

WEB-BASED ASSESSMENT OF INFORMATION SYSTEMS SERVICES
QUALITY IN MALAYSIAN GOVERNMENT AGENCIES

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DEDICATION

To my parents and wife Thenmozly, for all their belief, support, and understanding.

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ABSTRACT

Conducting assessments using conventional techniques is time consuming, labour intensive and costly. Assessment data captured through conventional means requires conversion to electronic form, relevant storage mechanism, and data crunching to obtain summaries and reports. Assessing Information Systems Service Quality (ISSQ) moreover requires repetitive and continuous effort in order to improve service quality. In order to provide a solution to the above issues, this research firstly provides an understanding of assessment by identifying assessment elements through literature review on assessments conducted in various fields. The identified elements are assessment area, purpose, subject of assessment, measurement, results, and assessors. This is followed by development of a Model for Web-Based ISSQ Assessment that incorporates gap measurement from Gap Model. The model consists of the following components: service stakeholders, ISSQ elements, process, instrument, analysis, results and the Internet as a media of communication. A Web-Based ISSQ Assessment System Architecture is derived from the Model for Web-Based ISSQ Assessment. The architecture is used to develop a web-based ISSQ assessment prototype. Two case studies were conducted to test the model through the use of the prototype. The findings of the research are categorized into four parts. Firstly, it is found that the Model for web-based ISSQ Assessment is useful to the service providers of the case study organization as it provides a guideline for web-based ISSQ assessment. Secondly, gap measurement provides a simplified but useful means of assessing ISSQ by the stakeholders. Third, the addition of data mart and Online Analytical Processing (OLAP) cube enhances the value of assessment data. Finally, the research also shows that web-based assessment of ISSQ is applicable and practical, but requires good infrastructure support.

ABSTRAK

Proses penilaian menggunakan teknik sedia ada didapati mengambil masa yang lama, menggunakan tenaga kerja yang banyak, serta mahal. Data penilaian yang diperolehi melalui teknik sedia ada juga memerlukan penukaran kepada bentuk elektronik, mekanisme storan data yang sesuai, serta pemprosesan yang intensif untuk mendapatkan ringkasan dan laporan. Untuk menyelesaikan isu – isu di atas, kajian ini memberikan pemahaman mengenai penilaian dengan mengenal pasti elemen – elemen penilaian berdasarkan kajian literatur terhadap penilaian yang dilakukan dalam pelbagai bidang. Elemen – elemen penilaian yang dikenal pasti adalah tumpuan penilaian, tujuan, subjek penilaian, pengukuran, keputusan, dan penilai. Seterusnya, satu Model Penilaian Kualiti Servis Sistem Maklumat (ISSQ) Berasaskan Web berdasarkan pengukuran jurang dari Model Gap. Model ini mengandungi komponen – komponen berikut: pihak berkepentingan, elemen – elemen ISSQ, proses, instrumen, analisa, keputusan dan Internet sebagai media penghantaran. Sebuah Senibina Sistem Penilaian ISSQ Berasaskan Web dibina daripada Model Penilaian ISSQ Berasaskan Web. Senibina berkenaan digunakan untuk membangunkan sebuah prototaip Sistem Penilaian ISSQ Berasaskan Web. Dua kajian kes dijalankan untuk menguji model berkenaan melalui penggunaan prototaip. Hasil kajian dapat dibahagikan kepada empat bahagian. Pertama, didapati Model Penilaian ISSQ Berasaskan Web adalah berguna kepada unit ICT organisasi kajian sebagai panduan dalam menjalankan penilaian berasaskan web. Seterusnya, pengukuran jurang merupakan satu teknik yang mudah dan berguna untuk melakukan penilaian terhadap ISSQ. Ketiga, penggunaan “data mart” dan kiub OLAP meningkatkan nilai data penilaian yang disimpan. Keempat, kajian menunjukkan bahawa penilaian ISSQ berasaskan web dapat dilakukan dan praktikal, tetapi memerlukan infrastruktur yang baik.

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ABBREVIATIONS

ANOVA	Analysis of Variance
ASP	Active Server Pages
BU	Business Unit
C	Citizen
CAPI	Computer-Assisted Personal Interviewing
CEO	Chief Executive Officer
DBMS	Database Management System
DID	Department of Irrigation and Drainage
DSS	Decision Support System
DVS	Department of Veterinary Services
EG	Electronic Government
EIA	Environmental Impact Assessment
EPS	Electronic Procurement System
ETL	Extraction, Transformation, and Loading
G	Government
GMPC	Government Multi-Purpose Card
GOE	Generic Office Environment
GUI	Graphical User Interface
GVU	Graphics, Visualization, And Usability Center
HRMIS	Human Resource Management Information System
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IBM	International Business Machine (IBM) Corporation
ICT	Information & Communication Technology
IHL	Institutes of Higher Learning
IIS	Internet Information Services
IRB	Internal Revenue Board

IS	Information Systems
ISDN	Integrated Digital Services Network
ISO	International Standards Organization
ISP	Internet Service Providers
ISS	Information System Services
ISSQ	Information System Services Quality
IT	Information Technology
ITD	Information Technology Division
JSP	Java Server Pages
KLCH	Kuala Lumpur City Hall
MAMPU	Malaysian Administration Modernization & Planning Unit
MARA	Majlis Amanah Rakyat
MDD	Multidimensional databases
MOH	Ministry of Health
MOLAP	Multidimensional Online Analytical Processing
MSC	Multimedia Super Corridor
NCREL	North Central Regional Educational Library
NID	National Immigration Department
NRD	National Registration Department
OLAP	Online Analytical Processing
OLTP	Online Transaction Processing
PC	Personal Computer
PHP	Hypertext Preprocessor
PMO	Prime Minister's Office
PMS	Project Monitoring System
PSD	Public Services Department
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RDBMS	Relational Database Management System
ROLAP	Relational Online Analytical Processing
RTD	Road Transport Department
SLA	Service Level Agreement
SMS	Short Messaging Service

SMTP	Simple Mail Transport Protocol
SQ	Service Quality
SSCMD	Sarawak State Chief Minister's Department
SSDC	Selangor State Development Corporation
UTM	Universiti Teknologi Malaysia
UTMCC	Universiti Teknologi Malaysia's Computer Centre
WWW	World Wide Web

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The advent of information and communication technology (ICT) has been a catalyst for the development of Multimedia Super Corridor (MSC). Through MSC, the government has initiated various IT flagship projects such as Smart School, E-Government, Telemedicine, Borderless Marketing Centre, National Multipurpose Card, Worldwide Manufacturing Web, and Research & Development Clusters. One of the seven flagships in MSC is the electronic government or EG (MAMPU, 1997a). The EG's vision stresses on some key issues: to dramatically improve productivity, and to provide high quality, low-cost, effective and efficient services from the government to the citizen, or G to C (MAMPU, 1997b). A paperless government will reduce cost, duplication of data and also the amount of time involved for the transaction. The services delivered by government agencies can be categorized into citizen and business, intra-agency, and inter-agency, and the means of interaction also varies (MAMPU, 1997a).

In EG, various initiatives are being undertaken such as Human Resource Management Information system (HRMIS), Electronic Procurement System (EPS), Project Management System (PMS), and Generic Office Environment (GOE) among others. Each of these projects is given to a lead agency and is currently under various stages of implementation. Lately, many government agencies have indulged in major upgrade and overhaul of their services. Road Transport Department (RTD), Internal Revenue Board (IRB), National Immigration Department (NID), and National Registration Department (NRD) are examples of agencies that have begun

incorporating ICT in their data management, office automation, intra-government relationships, and counter services. For example, NRD have been actively using ICT to enhance their products such as Government Multi-Purpose Card (GMPC). RTD has provided web-based information retrieval for summons and Short Messaging Service (SMS) via mobile phones. IRB are implementing tax payment through banks and introducing self-assessment for the taxpayers. Department of Irrigation and Drainage (DID) have introduced “infobanjir”, a flood information system recently. In EG – based projects, some government agencies are chosen as pilot agencies to implement these systems. HRMIS, for example, is undertaken by ten agencies namely Public Services Department (PSD), Kuala Lumpur City Hall (KLCH), Ministry of Health (MOH), Sarawak State Chief Minister Department (SSCMD), DID, Selangor State Development Corporation (SSDC), Majlis Amanah Rakyat (MARA), Department of Veterinary Services (DVS), Prime Minister’s Office (PMO) and Malaysian Administration Modernization and Planning Unit (MAMPU). DVS, in this case, have been in the forefront of implementing many of the government’s IT projects for many years. This research takes Department of Veterinary Services (DVS) headquarters and Department of Irrigation and Drainage (DID) headquarters as case study organizations to implement the research.

As with any other organizations, service recipients, either internal or external, of government agencies become customers of the organizations. The services offered by DVS and DID, both internal and external, will be under scrutiny and will be a reflection of the customer’s satisfaction while interacting with the agencies’ staff or systems. The country’s technological advancement in IT has increased the consumers’ expectation of public service. People tend to expect affordable, fast, efficient, and cheaper services (The Star, 2001a). The ordinary consumers are the real IT constituents, thus the authorities need to hold regular consultations with the public. When a government agency is privatized, computerized or goes online, the public expects tremendous improvement in quality and delivery of service. However, the complaints received indicate that the fundamental issue of rendering basic quality service is still lacking (The Star, 2001a). In order to achieve the vision of EG, services offered by agencies need to be assessed, so that improvements can be made.

Services provided by agencies can be categorized into transactional or informational (MAMPU, 1997a). Some of these transactional or informational services are related directly to the information systems used or provided by the agencies and can be identified as information systems services (ISS). These ISS will affect the productivity of the staff and subsequently the productivity of the agency. Information systems services quality (ISSQ) assessment is important so that areas that need improvement can be identified.

1.2 Problem Background

Currently, service quality is maintained through vehicles such as customer charters, quality committees, feedback boxes, and even the media. Customers may give feedback or opinions on the services obtained through suggestion boxes, telephone hotline, or conventional mail. Such methods are not conducive for assessment purposes because of time and place constraint. Customers must make themselves free to utilize the various methods mentioned above. Some of the methods also cause a delay in receiving these feedbacks, which will render them less useful to the organization.

Some of the provided methods are not properly utilized by the agencies concerned. Suggestion boxes are not placed in an accessible manner or the feedback forms are depleted. Hotlines can be busy or left unattended, while letters can get misplaced along the way.

Even if the feedback methods exist and are properly utilized, many customers will think twice about giving response because the information given will pass through another person. The staff who is involved in “sorting” or collecting the feedback information may be biased, or even unethical. The question of proper analysis of data also arises. Collating the data manually or entering data into computers introduces human error. If the data that are gathered are misinterpreted, wrong decision can be taken, resulting in resources being wasted.

With the introduction of the Internet, many government agencies place feedback forms or email link on their websites for the online visitors. These “advanced” methods do look attractive, but lack of proper publicity and coordination defeats the purpose of gathering feedback. E-mails sent to agencies are replied to after some duration of time, or worse still, not at all. The advantages of using such “advanced” methods are that the electronic format of data eases analysis and report generation. It also facilitates centralized data collection and information sharing in a paperless environment.

To win over customers and reduce the negative light being shed on them, many of the agencies are becoming proactive. The management is introducing newer ways of improving services. Brainstorming sessions, “Service with a Smile” campaigns, ‘open day’ with the public, and facilities upgrading exercises are some of many approaches being undertaken. On their part, the government has commissioned a Public Complaints Bureau for handling complaints against government agencies.

All the measures above deal with service quality in general. There is no special focus on IS services. Information systems service quality needs to be assessed because it will reflect on the success of the IS, the performance of the staff, and the productivity and involvement of the IT/IS department or business unit. More importantly, since public services tasks are increasingly being computerized, the ISSQ assessment will prove to be an indicator of the performance of that particular agency in a computerized environment. Feedback from such an ISSQ assessment is essential for government agencies to evaluate and improve their quality standards. The knowledge will facilitate more informed prioritization, improved strategic resource allocation, and improved value for money (Donnelly *et al.*, 1995). In order to solve the main drawbacks of current assessment methods (ad-hoc basis, element of bias, time and place constraint, time and labor intensive), a web-based assessment system is proposed.

1.3 Problem Statement

Continuing from the previous section, service quality assessment is generally conducted on an ad-hoc basis. Drawbacks such as improper planning, labor intensive, time and place constraints, lack of theoretical knowledge, and complexity associated with data collection and analysis cause service quality assessment to be rarely conducted. More specifically, information systems service quality is seldom the main focus during service quality assessment. Service consumers also face difficulties in providing feedback using conventional techniques due to high cost, labour intensive, and time consuming. However, ICT advancements provide a possible solution towards assessment of ISSQ. Thus, the research question is:

How can an ICT-based system be developed that allows for capture and storage of ISSQ assessment data for use by service providers?

1.4 Objectives of the Research

The purpose of this study was to (i) identify the elements involved in ISSQ assessment, (ii) design a model for web-based ISSQ assessment, (iii) design a web-based ISSQ assessment system, and (iv) create a web-based ISSQ assessment prototype based on the web-based ISSQ assessment system design.

1.5 Theoretical Framework

The basis of assessment in this research is the Gap Model by Parasuraman *et al.* (1985) and IS services (Bailey and Pearson, 1983; Ives *et al.*, 1983, Rand, 1992; Kettinger and Lee, 1994; Saaksjarvi and Saarinen, 1994; Pitt and Watson, 1995; Varun *et al.*, 1996; Jayasuriya, 1998). The Gap Model is commonly used to measure the difference between perception and expectation of service recipients. This difference is known as “service quality gap” and it reflects the underlying shortcomings or problems in a service-oriented organization. This study used the Gap Model for assessment of the services. The two concepts are described in the

following sub-sections. The assessment instrument is implemented using WWW technology. This is because the government agencies have various stakeholders who directly or indirectly use the ISS in different places at different times. Since there are many stakeholders, an ICT means of gathering information is suitable as it can cater to a larger group and does not have time or geographic constraints.

1.5.1 Service Quality Model

The main idea is that the concept of quality is influenced by or based on the users'/recipients'/participants'/customers' contact with the product and the environment (what the person hears/sees/thinks). This means that each person might have similar or totally different views on quality. External factors such as society norms, government and organizational policies, and international standards further influence these views. By interacting with the customers, their views can be obtained and used to improve the services provided. This concept is exemplified by the Service Quality Model.

Parasuraman *et al.*'s (1994) Service Quality Model (Figure 1.1) forms an important part of the assessment. The model is based on gap measurement. The most important among the gaps introduced by Parasuraman *et al.* (1994) is the "service quality gap". The service quality gap is the difference between recipients' expectation of service and perception of the service actually received. Their instrument, SERVQUAL, is used to measure the expectation and perception of the service recipient according to five dimensions of service quality: empathy, reliability, responsiveness, assurance and tangibles.

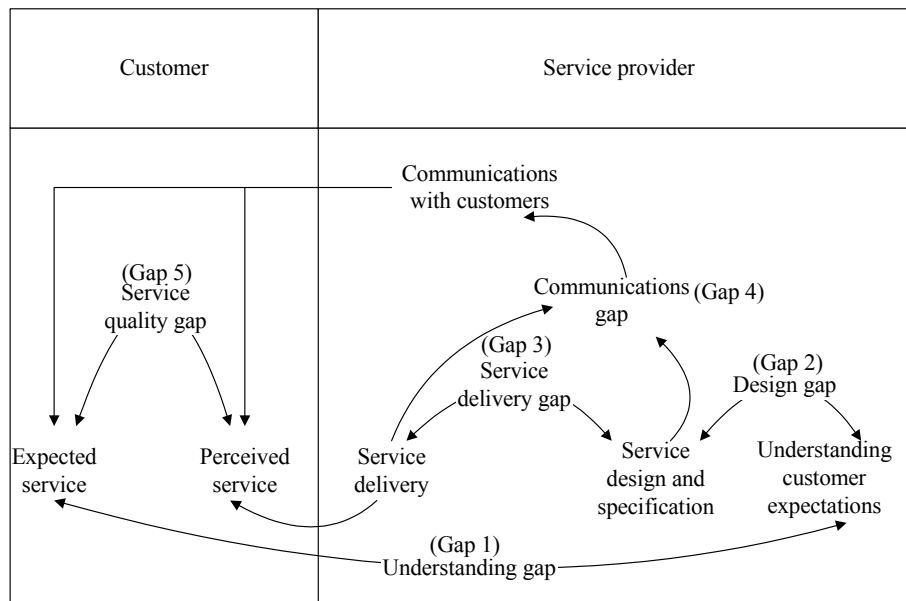


Figure 1.1: SERVQUAL (Gap) Model (Zeithaml *et al.*, 1990)

Even though the dimensions are considered generic in nature (meaning that it can be applied to all types of industries), many subsequent studies implemented SERVQUAL by introducing various modifications such as in wording of questions and number of questions. The SERVQUAL instrument has been extended to many areas and industries such as public services (Donnelly *et al.*, 1995), hospitality industry (Wong *et al.*, 1999), accounting firms (Freeman and Dart, 1993), hospital (Lam, 1997) management science projects (Robinson and Pidd, 1998), electrical and gas utility company (Babakus and Boller, 1992), banking (Johnston, 1995), pizza delivery service (Buttle, 1996), telecommunications services (Lapierre, 1996), extranets (Cody and Hope, 1999) and IS organizations (Kettinger and Lee, 1994; Pitt and Watson, 1995; Kang and Bradley, 1999). Because of the adaptation, some of the versions of SERVQUAL has been given specific names such as HOLSERV for hospitality industry, IS-SERVQUAL for IS related organizations, and EX-SERVQUAL for extranets.

This research used the fundamental ideas put forth by the Gap Model in developing an assessment method. The measurement of perception and expectation of the respondents is the main idea to be used in the proposed assessment model. The difference between the measured values is calculated and produced to the system owner.

1.5.2 Information Systems Services

Service in the field of IS was initially suggested in the early 1990's by few researchers (Rand, 1992; Kettinger and Lee, 1994; Pitt and Watson, 1995; Jayasuriya, 1998) due to the reason that the role of IS departments were not confined to system development and operations only, but increasingly covered other IS functions and became more distributed. IS may be considered as a static product, but in the context of its usage, it should be viewed as service throughout the organization (Rand, 1992).

Various definitions of IS services are provided (Rand, 1992; Kettinger and Lee, 1994; Pitt and Watson, 1995; Dhillon and Lee, 2000) and IS services were categorized according to different parameters by various researchers (Saaksjarvi and Saarinen, 1994; Rose Alinda Alias *et al.*, 2001a).

ISS are provided by the ISS provider, usually the IS department, distributed provider units or external vendors (Varun *et al.*, 1996). Similar to other types of services, ISS involves interaction between the service provider and the recipients. In the case of ISS, the service provider can be looked at from two different perspectives; the service provider may be the staff that represent the IS department or it may also be the IS products which are in a form of systems application or machines (Rose Alinda Alias *et al.*, 2001a). The recipients of the ISS are users who interact direct and indirectly with the service. Figure 1.2 illustrates ISS.

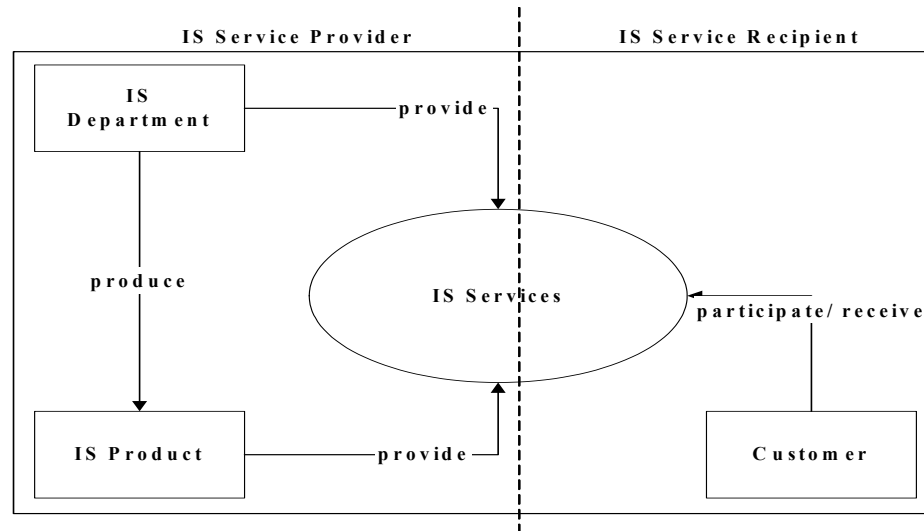


Figure 1.2: Information System Services (ISS) (Rose Alinda Alias *et al.*, 2001a)

1.6 Project Scope

This research makes use of existing knowledge about ISSQ and service quality assessment to extend the area of ISSQ assessment. The Gap Model proposed by Parasuraman *et al.* (1985, 1994) is used for assessment measurement.

The researcher was also part of a research team involved in conducting a case study on ISSQ in UTM and developing an ISSQ Model (Rose Alinda Alias *et al.*, 2001b). One of the researchers, Azizah Abdul Rahman (2004), focused on definition, and classification of IS services, and definition and description of ISSQ in form of a model. Azizah Abdul Rahman also categorized ISSQ elements, ISSQ factors, and ISSQ attributes.

However, this research focused on creating a web-based assessment for the ISSQ elements, factors and attributes described by Azizah Abdul Rahman. This research explores the use of ISSQ description by Azizah Abdul Rahman in the context of assessment and also web-based application. This research also focused on creating an assessment instrument, an assessment technique, and a suitable measurement. This research also attempted to identify and categorize IS services found in case study organizations according to the classifications developed by Azizah Abdul Rahman.

The focus of the research is on identifying assessment elements and developing a Model for Web-Based ISSQ Assessment. The elements are identified through literature reviews of assessments in industries such as environment, healthcare, and education.

The model is evaluated via a prototype Web-based ISSQ Assessment application at two government agencies: Department of Veterinary Services (DVS) headquarters in Bukit Damansara, Kuala Lumpur and Department of Irrigation and Drainage (DID) headquarters located in Kuala Lumpur. The evaluation is done through use of prototype demonstration, questionnaire and personal interviews.

Since the research involves case studies and prototype development, the research design includes feasibility study, instrument development, interviews, and application development processes.

The assessment system follows a client-server model with minimum processing on client side (thin-client). The client requires a web browser only since processing is done on the server side. This simple yet important implementation needs to be clarified in order to allow for least constraint on the end user part. This is because the client – server concept can also be implemented with a thick client - a client that takes part in some of the processing. In other words, the end – user’s machine most probably may require more than a basic web browser if the thick client implementation is used.

The assessment report generation involves generation of multi - dimensional data structure to facilitate a more dynamic reporting functionality. Thus data warehousing and online analytical data processing (OLAP) concepts were introduced at the design and implementation of the reporting stage of the assessment system. This allows for drill downs and slicing of assessment data based on the chosen criteria by the end user.

1.7 Project Importance

This project enables greater participation from service recipients of the organization and will contribute to a better understanding of customer needs. This project allows the agencies to identify and improve areas of ISSQ. By using the assessment system, the agencies will have an invaluable tool to gather feedback on ISSQ. This project can be part of e-government implementation as it deals with service quality issues. This project can also serve as a basis for other governmental agencies and private organizations to implement a similar system.

The research also broadens the knowledge in areas of web-based assessment, data warehousing, OLAP, and information systems service quality. The research contributes a model for web-based ISSQ assessment, a design of an assessment system, a dimensional model for ISSQ data mart, and an example of implementation using government organizations as a case study.

1.8 Thesis Structure

The thesis contents are divided into six chapters. Figure 1.3 shows the overall structure of the thesis report. The first chapter provides an overall view of the thesis. It contains the problem background, problem statement, research objectives, the theoretical framework, the research scope and importance of ISSQ assessment. It sets the background for the other chapters by providing an introduction to the research.

The second chapter contains the relevant literature review which was undertaken during the research. The literature review covers five broad areas: information systems, service quality, ISSQ, assessments, and data warehousing and online analytical processing (OLAP). It contains the relevant references, fundamental concepts and related issues that impact and provides groundwork for the research.

The third chapter is on the research design and implementation. It contains the operational framework. There are five phases in the operational framework consisting of initial study, feasibility study, prototype development, prototype evaluation, and report generation.

The fourth chapter is about the prototype design and development. The chapter begins with identification of assessment elements, followed by development of the Model for Web-Based ISSQ Assessment. The Model for Web-Based ISSQ Assessment is then used with the web-based assessment architecture to derive a web-based ISSQ assessment system design. The system design is the basis for the prototype development.

Chapter five continues with prototype evaluation. This chapter contains the case studies followed by the analysis of results obtained from the evaluation. The chapter also contains feedback from the case study organizations. A review of the research findings concludes this chapter.

The final chapter summarizes the research results, and identifies the contributions of the research. Some of the limitations faced during the research are also discussed here. Chapter six also provides some recommendations for further work in the area of web-based ISSQ assessment.

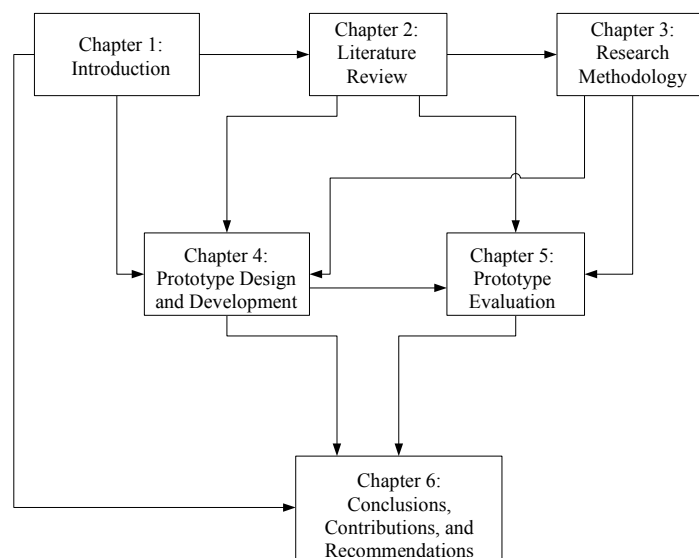


Figure 1.3: Thesis Structure

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