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

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

M.POOBALAN A/L M.MASILAMANI

A thesis submitted in fulfilment of the requirements for the award of the degree of
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Universiti Teknologi Malaysia

JUNE 2005
DEDICATION

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

Thank you Almighty Lord for giving me the strength and wisdom to pursue this research amidst many obstacles.

A glowing tribute to my dear supervisor Dr. Rose Alinda Alias who dedicated her time and energy trying to get me complete my research on time. Without her support and motivation, it would be a Herculean effort indeed.

A word of thanks to Dr. Azizah Abdul Rahman, fellow researcher and guide for her abundant advice and help throughout my journey.

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My gratitude also to the organizations that was considerate and helpful enough to allow my research to be conducted successfully.

To my buddies Ganesh, Suraj, Vallu, and other friends who have provided moral support.

Last, but not least, most importantly, to my excellent better half, Thenmozly, for continued support and zest that gave me the extra push every time I faltered.
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

# Table of Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARATION OF THE STATUS OF THESIS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUPERVISOR’S DECLARATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECLARATION ON COOPERATION AND CERTIFICATION OF EXAMINATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TITLE PAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DECLARATION PAGE</td>
<td>ii</td>
<td></td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
<td></td>
</tr>
<tr>
<td>ACKNOWLEDGEMENT</td>
<td>iv</td>
<td></td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>v</td>
<td></td>
</tr>
<tr>
<td>ABSTRAK</td>
<td>vi</td>
<td></td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vii</td>
<td></td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xiv</td>
<td></td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xvi</td>
<td></td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xix</td>
<td></td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xxii</td>
<td></td>
</tr>
</tbody>
</table>

1 **INTRODUCTION** | 1 |
1.1 Introduction | 1 |
1.2 Problem Background | 3 |
1.3 Problem Statement | 5 |
1.4 Objectives of Research | 5 |
1.5 Theoretical Framework | 5 |
1.5.1 Service Quality Model | 6 |
1.5.2 Information Systems Services | 8 |
1.6 Project Scope | 9 |
1.7 Project Importance
1.8 Thesis Structure

2 LITERATURE REVIEW

2.0 Introduction
2.1 Information Systems
  2.1.1 IS Perspective
  2.1.2 Information Systems Services
  2.1.3 Summary
2.2 Service Quality (SQ)
  2.2.1 Service
  2.2.2 Quality
  2.2.3 Service Quality Concept
    2.2.3.1 Service Quality Factors
  2.2.4 Service Quality Model
    2.2.4.1 Gap Model (SERVQUAL Model)
    2.2.4.2 Customer Quality Perception Model
    2.2.4.3 Service Management System Model
  2.2.5 SQ Measurement
    2.2.5.1 SERVQUAL
    2.2.5.2 SERVPREF
  2.2.6 Summary
2.3 IS Service Quality
  2.3.1 ISSQ Model
    2.3.1.1 ISS Package Content Quality
    2.3.1.2 ISS Component Quality
    2.3.1.3 Management Quality
  2.3.2 ISSQ Measurement Instruments
    2.3.2.1 IS-SERVQUAL
    2.3.2.2 IS User Satisfaction
    2.3.2.3 End-User Computing Satisfaction
    2.3.2.4 ISSQ Model Based Instrument
  2.3.3 Summary
2.4 Assessment
2.4.1 Assessment Concept
2.4.1.1 Definitions
2.4.1.2 Assessment Methods
2.4.1.3 Assessment Techniques

2.4.2 Service Quality Assessment

2.4.3 Web-based Assessment
2.4.3.1 Concepts and Definitions
2.4.3.2 Advantages of Web-based Assessments
2.4.3.3 Disadvantages of Web-based Assessments

2.4.4 Assessment Design
2.4.4.1 Enforcing Completion
2.4.4.2 User-selected ID
2.4.4.3 HTML Forms

2.4.5 Technology Requirements
2.4.5.1 Prototype Development Tool
2.4.5.2 Database
2.4.5.3 Web Server
2.4.5.4 Email Server
2.4.5.5 Internet Access
2.4.5.6 Client Side Requirements

2.4.6 Examples
2.4.6.1 GVU’s Series of WWW User Survey
2.4.6.2 EnGauge Online Assessment

2.4.7 Summary

2.5 Data Warehousing and Online Analytical Processing (OLAP)
2.5.1 Online Transaction Processing (OLTP) Databases
2.5.2 Data Warehouse
2.5.2.1 Data Warehouse Characteristics
2.5.2.2 Components of a Data Warehouse
2.5.3 Data Warehouse Architecture
2.5.3.1 Enterprise Data Warehouse
3 RESEARCH METHODOLOGY

3.0 Introduction 89

3.1 Operational Framework 89

3.2 Phase One: Initial Study 91
  3.2.1 Literature Review 91
  3.2.2 Research Refinement 92
  3.2.3 Case Study Organization Identification 92
  3.2.4 Summary 93

3.3 Phase Two: Feasibility Study 93
  3.3.1 Organization Identification 93
  3.3.2 Respondents Identification 94
  3.3.3 Tools and Instruments Preparation 95
    3.3.3.1 Interviews 96
    3.3.3.2 Questionnaires 97
  3.3.4 Data Gathering 97
  3.3.5 Data Analysis 98
  3.3.6 Summary 98

3.4 Research Design 98

3.5 Phase Three: Prototype Development 99
  3.5.1 Database Design 100
  3.5.2 Data Mart Design 101
  3.5.3 Report Design 102
  3.5.4 Summary 102

3.6 Phase Four: Prototype Evaluation and Data Gathering 102
  3.6.1 Interview Scheduling 103
  3.6.2 Data Gathering 103
    3.6.2.1 Interviews 103
4 PROTOTYPE DESIGN AND DEVELOPMENT

4.0 Introduction 107

4.1 Feasibility Study Findings 107

4.1.1 Feedback on Web-Based Assessment 108

4.1.2 Category and Classification of ISS 111

4.1.3 Service – Based Relationships in UTMCC 111

4.2 Assessment Elements 112

4.3 Instrument Development 116

4.4 Model Design 117

4.4.1 Input from ISSQ 118

4.4.2 Input from the Gap Model 120

4.4.3 Input from Assessment Concept 120

4.4.4 Input from Online Assessment Architecture 121

4.5 System Design 123

4.5.1 Use Case Analysis 124

4.5.1.1 Assessment Scenario 125

4.5.1.2 Use Case 128

4.5.1.3 Use Case To Architecture Mapping 130

4.5.2 System Architecture Modification 131

4.5.2.1 System Manager 132

4.5.2.2 Logging Routines 133

4.5.2.3 Report Engine 133

4.5.2.4 Databases 133

4.5.3 Process Design 133

4.5.3.1 Systems Manager 134

4.5.3.2 Question Engine 139

4.5.3.3 Logging Routine 141
4.5.3.4 Report Engine 142
4.5.4 Database Design 143
4.5.5 Data Warehousing 145
   4.5.5.1 Data Mart Design 146
   4.5.5.2 Data Transformation 154
   4.5.5.3 OLAP 158
4.5.6 Web-Based ISSQ Assessment System Design 160

4.6 Prototype Development 162
   4.6.1 Assessment Prototype 162
   4.6.2 ETL Component and Data Mart 166
   4.6.3 OLAP Components 169
   4.6.4 Summary 176

5 PROTOTYPE EVALUATION 178
5.1 Introduction 178
5.2 Case Studies 178
   5.2.1 Department of Irrigation and Drainage 179
   5.2.2 Department of Veterinary Services 180
5.3 Prototype Evaluation 181
   5.3.1 Prototype Evaluation at DID 181
      5.3.1.1 Data Preparation 182
      5.3.1.2 Assessment Promotion 182
      5.3.1.3 Assessment Scheduling 182
      5.3.1.4 Data Collection 183
      5.3.1.5 Data Analysis 184
      5.3.1.6 Feedback Analysis and Review 187
      5.3.1.7 Summary 190
   5.3.2 Prototype Evaluation at DID 191
      5.3.2.1 Data Preparation 191
      5.3.2.2 Assessment Promotion 191
      5.3.2.3 Assessment Scheduling 192
      5.3.2.4 Data Collection 192
      5.3.2.5 Data Analysis 193
      5.3.2.6 Feedback Analysis and Review 195
5.3.2.7 Summary 199

5.3.3 Prototype Evaluation Summary 200

5.3.3.1 Feedback Review 200

5.3.3.2 Problems During Evaluation 202

5.3.3.3 Prototype Weakness 203

5.3.3.4 Comparison with Conventional Technique 203

5.3.3.5 Summary 204

5.4 Model and System Review 204

6 DISCUSSION AND CONCLUSION 206

6.0 Introduction 206

6.1 Contributions 206

6.2 Research Limitation 208

6.3 Recommendations 208

6.4 Summary 209

6.5 Conclusion 210

REFERENCES 212

APPENDICES A – X 221
## LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Summary of IS Definitions</td>
<td>15</td>
</tr>
<tr>
<td>2.2</td>
<td>Summary of IS Functions</td>
<td>16</td>
</tr>
<tr>
<td>2.3</td>
<td>Breakdown of criteria for each dimension in SERVQUAL Instrument</td>
<td>32</td>
</tr>
<tr>
<td>2.4</td>
<td>Factors for ISS Package Content Quality</td>
<td>37</td>
</tr>
<tr>
<td>2.5</td>
<td>Factors for Application System Services</td>
<td>37</td>
</tr>
<tr>
<td>2.6</td>
<td>Factors for IT Infrastructure Services</td>
<td>38</td>
</tr>
<tr>
<td>2.7</td>
<td>Factors for Support Services</td>
<td>38</td>
</tr>
<tr>
<td>2.8</td>
<td>Factors for IS Management</td>
<td>39</td>
</tr>
<tr>
<td>2.9</td>
<td>Factors for Customer Management</td>
<td>39</td>
</tr>
<tr>
<td>3.1</td>
<td>Feasibility Study Respondents</td>
<td>94</td>
</tr>
<tr>
<td>3.2</td>
<td>The Process Involved in Implementing the Database Design</td>
<td>100</td>
</tr>
<tr>
<td>4.1</td>
<td>Feasibility Study Schedule</td>
<td>107</td>
</tr>
<tr>
<td>4.2</td>
<td>Results for Questions 7 to 11</td>
<td>109</td>
</tr>
<tr>
<td>4.3</td>
<td>Results for Question 12 (Problems that may occur if Internet-based assessment is used)</td>
<td>110</td>
</tr>
<tr>
<td>4.4</td>
<td>Elements in Assessment</td>
<td>112</td>
</tr>
<tr>
<td>4.5</td>
<td>Stakeholders In ISSQ Assessment</td>
<td>119</td>
</tr>
<tr>
<td>4.6</td>
<td>Comparison of elements existence between Web-Based ISSQ</td>
<td>124</td>
</tr>
<tr>
<td>4.7</td>
<td>Data Requirement for System Components</td>
<td>144</td>
</tr>
<tr>
<td>4.8</td>
<td>Dimensions for the Data Mart</td>
<td>151</td>
</tr>
<tr>
<td>4.9</td>
<td>Example of Data in Fact Table</td>
<td>153</td>
</tr>
<tr>
<td>4.10</td>
<td>Example of Data in Service Fact Table</td>
<td>154</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>SERVQUAL (Gap) Model</td>
<td>7</td>
</tr>
<tr>
<td>1.2</td>
<td>Information System Services</td>
<td>9</td>
</tr>
<tr>
<td>1.3</td>
<td>Thesis Structure</td>
<td>12</td>
</tr>
<tr>
<td>2.1</td>
<td>Literature Review Framework</td>
<td>13</td>
</tr>
<tr>
<td>2.2</td>
<td>IS Definition in an Organization</td>
<td>15</td>
</tr>
<tr>
<td>2.3</td>
<td>Perspectives on Information Systems</td>
<td>17</td>
</tr>
<tr>
<td>2.4</td>
<td>Relationship between ISS, IS provider work system, and IS work system</td>
<td>21</td>
</tr>
<tr>
<td>2.5</td>
<td>Customer Quality Perception Model</td>
<td>30</td>
</tr>
<tr>
<td>2.6</td>
<td>Service Management System</td>
<td>31</td>
</tr>
<tr>
<td>2.7</td>
<td>ISSQ Model Element Perspective</td>
<td>36</td>
</tr>
<tr>
<td>2.8</td>
<td>Model used in Web-Based Information System Service Quality</td>
<td>52</td>
</tr>
<tr>
<td>2.9</td>
<td>Online Assessment Architecture for A Set of Questionnaire</td>
<td>65</td>
</tr>
<tr>
<td>2.10</td>
<td>Web – Based Framework</td>
<td>67</td>
</tr>
<tr>
<td>2.11</td>
<td>Data Warehouse Concept</td>
<td>73</td>
</tr>
<tr>
<td>2.12</td>
<td>Contrasting OLTP and Data Warehousing Environment</td>
<td>73</td>
</tr>
<tr>
<td>2.13</td>
<td>Generic Data Warehouse Architecture</td>
<td>77</td>
</tr>
<tr>
<td>2.14</td>
<td>Enterprise Data Warehouse Architecture</td>
<td>77</td>
</tr>
<tr>
<td>2.15</td>
<td>Dependent Data Mart Architecture</td>
<td>78</td>
</tr>
<tr>
<td>2.16</td>
<td>Independent Data Mart Architecture</td>
<td>79</td>
</tr>
<tr>
<td>2.17</td>
<td>ROLAP Architecture</td>
<td>83</td>
</tr>
<tr>
<td>2.18</td>
<td>MOLAP versus ROLAP</td>
<td>84</td>
</tr>
<tr>
<td>2.19</td>
<td>Extraction, Transformation and Loading</td>
<td>86</td>
</tr>
<tr>
<td>3.1</td>
<td>Operational Framework</td>
<td>90</td>
</tr>
<tr>
<td>3.2</td>
<td>Research Design</td>
<td>99</td>
</tr>
</tbody>
</table>
3.3 Star Schema

4.1 Response to Questions 7 to 11

4.2 Rich Picture of ISS in UTMCC

4.3 Assessment Concept: Elements of ISSQ Assessment

4.4 Relationship between the various elements in assessment

4.5 Hierarchical Structure of instrument

4.6 Development Process for Model for Web-Based ISSQ Assessment

4.7 Initial Development of Model for Web-Based ISSQ Assessment

4.8 Expansion of Stakeholders’ View on ISS

4.9 Inclusion of Assessment Concept

4.10 Initial Model for Web-Based ISSQ Assessment

4.11 Assessment Flow for Respondents

4.12 Assessment Flow for Administrator

4.13 Use Case Diagram for Web-Based ISSQ Assessment System

4.14 Mapping Use Case to GVU’s System Architecture

4.15 Changes to the Web-Based ISSQ Assessment System Architecture

4.16 General Processes of System Manager (BU = business unit)

4.17 Quality Element Related Processes of System Manager

4.18 Service Related Processes of System Manager

4.19 Service Recipient Related Processes of System Manager

4.20 Question Engine Component Processes

4.21 Logging Routine Component

4.22 Report Engine Component

4.23 Information Flow From Assessment System to Data Mart and OLAP Tool

4.24 Provider and Service Dimension Link Only to Service Component Quality Results

4.25 Data Mart Dimensional Model Design

4.26 Data Access from OLTP to the User

4.27 Components of an ISSQ Assessment Cube

4.28 Web-Based ISSQ Assessment System Architecture

4.29 Main Screen for Respondents Showing Status of Each Assessment Section
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.30</td>
<td>Assessment Page for Services</td>
<td>164</td>
</tr>
<tr>
<td>4.31</td>
<td>Feedback Page for the Assessment Prototype</td>
<td>164</td>
</tr>
<tr>
<td>4.32</td>
<td>Main Screen for Administrator</td>
<td>165</td>
</tr>
<tr>
<td>4.33</td>
<td>Tables in Data Mart</td>
<td>167</td>
</tr>
<tr>
<td>4.34</td>
<td>Tasks in ETL Activity for Time Dimension</td>
<td>168</td>
</tr>
<tr>
<td>4.35</td>
<td>ActiveX script for populating an empty time dimension</td>
<td>169</td>
</tr>
<tr>
<td>4.36</td>
<td>Relationship between OLAP cubes</td>
<td>170</td>
</tr>
<tr>
<td>4.37</td>
<td>Browsing Data in Cube using Cube Browser</td>
<td>171</td>
</tr>
<tr>
<td>4.38</td>
<td>The Virtual Cube with Calculated Members – Non Service</td>
<td>172</td>
</tr>
<tr>
<td></td>
<td>Avg Gap, Service Avg Gap, and Overall ISSQ Gap</td>
<td></td>
</tr>
<tr>
<td>4.39</td>
<td>The Data Analysis and Report Page</td>
<td>175</td>
</tr>
<tr>
<td>4.40</td>
<td>Direct Queries to the OLAP Cube</td>
<td>176</td>
</tr>
<tr>
<td>5.1</td>
<td>DID ISS Provider Relationship</td>
<td>179</td>
</tr>
<tr>
<td>5.2</td>
<td>DVS ISS Provider Relationship</td>
<td>180</td>
</tr>
<tr>
<td>5.3</td>
<td>Revised Model for Web-Based ISSQ Assessment</td>
<td>205</td>
</tr>
</tbody>
</table>
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>ASP</td>
<td>Active Server Pages</td>
</tr>
<tr>
<td>BU</td>
<td>Business Unit</td>
</tr>
<tr>
<td>C</td>
<td>Citizen</td>
</tr>
<tr>
<td>CAPI</td>
<td>Computer-Assisted Personal Interviewing</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>DBMS</td>
<td>Database Management System</td>
</tr>
<tr>
<td>DID</td>
<td>Department of Irrigation and Drainage</td>
</tr>
<tr>
<td>DSS</td>
<td>Decision Support System</td>
</tr>
<tr>
<td>DVS</td>
<td>Department of Veterinary Services</td>
</tr>
<tr>
<td>EG</td>
<td>Electronic Government</td>
</tr>
<tr>
<td>EIA</td>
<td>Environmental Impact Assessment</td>
</tr>
<tr>
<td>EPS</td>
<td>Electronic Procurement System</td>
</tr>
<tr>
<td>ETL</td>
<td>Extraction, Transformation, and Loading</td>
</tr>
<tr>
<td>G</td>
<td>Government</td>
</tr>
<tr>
<td>GMPC</td>
<td>Government Multi-Purpose Card</td>
</tr>
<tr>
<td>GOE</td>
<td>Generic Office Environment</td>
</tr>
<tr>
<td>GUI</td>
<td>Graphical User Interface</td>
</tr>
<tr>
<td>GVVU</td>
<td>Graphics, Visualization, And Usability Center</td>
</tr>
<tr>
<td>HRMIS</td>
<td>Human Resource Management Information System</td>
</tr>
<tr>
<td>HTML</td>
<td>Hypertext Markup Language</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hypertext Transfer Protocol</td>
</tr>
<tr>
<td>IBM</td>
<td>International Business Machine (IBM) Corporation</td>
</tr>
<tr>
<td>ICT</td>
<td>Information &amp; Communication Technology</td>
</tr>
<tr>
<td>IHL</td>
<td>Institutes of Higher Learning</td>
</tr>
<tr>
<td>IIS</td>
<td>Internet Information Services</td>
</tr>
<tr>
<td>IRB</td>
<td>Internal Revenue Board</td>
</tr>
</tbody>
</table>
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
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMTP</td>
<td>Simple Mail Transport Protocol</td>
</tr>
<tr>
<td>SQ</td>
<td>Service Quality</td>
</tr>
<tr>
<td>SSCMD</td>
<td>Sarawak State Chief Minister’s Department</td>
</tr>
<tr>
<td>SSDC</td>
<td>Selangor State Development Corporation</td>
</tr>
<tr>
<td>UTM</td>
<td>Universiti Teknologi Malaysia</td>
</tr>
<tr>
<td>UTMCC</td>
<td>Universiti Teknologi Malaysia’s Computer Centre</td>
</tr>
<tr>
<td>WWW</td>
<td>World Wide Web</td>
</tr>
</tbody>
</table>
# LIST OF APPENDICES

<table>
<thead>
<tr>
<th>APPENDIX</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Factors and Attributes of ISSQ Elements</td>
<td>221</td>
</tr>
<tr>
<td>B</td>
<td>UTMCC’s General Information</td>
<td>225</td>
</tr>
<tr>
<td>C</td>
<td>UTMCC’s Organization Chart</td>
<td>226</td>
</tr>
<tr>
<td>D</td>
<td>UTMCC’s Client Charter</td>
<td>227</td>
</tr>
<tr>
<td>E</td>
<td>IS Services Provided By UTMCC</td>
<td>228</td>
</tr>
<tr>
<td>F</td>
<td>Interview Template B1 for Feasibility Study</td>
<td>230</td>
</tr>
<tr>
<td>G</td>
<td>Interview Template B2 for Feasibility Study</td>
<td>231</td>
</tr>
<tr>
<td>H</td>
<td>Interview Template B3 for Feasibility Study</td>
<td>232</td>
</tr>
<tr>
<td>I</td>
<td>Questionnaire B4 for Feasibility Study</td>
<td>234</td>
</tr>
<tr>
<td>J</td>
<td>ISSQ Assessment Instrument</td>
<td>239</td>
</tr>
<tr>
<td>K</td>
<td>Examples of Assessment Definitions in Healthcare Industry</td>
<td>249</td>
</tr>
<tr>
<td>L</td>
<td>Contact Person for Case Study Organization</td>
<td>250</td>
</tr>
<tr>
<td>M</td>
<td>Questionnaire for Case Study Organization</td>
<td>251</td>
</tr>
<tr>
<td>N</td>
<td>DID Information</td>
<td>254</td>
</tr>
<tr>
<td>O</td>
<td>ITD Units and Functions in DID</td>
<td>257</td>
</tr>
<tr>
<td>P</td>
<td>ISS Providers in DID</td>
<td>258</td>
</tr>
<tr>
<td>Q</td>
<td>IS Services, Providers and Recipients in DID</td>
<td>259</td>
</tr>
<tr>
<td>R</td>
<td>DVS Information</td>
<td>260</td>
</tr>
<tr>
<td>S</td>
<td>IT Units and Functions in DVS</td>
<td>263</td>
</tr>
<tr>
<td>T</td>
<td>IS Services, Providers and Recipients in DVS</td>
<td>264</td>
</tr>
<tr>
<td>U</td>
<td>Database Design and Description</td>
<td>265</td>
</tr>
<tr>
<td>V</td>
<td>DID Assessment Result</td>
<td>266</td>
</tr>
<tr>
<td>W</td>
<td>DVS Assessment Result</td>
<td>275</td>
</tr>
<tr>
<td>X</td>
<td>Data Mart Dimensions</td>
<td>284</td>
</tr>
</tbody>
</table>
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 (SSCMMD), 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.
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.
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.

![Diagram of Thesis Structure](image)


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