference on Information Systems (PACIS 2009)*, Hyderabad, India. "Measuring the Impact of Information Systems in Malaysia", presented at ICASEIT 2011. Elias, N. F. (2011). Measuring the Impact of Information Systems in Malaysia. *Proceedings of the International Conference on Advanced Science, Engineering and Information Technology (ICASEIT) 2011*, Bangi, Malaysia. Elias, N.F. (2011). The Impact of Information Systems from the Perspective of IS Stakeholders in Malaysia. *International Journal of Advanced Science, Engineering and Information Technology*, (forthcoming).

Appendix K
The Impact of SPEKS at State Governments in Malaysia (A Report)

The Impact of SPEKS at State Governments in Malaysia

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State Government of Negeri Sembilan
State Government of Johor
State Government of Kelantan

Executive Summary

This report contains findings from a survey that was carried out at four state governments in Malaysia in 2009. The purpose of the survey is to measure the impact of Sistem Perakaunan Berkomputer Standard Untuk Kerajaan Negeri (SPEKS), a standardised financial system that is currently being used at 11 state governments in Malaysia.
Findings indicate that overall, SPEKS has provided a strong positive impact to the users and the state governments. However, in order to continue providing benefits and remained effective, the IT Division and Management should take action for improving some areas that have been identified performing poorly. This report presents findings from the survey that can help IT Division and Management at Accountant General's (AG) Department and the state governments involved in this survey to decide further action in order to improve the effectiveness of SPEKS in the future.

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Part 1: Introduction

Introduction to the study

The IT Professional Services (ITPS) Research Program at Queensland University of Technology (QUT) – Brisbane, Australia begun the Information System Impact (IS-Impact) research since late 1990s, aiming to develop the most widely employed measurement model for benchmarking information systems (IS) in organisations for the joint benefit of both research and practice. The ITPS introduced IS-Impact measurement model in 2003 to help managers and practitioner in measuring information systems (IS) impact to their organisations. The model and instrument offer a practical means for organisations to evaluate the success of complex, contemporary information systems. The measurement model has been employed to measure IS impact across different sectors and applications for several years.

Focusing on the performance of SPEKS (a home grown Financial System that was designed for assisting financial management at state governments in Malaysia), studies have taken place at four state governments in Malaysia. Findings reported herein describe the current state of SPEKS and predict future impact based on the perception of the users at the state governments involved in the survey. This report aims to provide management information to the IT Division at Accountant General's Department (AG) and the state governments involved in the study to help identify the effectiveness of SPEKS and to facilitate further discussion on future investment to improve and maintain SPEKS.

Background of SPEKS

SPEKS is an integrated financial system that has been implemented across 11 states in Malaysia (Malaysia constitutes 13 states and three (3) federal territories). SPEKS was first implemented in the year 2001 at three state governments. The installation at the rest of the state governments fully completed in year 2005. The system contains eleven integrated modules (see figure 1 for the modules), used across a number of departments in a state government with at least 800 users at each state government.

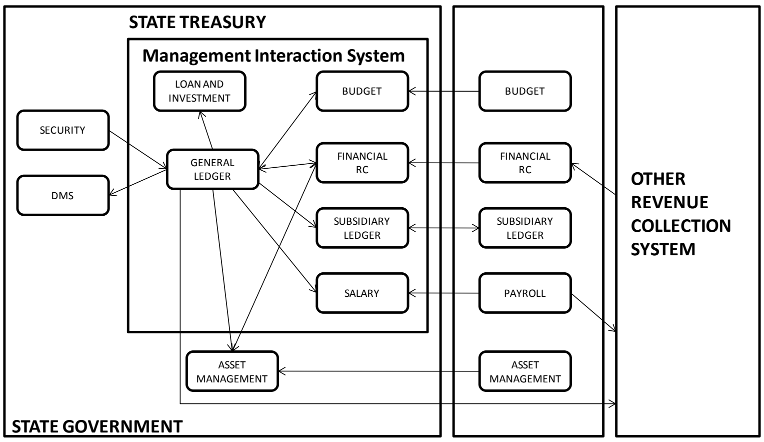


Figure 1- SPEKS Flowchart (adapted from AG Malaysia website)

The system also provides access to users outside the state government (e.g. employee provident fund (EPF) and Inland Revenue Board (IRB)). SPEKS was developed by KJSB, a local software developer with 18 years of experience in the ICT industry. The system's copyright is owned by Accountant General's (AG) Department, Ministry of Finance, Malaysia (Jabatan Akauntan Negara Malaysia, 2006).

SPEKS was developed for state governments in Malaysia with the following purposes: (1) to increase productivity and efficiency in Financial Management, (2) to prepare accurate Financial Statement on time, (3) to improve State's financial administration, (4) to provide Financial Information Source Centre and (5) to prepare the state government for the Electronic Government era (Jabatan Akauntan Negara Malaysia (n.d)).
Report Structure This report is organised into the following sections: Part 1: Introduction (this section) Part 2: The IS-Impact Measurement Model (an overview) Part 3: The Impact of SPEKS to the State Government Part 4: The Comparative Analysis of the Impact of SPEKS across Four State Governments Part 5: Conclusions

Part 2: The IS-Impact Model Overview

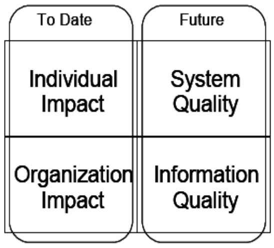


Figure 2- The IS-Impact measurement model

IS-Impact model

The IS-Impact model is a measurement model. The model captures the complex nature of IS-Impact by four dimensions: (1) Individual-Impacts, (2) Organizational-Impacts, (3) Information-Quality, and (4) System-Quality, a multidimensional phenomenon of Information System Success, as reflected in figure 2.

Individual-Impacts are concerned with how the IS has influenced the performance of individuals. These measures seek to measure whether the IS has helped staff of the organisation to perform their tasks efficiently and effectively, e.g. interpret information accurately, better understand information and work related activities in their area, make more effective decisions, and generally be more productive.

Organizational-Impacts refer to impacts of the IS at a broader level. Here we are interested in the most intuitive organisational performance indicators, e.g. improved outputs or outcomes, cost of organisational resources dedicated to run the IS, number of application replaced/introduced, changes in staff requirements, and changes in business processes, due to the introduction of the IS.

Information-Quality is concerned with such issues as the relevance, timeliness and format of the report and the accuracy of information generated from the IS. Here the focus is on the quality of the IS outputs; namely, the quality of the information the system produces on reports and on-screen.

System-Quality of the IS is a multifaceted construct designed to capture how the system performs from a technical and design perspectives. System-Quality aspects include commonly cited quality measures, e.g. consistency of the user interface, ease of use/ease of learning, quality of documentation, and the quality and maintainability of the program code. System-Quality also refers to the goodness of the IS functionality, and sophistication and integration of the system.

The dimensions as ‘guide-posts’ on the road to IS Success

The model dimensions represent distinct but related measures of the multidimensional phenomenon-IS-Impact. When evaluating an IS, measures of these dimensions represent a ‘snapshot’ of the organisation’s experience of the IS as at a point in time. The ‘impact’ dimensions (Individual & Organizational) are an assessment of benefits that have followed (or not) from the system. The ‘quality’ dimensions (Information & System) reflect future potential. Together, these four dimensions reflect an ostensibly ‘complete’ view on the Information System – an over-arching measure of Information Systems Impact.

While individual dimension scores are valuable, it is observed that treating one or a subset of the four dimensions (or variants) as a surrogate for over-arching success can be highly misleading. In an example, a system can demonstrate high quality that is not commensurate with excessively high-related costs.

Alternatively, the organisation may have eked substantial benefits from the IS investment in the short term, but now be faced with inflexible ‘e-cement’, of a low quality, portending small or negative future impacts.

IS Impact/Quality protocol

Knowing where you are at with your IS in terms of both Quality and Impact can provide valuable guidance on what actions to take. Here are what the scores from the Quality and Impact dimensions suggest (figure 3):

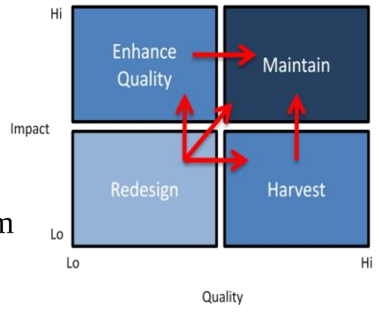


Figure 3 – A 'guide-post' to IS Success

Lo-Quality/Lo-Impact is of course cause for serious concern, and probably a major re-think of the system >> Redesign.

Lo-Impact/Hi-Quality suggests potential for harvesting substantial benefits, and a need to insure advantage is gained from the quality achieved >> Harvest.

Hi-Impact/Lo-Quality may have been strategic in the short-term, but investment must now be made in raising the System-Quality if future gains are to be realized >> Enhanced Quality.

Hi-Quality/Hi-Impact is the ultimate goal, the objective now being to maintain quality and to continue reaping positive impacts from the IS >> Maintain.

Study stakeholders

Early ITPS research highlighted the importance of assessing IS-Impact from multiple stakeholder perspectives based on our observation that sometimes quite different views held across these groups. Stakeholders within the organisation can be usefully categorized as Strategic, Managerial, Operational or Technical (Managerial and Operational being more direct 'Users' of the IS and its outputs). Data analysis reveals that each stakeholder group tends to be better informed about, and more influenced by a particular IS-Impact dimension(s), refer Figure 4 - Study Stakeholders (cohorts).

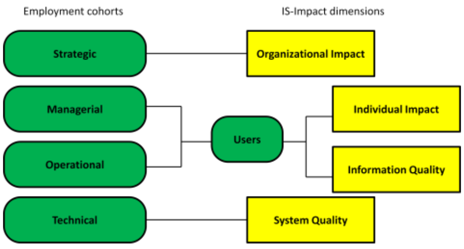


Figure 4 – Stakeholders relative emphasis on the dimensions

Not surprisingly, in their overall evaluation of IS-Impact, Strategic respondents place relatively greater emphasis on Organizational-Impact, and Technical respondents place relatively greater emphasis on System-Quality. Figure 4 indicates the approximate alignment of stakeholder groups with the dimensions ('approximate' because all cohorts have useful perceptions of, and are able to respond on all dimensions).

Examples of typical roles within an organisation for each of the cohorts might include:

- Strategic: IT and non-IT Strategic Management, Executive Management, Director, Head of Division
- Managerial: IT and non-IT General Management, Head of Department, Middle management staff
- Operational: End Users of SPEKS (e.g. clerk, administrative assistant)

- Technical: System Administrators, Technical Experts, IT Officers, Support and Development staff

Descriptive & comparative indicators

Having arrived at weighted benchmark scores, it is now possible to analyse and interpret the core survey data – scores on the 34 items. As a rule, highly consistent scores indicate some level of consensus (e.g. across the full sample, within stakeholder groups, or within organisational entities). Inconsistent scoring may point to areas of difference within these groupings warranting attention.

Score averages give us some sense of the relative 'impacts' across the four dimensions. Ranks (based on averages) indicate for example, the top-10 impact items and the bottom-10 impact items. Segmenting the sample, on the basis of various demographics or other distinctions observed in the data, will facilitate potentially useful: (1) within-organisation comparisons, and (2) across-organisations comparisons.

Possible Within-Organization Comparative Analyses - Dependent upon organisation size and number of respondents, a variety of potentially useful comparisons are possible, including: (1) across stakeholder-groups (depends on what demographic data is available on respondents – to be agreed at study design time); (2) across organisational units – e.g. a) application size (e.g. #seats, #named-licenses, license fees …), b) organisational unit size (e.g. #employees, turnover, assets, …), c) type (e.g. service, production, support …). Of course, it is also possible to 'repeat' the study for other systems or modules, or at a later date, in order to compare: (3) across systems and (4) across time (for the same system).

Possible Across-Organization Comparative Analyses - It is also possible to compare results against other organisations, which may be at similar or different phases in their application technology lifecycle. Inter-organisational comparisons will become increasingly possible as we grow our referent database. Over time it will become possible to compare: (1) The same vs. other application vendors; (2) Similar vs. other types of organisations (same vs. other sector); (3) Similar vs. other lifecycle phases; or (4) Similar vs. other implementation approaches. Like-minded organisations may see value in forming consortia for competitive analyses, within which cross-organisational results are shared, or against which member organisations compare themselves.

Part 3: The Impact of SPEKS to the State Government (overall observation)

Overview

The survey was conducted in October 2009. Since SPEKS successful implementation at eleven state governments in Malaysia, the system has never been evaluated systematically except for the User Acceptance Test (UAT) that was done by SPEKS' vendor with the collaboration from Accountant General's Department. The impact of SPEKS can be evaluated using the IS-Impact measurement model because the dimensions and the measures in the model have been tested for applicability and relevancy in a different study before the impact scores were collected from the respondents. Moreover, the dimensions in the IS-Impact model are relevant to determine if SPEKS has met the five objectives listed in Part 1: Background of SPEKS. Table 1 below display the SPEKS objectives and how each can be measured using the IS-Impact model.

SPEKS Objective	IS-Impact Dimension
To increase productivity and efficiency in Financial Management	Individual Impact and Organizational Impact
To prepare accurate Financial Statement on time	Information Quality and System Quality
To improve State's financial administration	Organizational Impact
To provide Financial Information Source Centre	System Quality
To prepare the state government for the Electronic Government era	Organizational Impact

Table 1 – Mapping the IS-Impact dimension to the SPEKS objectives

A total of 415 hardcopy questionnaires (see Appendix A for the survey instrument) were distributed to four state governments in Malaysia. 310 questionnaires were returned, indicates 74% response rate. From 310 returned questionnaires, 254 responses are considered valid for the analysis. About 25 departments across all four state governments have participated in the survey. These respondents include those from lower job category for example data processing machine operator to middle management for example accountant, and to higher management for example head of department. Overall, a total of 21 job titles in a state government have respond to the survey with a minimum of 1 month to over 10 years of working duration at the respondent's state government.

The survey contains 38 items: 4 items for measuring the impact of SPEKS on the individual, 8 items for measuring the impact of SPEKS on the organisation (based on the perception of the individual), 10 items for measuring the quality of the information that produced by SPEKS, and 16 items for measuring the quality of SPEKS in terms of technical and design perspectives. Based on the respondents experienced and perception on SPEKS, the respondents need to provide the score for each item between 1 and 6, with 1 indicate a strongly disagree with the item statement and 6 indicate strongly agree with the item statement. Based on the statistical analysis, only 34 items were considered valid items and can be used for interpretation (the list of items can be found in Appendix B).

Stakeholders

Based on the respondents' job description, the respondents are assigned to three employment cohorts. The identification of the respondents according to the employment cohorts will not only help in identifying the main users of SPEKS in each state government, but may provide some evidence that each cohort may have responded to the questions in the survey differently. Table 2 presents the number of respondents according to the employment cohorts.

Cohort	Num. Of Respondents	%
Managerial	17	7%
Operational	222	87%
Technical	5	2%
Unknown	10	4%
TOTAL	**254**	**100%**

Table 2 – Number of respondents according to cohorts

From table 2, the Operational cohort presents the highest number of respondents (87% of total respondents). This indicates that this cohort is the main users of SPEKS. The rest of the respondents include 17 (7%) from the Managerial cohort and 5 (2%) from the Technical cohort. 10 (4%) respondents, however, did not provide any job details, thus their employment cohort cannot be determined.

The high respond rate from the Operational cohort is expected as SPEKS is an operational system. Based on the job description, users of the system are mostly those who handle clerical works (that include key-in data, create payment slip, prepare vouchers) and prepare financial reports. Those in the managerial cohort handle job such as approve payment vouchers and revise financial reports. With the reasonable response rate of 74%, we believe that the percentage of respondents for each cohort is an accurate representative of the population of SPEKS users according to the employment cohorts. Thus, the score collected in this survey is representative of the total SPEKS users at the four state governments.

Overall impact score

To understand how SPEKS has impact the users and the organisations, we will present the findings in the following themes. First, we will present the score based on the dimensions average. Then, the impact of SPEKS based on different stakeholders scores are presented to provide some general interpretation on the perception of the users to SPEKS. We assumed that there will be similar perceptions across all employment cohorts and across all state governments that have participated in the survey. Nonetheless, further understanding of the impact scores by separating the respondents according to cohorts, and by separating the scores according to state governments can provide a clearer evaluation of the impact of SPEKS to the employees and organisations. Lastly, the score for each item in the survey will be presented by ranking them to provide a better understanding on the important aspects that need attention for further improving SPEKS in the future and also indicating the strength of SPEKS that should be maintained in the future.

Dimension scores

The dimension scores were calculated by averaging all respondents' scores for each dimension. These dimensions scores present the overall perception of the users towards SPEKS.

From figure 5, all four dimensionsscore are above the scale mid-point 3.5 demonstrate strong degree of positive feelings towards SPEKS. The mean score for Individual Impact is higher than the rest of the dimensions while System Quality has the lowest mean score. Meanwhile, the mean scores for the Organizational Impact and Information Quality are the same. Although the bar-chart demonstrates some variance in the dimension scores, however, we observed that the score differences between the dimensions are small.

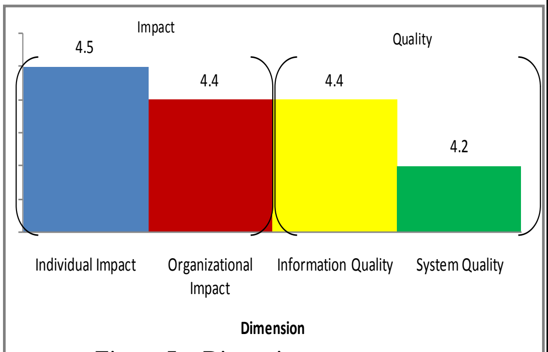


Figure 5 – Dimensions mean scores

The dimensions scores indicate that SPEKS users have similar perceptions on the impact that they have received from the system and the quality that they have experienced from the system. This can be summarised that SPEKS users are experiencing the impact of the systems.

As mentioned in the introduction of the IS-Impact model, the two Impact dimensions (the Individual Impact and Organizational Impact) are indicators of current (actual) performance of SPEKS, and the two Quality dimensions (Information Quality and System Quality) are indicators of SPEKS future impact to the users and the state governments. Based on the result (figure 5), we can summarised that overall the system presently is considered effective and had given positive impact to the users and the state governments. However, unless the quality of the system is improved, it is expected that SPEKS will further provides an average impact (not so strong) to the users and the state governments in the future.

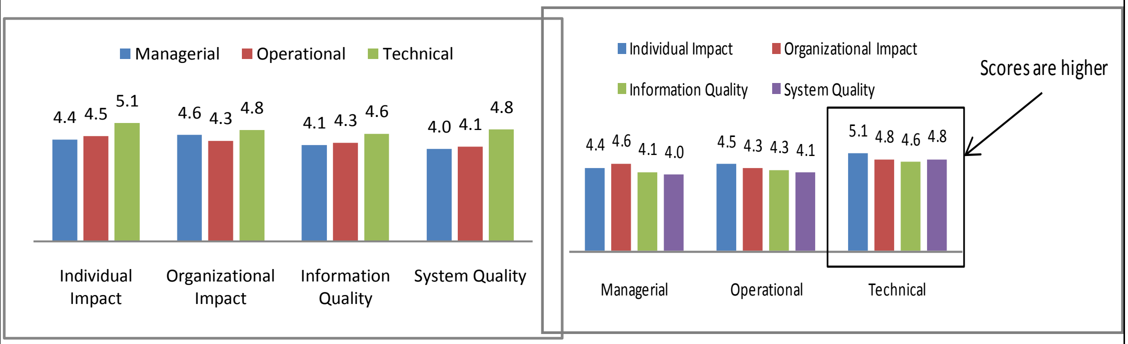


Figure 6 – Dimensions mean scores by cohorts

The perception of stakeholders on SPEKS may be different. Based on the Australian IS Impact study, findings had demonstrated that different stakeholders have different emphasis when measuring the impact of Information Systems to their organisation (see figure 4). Figure 6 above depicted mean scores of each dimension that are separated according to stakeholders. Findings indicate that the Technical users have scored all dimensions higher than the rest of the stakeholders with the highest mean score of Individual Impact. The Managerial users have scored Organizational Impact highest and System Quality lowest. Meanwhile, the Operational users have experienced the impact of SPEKS on the individual more with the highest mean score given by this type of stakeholders to the Individual Impact dimension. The Operational users, however, have lower perception on the technical and design aspects of SPEKS (measured through System Quality).

With this mixed scores, different stakeholders may have different opinions on how much SPEKS have affecting them and their organisation. It is also an indication that a certain stakeholder group is experiencing a certain aspect (reflected by a higher dimension score) more than the other dimensions. For example, the Managerial group of users may have experienced the impact of SPEKS to the state governments more than the other stakeholders, hence a higher mean score given by the Managerial group to the Organizational Impact dimension than other dimensions. This shows that it is important when measuring an IS, all views from all level of stakeholders (those who are affected by the system directly or indirectly) should be accounted. Collecting data from only a certain type of users may have resulted in partial evaluation of the system, thus biasness towards the system may be introduced.

Perceptions of SPEKS based on the Individual Items

The IS-Impact measurement model has 34 validated items (for the complete list of items please refers to Appendix B). Each item is measuring a specific aspect of the dimension in the model. This aspect is considered as current indicator of the effectiveness of SPEKS based on the perception of the users. Score for each item can help us identify which aspect that needs improvement to enhance the impact of SPEKS in the future. For instance, item with the lowest score indicates weak performance. Management can then focus on this weak aspect to find solution for improving it.

Figure 7 presents the mean score of each item. It is observed that SPEKS users have consistently scored items in the Individual Impact and Organizational Impact highly above the scale mid-point 3.5, thus presents a strong agreement of the impact of SPEKS to the user and the state governments. Moreover, the range of scores in these two dimensions is small. This indicates that the users' opinions on the Individual Impact and Organizational Impact measured by different aspects are similar. Overall, we can say that SPEKS has provided above average impact to the state governments.

Figure 7 – Items mean scores

Differently, SPEKS users have rather mixed views when measuring the quality aspect of SPEKS through Information Quality and System Quality. This is based on the larger range of scores of items in these two dimensions. Users have consistently measured the Information Quality above the scale mid-point. Overall, SPEKS users demonstrate high agreement on all aspects measuring the quality of the output provided by SPEKS.

However, as indicated by figure 7, two aspects that measure the quality of the system (SQ11 Reliability and SQ15 Customisation) are lower than the others, thus the IT Division need to investigate why these items performed poorly in order to improve these two aspects.

Ranking of the items

Table 3 presents a ranking list of the 34 items based on the items mean scores in ascending order.

IQ1	Information available from SPEKS is important	5.0
II4	SPEKS increases my productivity	4.6
II3	SPEKS enhances my effectiveness in the job	4.6
IQ5	SPEKS provides output that seems to be exactly what is needed	4.6
SQ4	SPEKS is easy to use	4.6
SQ5	SPEKS is easy to learn	4.6
SQ7	SPEKS meets department/agency requirements	4.5
IQ4	Information from SPEKS is easy to understand	4.5
OI5	SPEKS has resulted in improved outcomes or outputs	4.5
OI6	SPEKS has resulted in an increased capacity to manage a growing volume of activity (e.g. transactions, population growth, etc.	4.5
IQ3	Information from the SPEKS is in a form that is readily usable	4.5
II2	SPEKS enhances my awareness and helps me recall job related information.	4.5
II1	I have learnt much through the presence of SPEKS	4.4
IQ6	Information from SPEKS appears readable, clear and well formatted	4.4
OI7	SPEKS has helped the organisation to be better prepared for e-government	4.4
OI4	SPEKS has resulted in overall productivity improvement	4.4
OI8	SPEKS has resulted in improved organisational processes	4.4
SQ2	Data from SPEKS is current enough	4.4
SQ16	All information in SPEKS is secure	4.3
IQ2	Information needed from the SPEKS is always available	4.3
SQ8	SPEKS includes all the necessary features and functions	4.3
OI1	SPEKS is cost effective	4.3
IQ8	Information from SPEKS is concise	4.3
OI2	SPEKS has resulted in reduced staff costs	4.3
SQ14	All data within SPEKS is fully integrated and consistent	4.2
OI3	SPEKS has resulted in cost reductions (e.g. inventory holding costs, administration expenses, etc.)	4.2
SQ9	SPEKS always does what it should	4.1
SQ13	SPEKS requires only the minimum number of fields and screens to achieve a task	4.1
SQ10	SPEKS user interface can be easily adapted to one's personal approach	4.1
IQ10	Information from SPEKS is unavailable elsewhere	4.1
IQ9	Information from SPEKS is always timely	4.1
SQ12	SPEKS responds quickly	4.0
SQ15	SPEKS can be easily modified, corrected or improved	3.9
SQ11	SPEKS is always up-and-running as necessary	3.9

Note:

the top-10 impacts   the bottom-10 impacts

Table3 –Items ranking based on the mean scores (ascending order)

Item with the highest score is IQ1, with the mean score of 5. Items with the lowest score are SQ11 and SQ15, with the mean score of 3.9. The top-10 ranking is filled with items from every dimension in the model. The ranking of the items indicates that no one dimension dominated the top-10 positions. With the mixture of items from all dimensions in the model at the higher rank, this may suggest that SPEKS has managed to provide positive impact to the users and the state governments measured from different important dimensions. IT Division and Management should now take action to maintain these higher ranked items. What is important for the IT Division and Management is to focus on items that were ranked at the bottom-10. From table 3 we observed that some aspects of System Quality and Information Quality, such as system reliability, efficiency, system accuracy, timeliness and flexibility need to be improved. For example, system reliability has the lowest score thus this demonstrates that the majority of SPEKS users are not satisfied with the reliability of the system. Based on the qualitative survey that was conducted at one state government before this survey, many respondents complaint about SPEKS being stalled while using it. Some says that the instability of the system is caused by the technical problem such as the computer network.

Although the mean score for these bottom-10 items is above the mid-point scale (a highly likely agree indication for the measures) some action should be taken to identify problems that have caused SPEKS to perform poorly according to these aspects (based on the perception of the users) and find ways to improve SPEKS by focusing on these aspects.

Part 4: The Comparative Analysis of the Impact of SPEKS across Four State Governments

The Impact scores were collected from the State Government of Negeri Sembilan, State Government of Melaka, State Government of Johor and State Government of Kelantan. SPEKS was implemented about the same time at these four state governments which started at the end of 2002. The installation was completed in mid 2005 and the system had been running completely for at least 4 years when the data was collected. It is believed that the system is in the mature stage and it was the right time for the IT Division and Management evaluate the impact of SPEKS to the state governments.

States	end	eturn	% Response
Negeri Sembilan	35	01	75 %
Kelant an	00	1	81 %
Melaka	0	5	69 %
Johor	00	3	73 %
Total	15	10	75 %

Table 4 –Number of respondents and the response rate of each state government.

In this section the impact scores separated by the state governments will be presented. Findings can then help the IT Division and Management understand the state of SPEKS at each state government involved in this study. Based on the results, we can further compare the effectiveness of SPEKS across the state governments.

<u>Dimensions mean scores according to state governments</u>

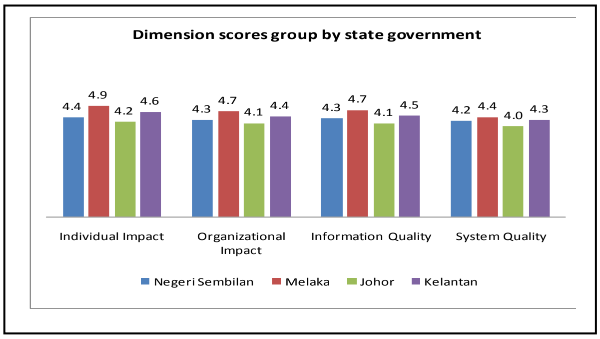


Figure 8 – Dimensions mean scores separated according to the state governments

Figure 8 presents the mean scores of Individual Impact, Organizational Impact, Information Quality and System Quality separated according to state governments. Mean scores range is mixed for each dimension. Large mean scores range is observed at Individual Impact that is between 4.2 and 4.9. The rest of the dimensions indicate smaller variance in scores given by these state governments. In fact respondents have provided almost consistent scores when evaluating the System Quality aspect of SPEKS with smallest mean scores range. Overall, these mean scores demonstrate a strong positive feeling of the respondents towards SPEKS because all mean scores are highly above the scale mid-point. Based on these mean scores, overall, we can conclude that all state governments have similar perceptions on the impact of SPEKS. This further indicates that the differences in the state government administrations do not influence on how SPEKS will impact a certain state government because overall we can see that SPEKS is effective and the impact given by SPEKS at these state government is almost the same.

Items mean score according to state governments

Although SPEKS has provided a strong positive impact to the state governments, the IT Division and Management can locate area that needs improvement in order to increase the impact score to the maximum score of 6. Focusing on the individual items in each Impact and Quality dimensions, IT Division and Management can identify which aspects that need improvement and which aspects need to be maintained. Figure 9 presents the mean scores of each item in the model separated by state governments.

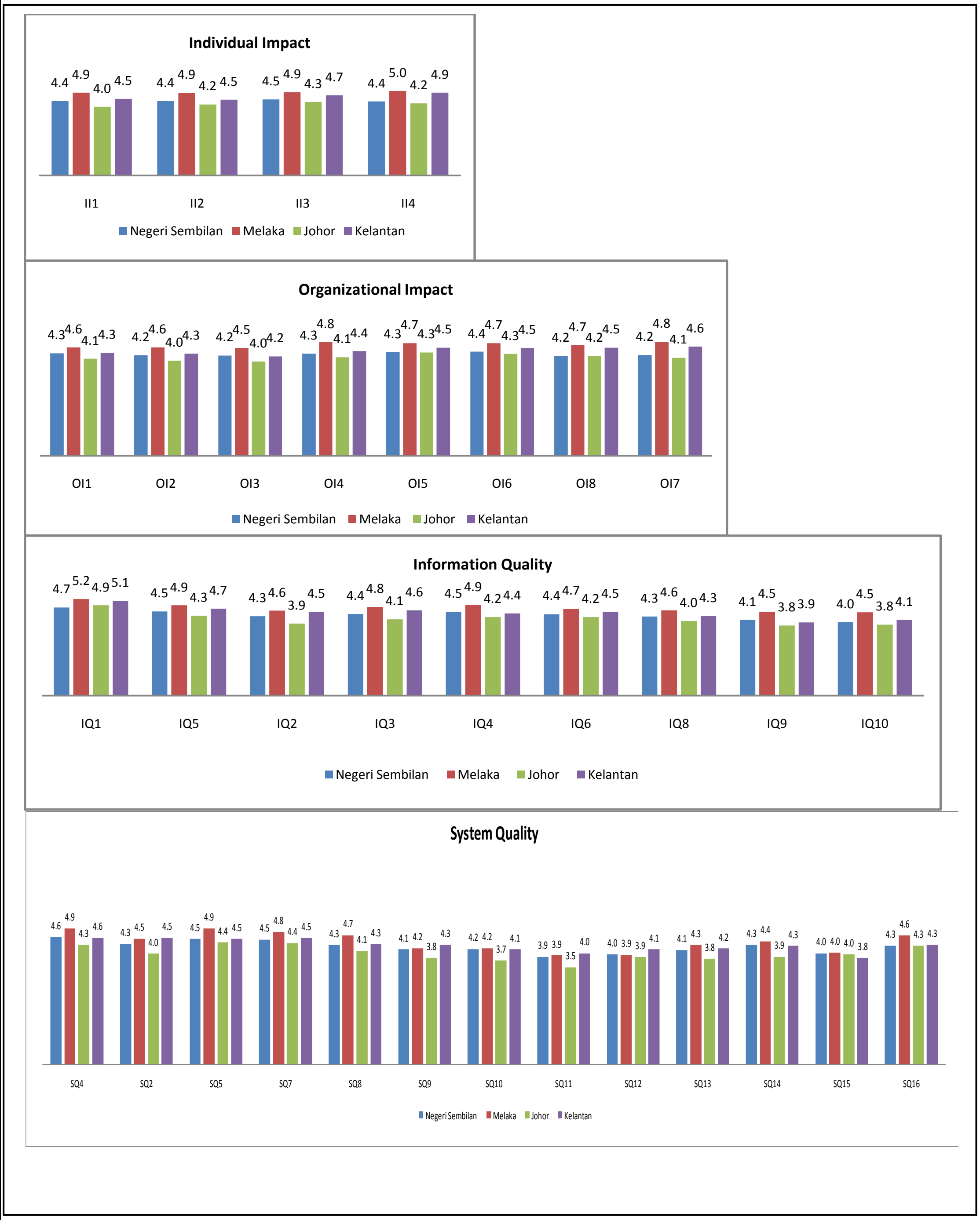


Figure 9 – Items mean score separated according to state governments

Items in both Individual Impact and Organizational Impact were scored higher by respondents, an indication that respondents agree that all aspects measure the impact of SPEKS to the users and the state governments have strongly affecting them positively. Moving on to the Quality aspects of SPEKS (measured through Information Quality and System Quality), we found that some items were scored lower for example items measuring Timeliness (IQ9) and Reliability (SQ11). Those items that were scored lower in this observation are the same items in the bottom-10 ranking presented in table 2. This findings also demonstrate that one state government (Johor) has consistently scored most items lower than the rest of the state governments. This may indicates that users in Johor do not think that SPEKS is effective than the rest of the respondents in other state governments.

Part 5: Discussion and Conclusions

This report has by far reported how SPEKS has impact the state governments involved in this study. Overall, we can conclude that SPEKS has provided a positive impact to the users and the state governments. However, there are still some actions that the IT Division and Management can take to improve the current impact score to the maximum score so that SPEKS can continuously provide benefits to both the users and the state governments.

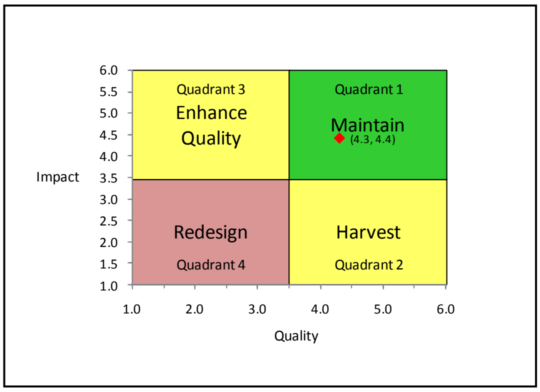


Figure 10 – The state of SPEKS (overall observation)

In order to help IT Division and Management planning for further action, we should first identify what is the current state of SPEKS by plotting the impact scores against the 'guidepost' to IS Success (see figure 3). By doing this, we can make conclusion where SPEKS is at and what action that we can take (either to maintain, enhance, harvest, or redesign) to improve the effectiveness of SPEKS in the future.

We first look at the overall impact scores. The two impact dimensions and the two quality dimensions are combined to form an impact and quality score. Figure 10 demonstrates that SPEKS presently in better position. With continuous maintenance SPEKS will continue provides positive impact to the state governments.

[Note that at this present stage the centroid (the intersection point that determines the boundaries for the four quadrants: Maintain, Harvest, Enhance Quality and Redesign) is equivalence to the scale mid-point. It is possible with continuous evaluation of SPEKS in the following years, the centroid may move up or down depends on the current situation. It is also depends on how competitive the stakeholders want SPEKS to be in the future.]

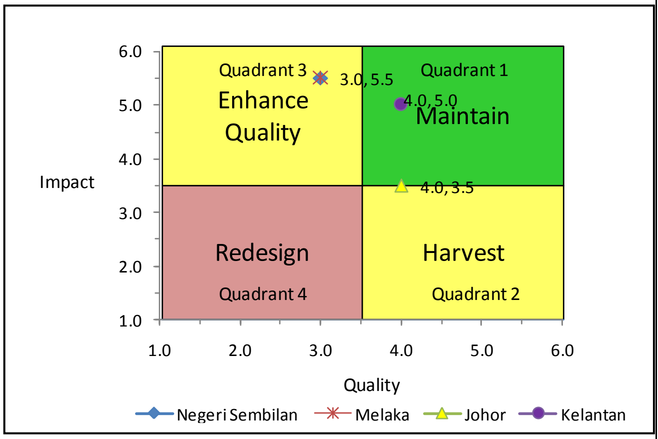
Although based on this general observation, we can see that SPEKS is performing well, however, the IT Division and Management should also identify the state of SPEKS at each state government. This is because, from the impact scores discussed in part 4, we can see that there are some differences on how users from different state government feel towards SPEKS. By separating the impact and quality scores according to the state government, we can see that the state of SPEKS is different at each state government (figure 11).

For Negeri Sembilan and Melaka, the Impact score is higher than the Quality score. Hi-Impact/Lo-Quality may have been strategic in the short-term, but IT

Figure 11 – The state of SPEKS (observed at each state government)

Division and Management should come up with a strategy to enhance the quality of SPEKS for future benefits.

The state of SPEKS in Kelantan is much better than in Negeri Sembilan and Melaka. The scores for Impact and Quality are high, thus the objective now is to maintain the quality of SPEKS.



Meanwhile, at state government of Johor, some work need to be done in order to enhance the impact of SPEKS for the users at this state government. Hi-Quality/Lo-Impact indicates that the users may have not seen the benefits of SPEKS to the individual and the state government, although the users agreed that the quality of SPEKS is high. A follow up with SPEKS users at state government of Johor can help identify the problem.

Referring to the objectives of developing and implementing SPEKS at state governments in Malaysia, we believe that based on the current state of SPEKS, most of the objectives outlined in Part 1 (objective 1, 2, 3 and 5) are met. This conclusion is made based on mean scores of specific items that are more related to the objectives. Table 5 presents the mean scores of some items that are closely related to the objectives of SPEKS.

SPEKS Objective	IS-Impact Dimension	Specific Items (mean scores)
To increase productivity and efficiency in Financial Management	Individual Impact and Organizational Impact	II3 (4.6), II4 (4.6) OI4 (4.4), OI8 (4.4)
To prepare accurate Financial Statement on time	Information Quality and System Quality	IQ8 (4.4), IQ9 (4.1) SQ2 (4.4)
To improve State's financial administration	Organizational Impact	OI5 (4.5)
To prepare the state government for the Electronic Government era	Organizational Impact	OI7 (4.4)

Table 5 – SPEKS performance

For conclusions, based on the results and observations, we believe that SPEKS has effectively provides benefits to the users and the state governments. Although some areas of quality need to be improved, the users feel that SPEKS is performing well. Furthermore,the IT Division and Management should conduct a regular evaluation of SPEKS (based on the standard set by the government) in order to keep track of the performance so that maintenance can be done appropriately to ensure SPEKS will continue providing positive impact to the users and organisations.

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