
By

William Belton Moinin
Department of Photogrammetry and Surveying
University College London
Gower Street
London WC1E 6BT


June 1997
Abstract

A modern Land Information Systems (LIS) is increasingly recognised as essential to a modern land market economy. However, while the ideals of a modern LIS are well defined, the investment issues involved in modernising an existing system are less clear.

This research attempts to clarify the issues involved in assessing the costs, benefits and values of instituting a LIS in a developing country, by studying the case of Sabah, in East Malaysia. It argues that instead of approaching LIS investment by quantifying the anticipated LIS benefits, many of which are unquantifiable, it is preferable to minimise existing inefficiencies and ineffectiveness in current procedures.

The research demonstrates that the existing shortfalls in the management of land information in Sabah, particularly in granting land titles, suppresses the land market value by as much as MR1.2 billion. In addition, it identifies annual losses ranging between MR0.2 to 0.8 million in lost revenue. The efficiency benefits with a computerised and modern LIS infrastructure are estimated to be worth MR1.1 million per annum. It is postulated that an investment of MR 118 million, in addition to the current LIM expenses, will be required to overcome existing inefficiencies and ineffectiveness. This amount is deemed necessary to identify problems, intensify the digital data conversion effort for the proposed Sabah Land Information System (SALIS), and to undertake the cadastral survey activities required for producing land titles. The investment should result in an undiscounted benefit to cost ratio of 10:1 for the state.

While the approach developed in this thesis does not purport to be the ideal solution for other developing nations as each national LIS investment problem is unique, the conclusion is that any major investment in a LIS should be driven by minimising current inefficiencies and ineffectiveness, and by the needs of the end users.
Acknowledgements

Many people have contributed to this work, which is the culmination of more than seven continuous years of study in the UK. First and foremost, my gratitude goes to my family, in particular my parents, John Moinin and Helen Boyong, who have been patient and supported me throughout my stay here. Thanks must also be extended to the Sabah State Government who sponsored the research and for allowing me leave from the state civil service.

This research in particular has benefited from the close guidance, supervision and tutelage of the supervisor, Professor Peter F. Dale. He has always been enthusiastic, patient and conscientious in his advice throughout the past three and a half years but more significantly during the difficult period of writing up for this thesis, he was very understanding, supportive and kind; it was an honour to have worked with him. Staff and colleagues at the department and the college in general have also provided a conducive atmosphere for independent thinking and study from which I feel privileged to have been a part. Two individuals from the department deserve mentioning for the help and advice throughout my stay, i.e. the Head of Department Professor Ian Harley for his approachability, and to the departmental secretary Mr. Gordon Bentley for always being there when I had a request or two.

During the data collection phases for this research, some other individuals and establishments must be acknowledged. The staff of the Department of Geomatics at the University of Melbourne, Australia, were very helpful during my research attachment at that institution and made my stay a very enjoyable experience. Professor Ian P. Williamson kindly spared much of his time in fruitful discussions and I shall always be grateful for the lessons that he imparted. Thanks must also be extended to Mr. Tai On Chan, a research student working with Professor Williamson, for engaging in many discussions and providing his perspectives on many related issues.

I owe a lot to many individuals who aided me during the research attachment in Sabah. Two people merit mentioning, i.e. the Director (Mr. Mohamad Jefry - now retired) and other fellow staff of the Lands and Surveys Department, and the Director (Dr. Yaakob
Johari) of the Sabah Institute for Development Studies (IDS), for allowing me to spend some time at their establishment for the purpose of conducting interviews, discussions and accessing documents, necessary for this research. Many other friends, individuals and government officers helped with useful advice and provided relevant reports but who wished to remain anonymous; my thanks for their assistance and understanding. Others who have contributed include Mr. H. Mogindol and Mrs. P. Lojikip of the Lands and Surveys Department, and particularly during the past year, to Ms. D. Mukiau for her encouragement and support.

Also, to the many unmentioned authors whose ideas have contributed in many ways during the course of this research and will no doubt continue to help in other ways in the future. Life will not be the same without the guidance and reflection resulting from their printed words. Any errors however are my own responsibility alone.

Last but not least, this thesis is dedicated to Sabah, my grandmother Tubong Dulijin and to the memory of my late grandfather, Mr. Boyong Matanul, with whom I wish I had spent more time.
TABLE OF CONTENTS

Title ................................................................................................................................. 1
Blank Page ..................................................................................................................... 2
Abstract ......................................................................................................................... 3
Acknowledgements ....................................................................................................... 4
Table of Contents .......................................................................................................... 6
List of Figures ................................................................................................................. 11
List of Tables .................................................................................................................. 13
List of Acronyms .......................................................................................................... 15
Map Showing Location of Sabah .................................................................................. 18

Chapter One
Introduction
1.1 Thesis Objective ..................................................................................................... 19
1.2 Investment Issues in a National LIS ...................................................................... 22
1.3 Thesis Structure ..................................................................................................... 25

Chapter Two
Land Information: A Review of Core Concepts, Management and Applications
2.1 Introduction .......................................................................................................... 27
2.2 Land Information ................................................................................................. 27
   2.2.1 Types of Land Information ..................................................................... 29
2.3 The Cadastre Concept ......................................................................................... 31
   2.3.1 Evolution of the Cadastre ..................................................................... 33
2.4 Land Registration ................................................................................................. 35
2.5 Multipurpose Cadastres, LIS and GIS ................................................................. 36
2.6 Uses of Land Information in Developing Countries ............................................ 40
   2.6.1 Urban Uses of LIS in Developing Countries ...................................... 41
   2.6.2 Rural Uses or Application of LIS in Developing Countries .............. 46
2.7 Consequences of Inadequate Land Information ................................................ 50
2.8 Conclusions ......................................................................................................... 53
Chapter Three

Economics of Land Information-A Theoretical Approach

3.1 Introduction .................................................................................................................. 55
3.2 Overview of Information as a Public good ............................................................... 55
3.3 Reasons for State Funding of Land Information Management ............................... 57
3.4 Changing State Roles and Consequences to Surveying and Mapping ..................... 60
3.5 Pricing for Land Information ...................................................................................... 63
3.6 Consequences to the Users of Changing Environment of
   Land Related Information .......................................................................................... 68
3.7 Salient Aspects of Information ................................................................................... 71
3.8 Determining the Value or Utility of Land Information ............................................ 75
   3.8.1 Problems of Information Valuation ............................................................ 76
3.9 Perspectives of Information Value ............................................................................ 77
3.10 Approaches to Valuing Information ........................................................................ 78
   3.10.1 Tangible Approaches to Valuing Information ........................................... 79
   3.10.2 Intangible Methods .................................................................................... 81
3.11 Comments on the Evaluation of Tangible and Intangible Values of Information ... 87
3.12 Approaches for Valuing Land/Geographic Data in Practice .................................. 89
   3.12.1 Studies in Great Britain ............................................................................. 89
   3.12.2 Australian Studies ..................................................................................... 92
3.13 Research Methodology for assessing Value of Data .............................................. 94
3.14 Conclusions ................................................................................................................ 96

Chapter Four

Costing Issues of LIS

4.1 Introduction .................................................................................................................. 97
4.2 Cost Factors and Literature Review of LIS .............................................................. 97
4.3 Proposed LIS Cost Schema ...................................................................................... 100
   4.3.1 System Acquisition Costs ......................................................................... 102
   4.3.2 LIS Staffing Costs ..................................................................................... 106
4.4 Investment Issues in Digital Data ............................................................................ 109
   4.4.1 Investment Intensity in LIS ....................................................................... 111
   4.4.2 Coverage of the LIS resource base ......................................................... 114
   4.4.3 Other issues in the data conversion process ............................................ 114
Chapter Four.

4.4.4 Cost and Data Sharing Issue ................................................................. 116
4.5 Cost Assessment ............................................................................................ 120
4.6 A Generalised LIS Data Collection Cost Model for a Developing Country ...... 123
  4.6.1 Scanning ................................................................................................... 123
  4.6.2 Digitising and Attribute Data Collection costs ....................................... 124
  4.6.3 Aerial Surveys ........................................................................................ 125
  4.6.4 Control Points Survey ......................................................................... 126
  4.6.5 Conventional Land Surveying ............................................................... 127
  4.6.6 Remote Sensing ..................................................................................... 128
  4.6.7 Summary of LIS Costs ......................................................................... 128

4.7 Consideration for Across Region Comparisons .................................................... 129
4.8 Intangible Costs in LIS ..................................................................................... 130
4.9 Outsourcing in LIS .......................................................................................... 133
4.10 Review of Funding Approaches for LIS in Developing Countries ..................... 135
4.11 The Funding of Federal and State linked agencies in Malaysia ....................... 139
4.12 Development Allocation and Budget Planning at the State Level .................... 143
4.13 Analysis of LIS funding options in Sabah ..................................................... 147
4.14 Conclusions .................................................................................................. 148

Chapter Five.

LIS Benefits in Developing Countries and a LIS Investment Justification Model

5.1 Introduction ...................................................................................................... 150
5.2 Classification of LIS Benefits ........................................................................ 150
5.3 Measurement of Efficiency Benefits ............................................................... 154
5.4 Measurement of Effectiveness Benefits .......................................................... 158
5.5 The Cadastre and LIS Benefits Within a Land Markets Context ....................... 161
5.6 Justifying Information Systems Investments - A Review ................................ 162
  5.6.1 Benefit Cost Ratios ................................................................................ 163
  5.6.2 Return on Investment (ROI) or Pay-back Period ................................... 165
  5.6.3 Net Present Value .................................................................................. 165
  5.6.4 Economic Internal Rate of Return .......................................................... 167
5.7 General Observation of the Evaluation Method ................................................ 168
5.8 Risks in LIS implementation .......................................................................... 169
5.9 A Conceptual National LIS Investment model ............................................... 173
5.10 Conclusions ............................................................................................................ 180

Chapter Six
Analysis of Existing Inefficiencies and Ineffectiveness in Sabah

6.1 Introduction ................................................................................................................ 181
6.2 Administration of Land in Sabah ............................................................................. 181

6.2.1 The Land Information Products and Services provided
by the Sabah LS department ..................................................................... 182
6.3 Current Processes of Applying for Land in Sabah .................................................. 186

6.3.1 Licensed Private Surveyors in Sabah ...................................................... 190
6.3.2 Applications for Land Development ........................................................ 192
6.4 An Analysis of the Major Backlog Issues in the Land Titling Process in Sabah ... 195

6.4.1 Land Application Backlogs - ACLR Offices .......................................... 196
6.4.2 Backlogs of Cadastral Surveys - DS Offices ........................................... 198
6.4.3 Backlogs in Cadastral Plan Checking ..................................................... 200
6.5 Estimate of Untitled Land in Sabah ......................................................................... 202
6.6 Costs of Land Titling Ineffectiveness in Sabah ...................................................... 204
6.7 Implications of Inefficiencies and Ineffectiveness in the Management of
Land Related Data ..................................................................................................... 207
6.8 Conclusions ................................................................................................................ 208

Chapter Seven
LIS Justification in Sabah and Related Issues of Finance

7.1 Introduction ................................................................................................................ 209
7.2 Quantification of Possible Benefits of a Cadastre based LIS in Sabah .......... 210
7.3 Anticipated Efficiency Benefits ............................................................................. 217

7.3.1 Estimation of Present Land Information Costs and Value in Sabah ...... 218
7.3.2 Assessment of Efficiency Benefits .............................................................. 223
7.3.3 Overview of Efficiency Benefits ................................................................. 228
7.4 Intangible LIS benefits to the LS Department ....................................................... 229
7.5 Overview of Sabah’s Economy ............................................................................. 231
7.6 Consequences of State-Federal Relations to the funding of LIS in Sabah ......... 239
7.7 Conclusions ................................................................................................................ 242
Chapter Eight
Research Analysis and Conclusions

8.1 Introduction ................................................................................................................ 245
8.2 Evidence for Investing in LIS Improvements .......................................................... 245
8.3 Present Scope of LIS Investment in Sabah ............................................................. 246
8.4 An Optimum LIS Investment Model in Sabah ....................................................... 251
8.5 Funding Sources ........................................................................................................ 255
8.6 Recommendations for the LS Department .............................................................. 257
8.7 Strategies for Sabah’s Land Information System (SALIS) .................................... 259
  8.7.1 Co-ordination ............................................................................................. 260
  8.7.2 Improving Institutional Arrangements ...................................................... 262
  8.7.3 Skills Development .................................................................................... 263
8.8 Lessons for Other Developing Countries ................................................................. 264
8.9 Recommendations for Further Work ...................................................................... 265
8.10 Conclusions .............................................................................................................. 266

Bibliography .................................................................................................................... 268

Appendix A: Checklist Used during Field Study ............................................................ 289
Appendix B: NALIS Cost Model ................................................................................... 299
Appendix C: Checklist for Cadastral Surveys Plan Checking .................................... 300
Appendix D: Checklist for Title Lease Preparations ...................................................... 301
List of Figures

Figure 2.1: Land Information required for urban development classified by function (Adapted from Holstein, 1992). .................. 44
Figure 2.2: Land-Ownership security and farm productivity: A Conceptual Framework (Adapted from Barnes, 1994). ........... 48
Figure 3.1: Classification of Information Value Measurement (Modified from Silk, 1991). ............................................................ 79
Figure 3.2: Guideline Criteria for Determining Intangible Information Values. .......................................................... 84
Figure 3.3: Model for Determining Information Value. ........------------ 87
Figure 4.1: LIS Cost as classified by Holstein (1991). ....................... 98
Figure 4.2: The LGMB (1989) Cost Model. ........................................ 99
Figure 4.3: A Proposed LIS Cost Model. ............................................ 101
Figure 4.4: Average Lifetime of Main LIS components. ................. 109
Figure 4.5: Required Critical Mass. ................................................... 112
Figure 4.6: The rate of adoption for LIS (Adapted from Rogers, 1993). ... 113
Figure 4.7: Components of a Spatial Data Sharing Program. (Adapted from MSC, 1993, p.95). ...................................................... 119
Figure 4.8: Process of National Development Planning (Adapted from IDS, 1992). ................................................................. 142
Figure 4.9: Process of Annual Development Budget Preparation (Adapted from IDS, 1992). .......................................................... 144
Figure 4.10: Request for and Additional fund for existing or new projects for the Current Year (Adapted from IDS 1993). .......... 145
Figure 5.1: A General Classification of LIS Benefits in Developing Countries. .............................................................. 152
Figure 5.2: LIS Efficiency Benefits. .................................................. 157
Figure 5.3: A Generalised LIS Benefit model. ................................. 158
Figure 5.4: Gap between existing benefits and costs due to Ineffectiveness and Inefficiencies in land information management (LIM) procedures. .................................. 175
Figure 5.5: Costs Benefits Curves and Optimum Investment level. .......... 179
Figure 6.1: Procedure of land application for all purposes
Source: Lands and Surveys Department, 1995). ........................................ 188

Figure 6.2: Cadastral Surveys procedure for Approval Applications
(Land and Surveys, 1995). ........................................................................ 191

Figure 6.3: The Title Conversion Process in Sabah (Lands and Surveys, 1995). .. 193

Figure 8.1: A General Outline of SALIS .................................................... 248

Figure 8.2: Land Information System Layer Concept (Adapted
from Dale and McLaughlin, 1988). ......................................................... 260
List of Tables

Table 2.1: Types and Purposes of Land Information (Adapted from Holstein, 1992). ................................................................. 30

Table 2.2: Land Information Management in the Urban Development Project Cycle (Adapted from Holstein, 1992). ................. 43

Table 3.1: The Service Benefit of LIS (Adapted from CCTA, 1995, p.34). ......... 86

Table 4.1: Simplified LIS Cost Model. ................................................................. 105

Table 4.2: Cost Model for Assessing Costs of Employee Involvement in a Land Information Project (Adapted from LCDM, 1995). .......... 106

Table 5.1: Example of Net Present Value (Adapted from Kohli, 1993, p.99). ................................................................. 166

Table 5.2: Investment Purposes, Types and Evaluation Techniques (Adapted from Remenyi et al, 1993). ........................................ 169

Table 5.3: Obstacles in GIS Implementation (Adapted from Crosswell, 1989). ................................................................. 172

Table 6.1: Main Sections and Functions of the Sabah LS department. ........... 184

Table 6.2: Table showing the main Functions, Outputs and Land Informational requirements of the District Lands Offices (Source: Various Lands & Surveys Department Loose Notes). ........... 185

Table 6.3: Sabah State wide Backlogs Reported by ACLR (Source: LS department Annual Statistic Reports). ......................... 197

Table 6.4: Backlogs of Cadastral Surveys in Sabah (Source: LS department Annual Statistic Report). ................................. 199

Table 6.5: Backlog of Surveys and Plan Checking (Source: LS department Statistic Reports). .................................................. 201

Table 6.6: The Backlogs of Draft Title Preparation (Source: LS department Annual Statistic Reports). ........................................ 202

Table 6.7: Summary of Work Backlog. ................................................................. 203

Table 6.8: Value of Agricultural Land (Adapted from Williams, Talhar and Yong). ................................................................. 205

Table 7.1: Sabah’s Land Distribution (Source: LS department 1994). ............. 211

Table 7.2: Proportion of various Land Titles as at March 1995 (LS department LS department Statistic Report 1995). ....................... 212
Table 7.3: Valuation Estimate of Work Backlogs in Sabah. .......................... 214
Table 7.4: Estimate of Annual Lost Revenue due to Backlog. ..................... 216
Table 7.5: Annual Costs of Managing the Sabah LS department from
Table 7.6: Overview of LS department Output (Source LS department Statistics Report, 1996). ......................................................... 221
Table 7.7: Sabah’s Revenue and Expenditure Estimates for 1994 to 1996
(Source: Compiled from Sabah’s Annual Estimates of Revenue and Expenditures 1994-1996). ......................... 232
Table 7.8: Major Components of State Revenue (Adapted from Pang and Vun 1994). ................................................................. 234
Table 7.9: Comparison of Federal and State contribution to the Malaysia Plans (Adapted from IDS, 1991). ..................................................... 237
Table 7.10: The Major Components of Sabah’s Expenditure
(Adapted from Pang and Vun, 1994). ..................................................... 241
# List of Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACLR</td>
<td>Assistant Collectors of Land Revenue</td>
</tr>
<tr>
<td>ADO</td>
<td>Assistant District Officers</td>
</tr>
<tr>
<td>AusAID</td>
<td>Australian International Development Assistance Bureau</td>
</tr>
<tr>
<td>ALIC</td>
<td>Australian Land Information Council</td>
</tr>
<tr>
<td>ANZLIC</td>
<td>Australia and New Zealand Land Information Council</td>
</tr>
<tr>
<td>ARIST</td>
<td>Annual Review of Information Science and Technology</td>
</tr>
<tr>
<td>AGI</td>
<td>Association for Geographic Information</td>
</tr>
<tr>
<td>B/C</td>
<td>Benefit Cost</td>
</tr>
<tr>
<td>BNBCC</td>
<td>British North Borneo Chartered Company</td>
</tr>
<tr>
<td>CALS</td>
<td>Computer Assisted Land Survey</td>
</tr>
<tr>
<td>CBA</td>
<td>Cost Benefits Analysis</td>
</tr>
<tr>
<td>CCTA</td>
<td>Central Computing Telecommunications Agency</td>
</tr>
<tr>
<td>CDMS</td>
<td>Cadastral Digital Mapping System</td>
</tr>
<tr>
<td>CM</td>
<td>Chief Minister</td>
</tr>
<tr>
<td>CPS</td>
<td>Cadastral Processing Section</td>
</tr>
<tr>
<td>CL</td>
<td>Country Leases</td>
</tr>
<tr>
<td>DBMS</td>
<td>Database Management System</td>
</tr>
<tr>
<td>DCBD</td>
<td>Digital Cadastral Data Base</td>
</tr>
<tr>
<td>DFG</td>
<td>Direct Federal Grant</td>
</tr>
<tr>
<td>DO</td>
<td>District Officers</td>
</tr>
<tr>
<td>DOSLI</td>
<td>Department of Survey and Land Information</td>
</tr>
<tr>
<td>DP</td>
<td>Development Plans</td>
</tr>
<tr>
<td>DS</td>
<td>District Surveyor</td>
</tr>
<tr>
<td>EIRR</td>
<td>Economic Internal Rate Return</td>
</tr>
<tr>
<td>EPD</td>
<td>Economic Planning Division</td>
</tr>
<tr>
<td>FG</td>
<td>Federal Government</td>
</tr>
<tr>
<td>FGDC</td>
<td>Federal Geographic Data Committee</td>
</tr>
<tr>
<td>FIG</td>
<td>International Federation of Surveyors</td>
</tr>
<tr>
<td>FR</td>
<td>Field Registers</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>IDS</td>
<td>Institute of Development Studies, Sabah</td>
</tr>
<tr>
<td>IGC</td>
<td>Inter Governmental Committee</td>
</tr>
<tr>
<td>IJGIS</td>
<td>International Journal of Geographic Information Systems</td>
</tr>
<tr>
<td>IS</td>
<td>Information System</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>LA</td>
<td>Land Application</td>
</tr>
<tr>
<td>LCDM</td>
<td>Malaysian Ministry of Land and Co-operative Development</td>
</tr>
<tr>
<td>LGMB</td>
<td>Local Government Management Board</td>
</tr>
<tr>
<td>LIM</td>
<td>Land Information Management</td>
</tr>
<tr>
<td>LIS</td>
<td>Land Information Systems</td>
</tr>
<tr>
<td>LS department</td>
<td>Land and Surveys Department, Sabah, East Malaysia</td>
</tr>
<tr>
<td>LUWC</td>
<td>Land Utilisation Working Committee</td>
</tr>
<tr>
<td>MIS</td>
<td>Institute of Surveyors, Malaysia</td>
</tr>
<tr>
<td>MP</td>
<td>Malaysia Plan</td>
</tr>
<tr>
<td>MR</td>
<td>Malaysian Ringgit</td>
</tr>
<tr>
<td>MSC</td>
<td>Mapping Science Committee</td>
</tr>
<tr>
<td>NALIS</td>
<td>National Land Information System</td>
</tr>
<tr>
<td>NCR</td>
<td>Native Customary Rights</td>
</tr>
<tr>
<td>NDP</td>
<td>New Development Policy</td>
</tr>
<tr>
<td>NDPC</td>
<td>National Development Policy Council</td>
</tr>
<tr>
<td>NEP</td>
<td>New Economic Policy</td>
</tr>
<tr>
<td>NGOs</td>
<td>Non Governmental Organisations</td>
</tr>
<tr>
<td>NGRS</td>
<td>National Geodetic Reference System</td>
</tr>
<tr>
<td>NGS</td>
<td>National Geodetic Survey</td>
</tr>
<tr>
<td>NLIS</td>
<td>National Land Information System</td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
</tr>
<tr>
<td>NT</td>
<td>Native Titles</td>
</tr>
<tr>
<td>OGDC</td>
<td>Office of Geographic Data Co-ordination</td>
</tr>
<tr>
<td>OPP1</td>
<td>First Outline Perspective Plan Malaysia</td>
</tr>
<tr>
<td>OS (GB)</td>
<td>Ordnance Survey of Great Britain</td>
</tr>
<tr>
<td>PERS</td>
<td>Photogrammetric Engineering and Remote Sensing</td>
</tr>
<tr>
<td>PL</td>
<td>Provisional Leases</td>
</tr>
<tr>
<td>PLS</td>
<td>Private Licensed Surveyor</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>PSD</td>
<td>Public Service Division</td>
</tr>
<tr>
<td>ROI</td>
<td>Return on Investment</td>
</tr>
<tr>
<td>RSP</td>
<td>Registered Survey Papers</td>
</tr>
<tr>
<td>SAR</td>
<td>Synthetic Aperture Radar</td>
</tr>
<tr>
<td>SEPD</td>
<td>State Economic Planning Division</td>
</tr>
<tr>
<td>SDP</td>
<td>State Development Plan</td>
</tr>
<tr>
<td>SDPC</td>
<td>State Development Plan Committee</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operating System</td>
</tr>
<tr>
<td>SSB</td>
<td>Skim Saraan Baru (New Remuneration Scheme)</td>
</tr>
<tr>
<td>TL</td>
<td>Town Leases</td>
</tr>
<tr>
<td>TOL</td>
<td>Temporary Occupational Leases</td>
</tr>
<tr>
<td>UMI</td>
<td>Universities Microfiche International</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNCHS (Habitat)</td>
<td>United Nations Centre for Human Settlements</td>
</tr>
<tr>
<td>UNESCO</td>
<td>UN Education, Scientific and Cultural Organisation</td>
</tr>
<tr>
<td>URISA</td>
<td>Urban and Regional Information Systems Association</td>
</tr>
<tr>
<td>WCED</td>
<td>World Commission on Environment and Development</td>
</tr>
</tbody>
</table>
Map Showing Approximate Location of Sabah, East Malaysia
Chapter One
Introduction

1.1 Thesis Objective

The central objective of this thesis is to examine the issues involved in determining an appropriate investment level in a modern computerised land information system (LIS) in a developing country. However, the complexity and varying requirements involved in the implementation of a modern LIS, added to the uniqueness of land information management procedures in any country, necessitates that this research should focus on a single case study. For this purpose, the situation in Sabah, which was one of the original members of the Federation of Malaysia, will be examined and analysed.

It proposes the notion that as opposed to the widely held view of comparing the anticipated benefits and costs of introducing, adopting and integrating computer related approaches to the management of land related data, it is more beneficial for the agencies concerned to instead quantify the consequential costs of existing inefficiencies and ineffectiveness and use the estimate of these forgone benefits to determine an investment level in upgrading an existing LIS. This dissertation argues that using these estimated values to determine how much to invest in reforming existing methodologies provides some useful advantages including a better identification of the management areas that require improvements. It focuses attention on the needs of the users, identifies weaknesses in existing processes and systems, as well as gives an indication of what is forgone, i.e. the opportunity costs, due to existing shortcomings.

A wide range of literature is now available on the means, methods, advantages, etc. of managing land related records with the aid of computers. The significant developments can be traced back since the 1970s and 1980s (McLaughlin, 1975; Dale and McLaughlin, 1988; Williamson, 1983) although the use of computers in geographical data handling existed much earlier (Tomlinson, 1974). It is generally accepted that computerising the processes involved in data collection, handling, formation of data models or analysis that aids the decision making processes, offers significant benefits over previous procedures, in which maps and records or registers form the most common method of data representation, description and analysis.
What has not always been clear however are the issues concerned with the ideal amount of investment, i.e. how much should an organisation or a government invest in improving the management of its land information? This leads to a wide range of concerns, e.g. the question of what should be evaluated in order for the proposed computer related solutions to be adopted and integrated into existing mechanisms and processes of land information management. It is a widely accepted fact that in today’s competitive economic environment, it usually takes a good deal of time and effort by the organisations concerned to convince their paymasters of the benefits in e.g. building a digital spatial database conducive to the development of a modern LIS infrastructure. As hinted by McLaughlin and Larsen (1976), there is also the danger that the costs of the system will easily get out of hand if they are not tied to the usefulness of the information in achieving stated objectives.

The most common method for quantitatively justifying a case for modernising an existing land information system is the cost and benefit analysis (CBA), which has often been mentioned in the literature on land records management and administration (McLaughlin and Larsen, 1976; Dale and McLaughlin, 1988; Epstein and Duchesneu, 1984; Angus Leppan, 1983; Larsson, 1991). A recent example of the technique’s successful usage within this context is the Consultancy work undertaken by Tomlinson Associates (1993a) for the state of Victoria in Australia. The study, which determined the costs and benefits of improving the Victorian Government’s approach to managing and using land and geographic information systems, can be considered to be successful because it convinced the Government to accept the vision contained in the CBA report. It resulted in government departments implementing the broad strategy outlined in the consultant’s report.

Whether such approaches are applicable for evaluating an investment in modernising or improving an existing LIS infrastructure in developing countries is however questionable, judging from the comments by Chan and Williamson (1995) in their review of the planning methodology in Victoria. They stated for example that while the study adopted standard procedures, i.e. basing their findings and proposals on the “actual review of activities and readily available information - information that did not have to be researched”, the study (Chan and Williamson, 1995):
"... had a limited scope as it covered only the cost of acquisition of data and technology, and the provision of training, all the work carried out behind the scenes, such as planning, and management to overcome the various technological and organisational barriers, was not included in the cost model. ...[the study]... avoided tackling other potential scenarios of GIS implementation apart from the best one. This was qualified by a list of requirements for going forward and some recommended actions in the strategy".

Chan and Williamson (1995) also commented that there was no "investigation into the organisational barriers to change, no consultation with local government, utility companies nor the private sector, which are major users of spatial data in the state". Such comments demonstrate the weaknesses of the CBA technique in LIS implementation and within the context of this thesis, the technique does not provide the necessary guidelines to assist government in determining how much to invest in modernising existing procedures of land information management.

Hence, although the usefulness of CBA in aiding decision making is considerable, it does not necessarily follow that the technique is suitable for developing countries. It appears logical to assume that if researchers acknowledge the limits of a CBA in a developed state such as that in Victoria, Australia, it can be expected that the consequences stemming from its inadequacies will be more profound in developing countries which generally have fewer resources, more widespread lack of skilled personnel and training facilities, and by definition, are poorer. Such consequences if left unchecked, may translate into situations where e.g. the anticipated costs of hardware and its maintenance are higher; there is underestimation of the expertise required, a lack of cooperation in surmounting the institutional and bureaucratic hurdles associated with the shift to digital data and their associated methodologies, overlooking the amount of incentives or mechanisms required in integrating the technology into the organisation's workflow processes, etc.

This research attempts to contribute in this respect by proposing an investment methodology that accepts the fact that while CBA is probably the best means of documenting the cost and benefits associated particularly with a land and geographical information system, other justification means should be developed and used to support the CBA. In this respect, the thesis argues that an analysis of the inefficiencies and ineffectiveness in existing procedures, as well as an examination of the funding limitations,
can be used to assess the amount of investment that should be allocated for modernising existing land information management processes.

1.2 Investment Issues in a National LIS

The difficulties of determining how much to invest in a LIS infrastructure is further increased by the fact that in most instances of land information management, no single agency can truly address the complete LIS requirements. It is rare to find for example, a government department that has sole custodianship (i.e. the responsibility of ownership, collection, supply and maintenance) of all the possible range of land related information. A centralised agency often does not have the mandate, skills nor the need to update data beyond their intended use or solely for other agencies or users. More realistically, data are typically held by different departments and agencies that are geographically dispersed, and whose control and influence are held by differing authorities, ministries or jurisdictions.

An ideal LIS requires some basic criteria among which the following components have commonly been mentioned (Dale and McLaughlin, 1988; Larsson, 1991; Williamson, 1983):

- That a common coordinate positioning or geo-referencing system be adopted by the agencies concerned for positioning and locating all information pertaining to land. This has usually meant the use of common maps that are typically based on a land parcelling system with unique identifiers for recordation purposes.
- That the data sets held by the varying agencies can be integrated, are exchangeable, and can be used with minimal disruption to the core data; this results in added value to the data.

The implications for instituting the ideals above are far reaching because it essentially means attempting to integrate existing discrete or localised land information systems, that are often incomplete, into a system of co-operation in the management of their land related data, with the assistance of information technology. The end objectives in addition to the above, include the ability to maintain up to date land records, with the view of
minimising costs or duplication of efforts in the collection, use and maintenance of land information.

The costs will need to consider a wide range of issues related to the acquisition of computer related peripherals and techniques, the recruitment of more personnel in the short term, as well as the provision of education and training for upgrading the existing skill levels of staff; the acquisition or modification of new or existing data sets and a host of other issues. Upgrading existing computer related systems is also no less problematic, as observed by Tenner (1997, p.208):

"The relentless speed and efficiency promised by microcomputers and networks, their computation capacity doubling every eighteen months, has a catch. The more powerful systems have become, the more human time it takes to develop the software, to resolve bugs and conflicts, to learn new versions, to fiddle with options."

More significantly for a data sharing environment are issues related to infrastructure building such as how can the case be made to persuade existing stake-holders to bear e.g. the costs of maintaining their data currency beyond their present requirements, or to share their data with other users in which the benefits may not be mutual. Assuming that these can be agreed to by the agencies concerned, a further initial hurdle concerning finance will also need to be addressed. Should the costs be borne by the individual agencies or should there be subsidies from the state, or should cost recovery mechanisms be instituted? These are among the issues that will be addressed in this thesis.

Most of the benefits of a computerised land information system in this respect, can be compared with the disadvantages of manual techniques. As stated by Tomlinson (1974, p.13) in the use of manual based maps:

"Although maps can be an efficient way to store and display data concerning the earth's surface, there are two basic limitations to their use. The first is that there are physical limits on the amount of descriptive data that can be displayed and stored in a map. To reduce such data to a sensible graphic form, they must be classified and generalised, which too often causes a loss of detail during the transition from a less to a more generalised form of data record. The second limitation is that information in a map format, as we know it, has to be retrieved visually and manually. Measurement is laborious, and quantitative comparisons are slow and expensive. Any large collection of cartographic material presents a formidable task of reading and analysis to obtain even the simplest understanding of the information it contains."
The benefits of a modern LIS, similar with the costs, can generally be classified into those that are tangible and intangible. However, monetarily quantifying the benefits is difficult in practice because the availability and consequences of having more information is not easy to evaluate. As opposed to many other types of goods, land information is a public good, whose accepted output units do not, at present, exist. The impact of having more information is thus difficult to assess with any reasonable degree of certainty if all possible benefits are to be considered. This is because not only are the informational users and markets ill defined, but also the basis for quantification and comparison does not exist.

Cost savings and costs avoided resulting from the immediate access to more data are the most commonly used techniques, although other user based interview methodologies exist. It is easier to assess the benefits from a single agency perspective but for a national investment strategy, the assessment becomes more problematic and cumbersome as it may be necessary to view the benefits beyond the perspective of a single user or provider agency, i.e. to include all those affected. Moreover, the benefits may not be realisable until and after the contentious issues related to institutional cooperation, data accessibility and cost sharing have been agreed upon.

The use of an ideal LIS that satisfies all the hardware, data, expert skills and institutional infrastructure requirements is relevant to all countries, whether developed, in transition or still in the process of developing. What is less clear however are the justifications for investing in a LIS; should these be based on e.g. purely concentrating on the costs and benefits alone, or should they be driven by the need for computerisation knowing its potential for the future, i.e. a leap of faith? It may be stated however that the lack of quantified post-implementation studies in successful, or otherwise, land information systems in developing countries is an indication that a national LIS investment should be treated with care because mistakes can prove to be costly, considering their general limited resources.

The implications of the foregoing discussion leads to the observation that there are significant complexities related to the usage and adoption of computer related

---

1 See Chapter Four
methodologies into organisations, and their ensuing institutional demands. Examining these issues in great detail is however beyond the context of this thesis, although they will be discussed where necessary. The specific LIS issue tackled in this research is the development of an approach that can be used for determining an optimum investment level in a land information system for a developing country. In achieving this objective, it addresses *inter alia*, the main points involved in the pricing of land related data, and analyses the costs and benefits issues associated with the implementation of a LIS, taking the state of Sabah in East Malaysia as a case study. Although the findings are specific to Sabah, the ideas developed in the study may be useful for other developing states; it leads to the conclusion that any investment in improving a land information system should tackle any existing management shortfalls, based on the needs of the users.

### 1.3 Thesis Structure

The thesis starts with a review of the core concepts of land related information and their management procedures, as used within the context of this research. It provides an overview of the major uses that a computerised land information system can offer, particularly those related to the cadastre. In addition, the chapter also reviews how the integration or addition of other types of land related data to the basic land parcel can result in increasing its value via the wider range of applications, both in the rural and urban context of land information management.

Chapter three examines the main economic ideas of land information value and their means of assessment. It also explores the issues that may affect how land information will be perceived and managed by government agencies in the future. It argues among others, that data conversion to digital form, the increased awareness in the importance of spatial data, and the changing economic environment in which they are being used and operated, may affect their availability. These have considerable directional implications in how spatial based data may be collected and distributed by future providers and users. It notes that while value added data may imply more application benefits, the introduction of economic ideas such as cost recovery and user pay concepts into the land information management environment may affect the end users.
The following two chapters, i.e. four and five, examine the cost and benefits issues of collecting land information. Common models used for their assessment in the ideal scenario are reviewed, as well as an elaboration of the approach developed. Major constraints faced during data collection phases for this thesis will also be discussed. A review of the possible LIS funding options is also included in chapter four whereas in chapter five, the relevance of the investment model developed for this thesis is outlined.

Chapter six applies the model developed in the previous chapters. Specifically within the context of this research, it reviews the land information management scenario in Sabah from the perspective of the Lands and Surveys Department, which is the largest custodian of land related and cadastre based data in the state. It seeks to identify the sources that lead to present inefficiencies and ineffectiveness in the management of land titling information, i.e. those related to the registration of property rights to land and other land development delays. These were discovered to be associated with the historical legacies of colonialism that still affect the overall land information management processes in the state. Chapter six also reviews the present system of applying and alienating land in the state, identifies the funding options for modernising the existing LIS, and reviews the project funding or allocation arrangements as well as the existing potential constraints in State and Federal funding. Chapter seven quantifies the inefficiencies and ineffectiveness of the present system, resulting for instance from the delayed land titles and lost revenue.

The final chapter concludes the thesis. It synthesises the thoughts argued in the foregoing chapters and reviews the requirements, options and proposals available to the area studied, while recognising the significant constraints in funding and LIS training related issues. A strategy for the development of a national LIS that should be adopted by Sabah is also proposed. The arguments are based on one of the thesis’ main contributions, i.e. that the level of LIS investment in a developing country should be based upon the costs of present inefficiencies and ineffectiveness. Two main reasons for this are that the approach is user based and secondly, that if the quantification of lost opportunities is accurate, the investment in a national LIS infrastructure will be based upon concrete evidence which should be appealing to decision makers.
Chapter Two

Land Information: A Review of Core Concepts, Management and Applications

2.1 Introduction

This chapter lays the underlying arguments for the issues addressed in this thesis. It defines, explores and reviews the main ideas commonly associated with a land or geographical information system (LIS/GIS). In addition it will also explain terms that are of relevance within the context of this research, reviews some aspects of the evolution of land information documentation procedures, and the major uses of a LIS with emphasis on developing countries.

2.2 Land Information

In order to define and appreciate the significance of land information, it is necessary in the first instance, to understand what is meant by land. Land is an abstract concept as well as a physical entity that can be interpreted in various ways. The Chamber’s thesaurus (Schwarz, 1995) for example, has the following entry for land if used as a noun:

“country, countryside, dirt, district, earth, estate, farmland, fatherland, ground, grounds, motherland, nation, property, province, real estate, rety, region, soil, terra firma, territory, tract.”

The Oxford dictionary (1996) meanwhile defines land as the “solid part of earth’s surface; ground, soil, expanse of country; nation, state; loaded property; estates”. More specifically in the present context however, the term land will be used to mean the footing or foundation upon which all forms of human activities are built. As stated by Binns (1953):

“The land is man’s most valuable resource. It is indeed much more than this: it is the means of life without which he could never have existed and on which his continued existence and progress depend”.
A more recent, albeit similar definition of land as a resource is given in a document on land administration by the United Nation's Economic Commission for Europe Committee on Human Settlements (UN, 1995):

"Land is the ultimate resource, for without it life on earth cannot be sustained. Land is both a physical commodity and an abstract concept in that the rights to own or use it are as much a part of the land as the objects rooted in its soil."

Information meanwhile is "what is told, e.g. knowledge, news, ..." according to the Oxford (1996) dictionary. Viewed simply, land information is essentially concerned with its representation about natural or person-made features and other facts associated with it. These may be documented, depicted, stored and accessed in any medium typically as textual or graphic records, documents, registers or maps. More commonly nowadays, computers are being preferred over these traditional means of managing and portraying land information. This is partly due to the increased awareness of the importance of land information but also, due to the benefits that computer assisted techniques offer in terms of improved access, reduction in storage requirements and improved decision-making from the various analyses that are possible with computers.

Further, the comments by Dale and McLaughlin (1988, p.1) that "the need for thoughtful and careful stewardship of the land, together with the more intensive use and management of its resources, has emerged as a matter of global concern" gains added weight if viewed under the concept of 'sustainable development', which has been actively promoted worldwide over the past decade or so. Land, being a life supporting and generating resource, plays a fundamental role within this concept which according to the Bruntland report (WCED, 1987), is concerned with "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

It follows that for the optimal management of land, it is essential that the provision of timely, accurate, up to date and appropriate (to circumstances) land information be available to those involved in all aspects of land administration or its management. These may be required in e.g. their strategic planning and management of land, monitoring changes in land use, controlling existing natural resources such as timber and the management of other land related development projects.
As succinctly observed by Dale and McLaughlin (1988 p.2) the "...effectiveness of the decision-making process is directly related to the quality of the information and the manner in which it is made available". It is an accepted fact that information supports all aspects of decision making and it is on this recognition that the following discussion on land information will be based. Information is also the main criterion in all forms of judgment or arbitration, ranging from the individual to the state. It reduces uncertainty by helping to identify and analyse problems, from which strategies or options may then be prepared and implemented.

Within the context of this thesis, land information will be used to mean information about land whose positions can be specified within a two or three dimensional coordinate reference framework, i.e. that their locations can be uniquely defined or approximated on the earth's surface. The term will be treated as all embracing and may include data that are e.g. topographic, environmental, representing physical infrastructures or consisting of land tenure records, to name a few. There are however other commonly used alternatives such as land related data, spatially based data, or geo-information. These will be used to be the equivalent of land information, unless otherwise stated.

### 2.2.1 Types of Land Information

Due to its subjective nature, land information subscribes to a wide-range of interpretation, depending on both its context and use; thus, any effort to classify all the possible uses will not be an easy undertaking. Despite this diversity however, some form of classification by which the basic raw data or facts can be classified to suit the varying needs or the function of the users is necessary, since there is no natural or standard set of definitions of land related information. Such classification may for example be based on its use, scale, themes or layers. Table 2.1 below implies some of the common types of information that are based on their functions.
TABLE 2.1: Types and Purposes of Land Information (Adapted from Holstein, 1992)

<table>
<thead>
<tr>
<th>TYPE OF INFORMATION</th>
<th>RECORD TYPE</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND ADMINISTRATION</td>
<td>+ Cadastral maps + Subdivision plans + Individual parcel plans + Real Property transaction records (incl. deeds and titles) + Property tax maps and records</td>
<td>* Land market operation * Land development &amp; subdivision * Property transaction * Land administration * Town Planning</td>
</tr>
<tr>
<td>ENVIRONMENTAL AND RESOURCE INFORMATION</td>
<td>+ Soil and vegetation maps + Physical maps and records + Land-use maps and records + Water quality surveys + Air quality surveys</td>
<td>* Environmental impact assessment studies * Land use risk analysis * Land development studies</td>
</tr>
<tr>
<td>INFRASTRUCTURE AND ENGINEERING INFORMATION</td>
<td>+ Maps of major reticulation + Maps of minor reticulation + Customer records + Detailed contract plans + Inventory of assets and facilities</td>
<td>* Design and construction * Operations and maintenance * Safety especially gas and electricity * Modelling of total system</td>
</tr>
<tr>
<td>SOCIO-ECONOMIC INFORMATION</td>
<td>+ Census maps and data + Housing, building-type surveys + Distance to work-maps + Demographic maps and data</td>
<td>* Housing demand studies * Industrial location studies * Major infrastructure location analysis</td>
</tr>
<tr>
<td>TOPOGRAPHIC INFORMATION</td>
<td>+ Contours and spot-heights + Survey control network + Line-maps + Digital databases + Photomaps</td>
<td>* Project preparation * Environmental protection * Land-use planning * Terrain modelling</td>
</tr>
<tr>
<td>AIRCRAFT ACQUIRED INFORMATION</td>
<td>+ Aerial photographs - black and white - colour - colour infra-red + Line maps - scale 1:500 to scale 1:100,000 + Photo maps - scale 1:1,100 to 1:75,000 + Digital terrain and evaluation data</td>
<td>* Terrain Analysis * Water reticulation location studies * Infrastructure route planning * Basemaps for all purposes including utility mapping, property tax maps</td>
</tr>
<tr>
<td>SATELLITE INFORMATION</td>
<td>+ Photo-like maps and digital records of 1:25,000 to 1:250,000 [mono-colour, infra-red, thermal, radar] + Cartographic maps with 10 meter contours scale 1:50,000 + Geographic co-ordinate determination</td>
<td>* Major urban infrastructure planning * Dialogue with government * Broad land use planning * Survey network establishment</td>
</tr>
</tbody>
</table>

It is clear from Table 2.1 above that the issue of classifying land information is highly dependent on its uses and users. For example, those concerned with landscape or nature conservation are likely to need detailed information of vegetation cover but may categorise built structures into a single 'urban land use', whereas policy makers related to the urban sector may categorise different types of urban use, e.g. residential, transport,
industry and commerce, etc. While it is a challenge to LIS or GIS implementers to be able to integrate or manipulate these data sets to satisfy the demands of the various users, a useful concept is the assembly of land related data at the parcel unit level, which is expanded in the following.

2.3 The Cadastre Concept

The collection, recording and maintenance of land information at the land parcel unit level have traditionally been linked with the cadastre, whose derivation is thought to come from the Greek word ‘katashtikon’, meaning a note book or business record (Dale, 1976a). More commonly however, the cadastre is a European concept used to denote a general, systematic and up to date register containing information about land parcel details primarily reflecting but not limited to their usage, value and ownership (Dale, 1976a; McLaughlin, 1975; Williamson, 1983; Barnes, 1988).

The land parcel is a useful unit of reference that has often been referred to as a lot or plot; it is a tract of land typically defined as an area or more strictly, a volume of space recognised for recording purposes, e.g. proof of ownership or the taxes due from a parcel. In some instances, the space may be divided into strata titles such as in high rise buildings, or into other forms such as interests and rights. One of its significant uses is to provide a means for defining a land parcel whose location is unique, for all intents and purposes.

Williamson (1985) observed that constructing a definition of a cadastre that is both terse and comprehensive is difficult due to the varying formation and nature of a jurisdiction’s control over land, as well as the differing and often unique influence leading to the emergence of a land market. For example, western states may have a more evolutionary, systematic and orderly way of managing land information as opposed to a Third World country whose course of history may have been influenced by colonialism. Recently however, a definition of the cadastre adopted by the Federation Internationale des Geometres FIG (1995) is as follows:

"A cadastre is a complete and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, and ownership or control of those interests, and often the value of the parcel"
and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection."

Dowson and Shepherd (1956) observed that a distinctive character of any cadastre is the recording of land information that commonly consists of two parts. The first of these is the written record or register containing the land parcel's information, e.g. the name of the owner and a reference (usually a unique identifier) to the location, nominal area and value of the land. The second part of the record is cross-referenced to the first and contains a technical record of the land's parcellation on any given territory usually represented on plans or maps of suitable scale (Williamson, 1985). An earlier observation by Dale (1976b, p.2) indicates some of the answers that can be provided by such registers:

"the register answers questions concerning ownership of land and the conditions under which it is held that is the questions of whose and how whilst the cadastral survey is concerned with the location of the land and its extent (where and how much)"

As indicated above, a concept related with the cadastre is cadastral surveying. Its primary object is to "determine for each land parcel its location, the extent of its boundaries and, surface area and to indicate its separate identity both geographically on a map or record and physically on the ground". (Dale, 1976b, p.3). A secondary objective noted by Dale (1976b) includes the provision of supplementary data for a multipurpose cadastre to satisfy the overall information requirements of land administration. It is however in its role in supporting a system of enforcing and transferring rights in land via the establishment and recognition of boundaries that cadastral surveys have mainly been directed. The end output is typically a cadastral plan or land title showing the boundaries of the tract of a land parcel concerned and the associated ownership records. These authenticate the possession of land rights which are essential elements in any transaction in the land market.

The demarcation and recordation of boundaries in a land parcel however are not the only means by which ownership of land rights can be identified and transferred, as there are other methodologies by which these can be done. Generally, three distinct methods for the transfer of legal rights, i.e. conveyancing, exist which have been summarised by Dale (1976b, p.2):
"No system of deeds or document which purports to give evidence of the ownership of land would be complete if no-one could tell from the document what land was being conveyed or where its boundaries were located. Conveyancing may be by private deed, in which case a vendor and purchaser exchange documents without reference to any public register; or it may be by registration of deeds, in which case copies of the documents of transfer are deposited in a public register thus reducing the chances of fraud and double dealing; or it may be through registration of title in which case the transfer is recorded on a land register which gives a clear description of each land parcel, the state of ownership and other rights relating to the land”.

The registration of titles is of concern in the present context because of the State’s involvement in recording and maintaining the relevant land information. It is however worthwhile to note the main function of cadastral surveys in a title rather than in a deeds registration system; cadastral surveys support the systematic registration of titles to land where the essential record of the register is the permanent land unit and not the temporary owner of rights in land, as is the usual case under a deeds system (Dale 1976b).

2.3.1 Evolution of the Cadastre

Land information collected for cadastres has traditionally been classified according to their primary functions:

- fiscal cadastres
- juridical/legal cadastre and
- multipurpose cadastre

Fiscal cadastres evolved from the State’s taxation of land for revenue generation purposes and essentially, were designed to provide the information required to determine the value of each parcel and the taxes due on it. Juridical cadastres on the other hand were created to deal with recording ownership and other legal interests in land, i.e. a land tenure record. Multipurpose cadastres were developed when additional registers or information were added to the legal and/or fiscal components of the cadastre which by theory and implication, can serve a wider range of users.
A review of the origins of the cadastre and its evolution has been covered by e.g. Dowson and Shepherd (1956), Simpson (1976), Dale (1976a) and Williamson (1983). The general observation is that the earliest official records of ownership and taxation have been documented around 3000BC in Ancient Egypt but fall short of the concept of the modern cadastre because in general, they were written registers and were not based on comprehensive large scale maps. The forerunner of the modern cadastre according to Williamson (1985), can be traced from the French cadastre of Napoleon I, which was commenced in 1808, whereas the use of the cadastre for legal purposes did not commence until the middle or latter part of the nineteenth century. What appears to be implied from the history of the cadastre however is the fact that fiscal cadastres were originally instituted in recognition of the fact that taxation of land tilled by the peasants in an agriculture-based economy provided a justifiable means for the imposition, collection, and maintenance of state revenue. There was hence a greater need to know for example the value of produce from a particular land parcel, and this necessitated some form of land information and record maintenance. Over time, this resulted in the importance of large scale maps and a systematic cadastral survey.

Williamson (1983, p.7) noted that the development and importance of legal matters in the cadastre paralleled the period of industrialisation, i.e. when taxation based on industrial development was increasing, and quoted the comments by Dowson and Shepherd (1956) that well maintained fiscal cadastres tended “progressively to develop and to crystallise the rights of the taxpayers to the use, occupancy and ultimate ownership of the land in respect of which they are taxed”.

The juridical cadastre is essentially concerned with documenting the rights of use or control over land, i.e. all forms of property rights and interests, whose holders may range from the individual, through private corporations, to state agencies. It has been proposed that the implementation and construction of modern land information systems should be centred around the legal or juridical cadastre, because of the use of the proprietary land parcel as the basic unit (Williamson, 1985; Holstein, 1987).

Much work has been carried out in clarifying the concepts and identifying the essential elements of the cadastre, notably by McLaughlin (1975), Dale (1976a), Williamson (1983) and Dale and McLaughlin (1988) and it is not within the bounds of this research to
review the issues in great detail and extent. Jeyanandan and Williamson (1990) however identified the following core elements of a cadastre:

- clear and consistent definition of each land unit within a given area (generally the proprietary land unit);
- map showing every land unit in the area;
- related descriptive records (register) which contains, in respect of each land unit, details of legal rights, value, use and other connected data;
- linking mechanisms to relate every land unit on the map to the corresponding unit in the register;
- map and register should reflect all changes affecting every land unit from the time of initial compilation.

In improving an existing cadastre or introducing a modern LIS, the above constituents should be catered for or at least, provisions made for their future inclusion. However it is also worthy to recognise the observation by Jeyanandan and Williamson (1990) that the inclusion of all the elements above in a LIS is rare and are "ideals that very few countries, even in the developed world have achieved". This suggests the complexity of integrating information that must take into account the existing underlying institutional, economic, technological and educational issues that must be addressed when aiming to integrate the varying data sets in a LIS. As noted by Dale (1990):

"The cadastre needs to be regarded as an integrated land information system and should be designed to ensure the best use of land as a resource. It should not be seen solely as a service to private individuals to help them buy or sell land, even though security of tenure and simplification of the land market procedures are important objectives. It is the totality of land and all its attributes that must be addressed."

2.4 Land Registration

Land registration as opined by Nichols (1993) is usually defined in terms of creating and guaranteeing a record of property rights that is often in practice further restricted to the register of private, surface land interests. In most states however land registration is the official and systematic process of mapping land tenure information encompassing a wider range of interests and information. Nichols (1993) classified this information as:

- information about people, i.e. individuals and groups of individuals who have recognised interests in land;
information on the nature of these interests, i.e. the rights, responsibilities, and restrictions in land, including their duration and their effect;

information about the land, i.e. the units of land, or land parcels, to which these apply, including location, value, resources, and use where appropriate.

Broadly therefore, land tenure is the intricate pattern of legal, cultural, economic and political relationships that people have with the land. Land registration has usually been associated with the survey of land boundaries in which the distinction between 'general' and 'fixed' boundaries has often been made, as well as the system of 'deeds' and 'title' registration; these however will not be discussed further in this thesis as the main issues have been covered in earlier work by e.g. Dale (1976a) and Simpson (1976). Suffice to state that the function of land registration is to provide a safe and certain foundation for the acquisition, enjoyment and disposal of rights in land; its primary function is concerned with ownership and the benefits include the following (Dale and McLaughlin, 1988, p.26):

- Certainty of ownership
- Security of tenure
- Reduction in land disputes
- Improved conveyancing
- Stimulation of the land market
- Security for credit
- Monitoring of the land market
- Facilitating land reform
- Management of state lands
- Greater efficiency in land taxation
- Improvements in physical planning
- Support for land resource management

Within the context of this research, the main significance of land registration will be its role in identifying or specifying the basic land parcel unit by ownership. This aspect is essential as a supporting mechanism or as a core facilitator component in a modernised land information system. As long as the land parcel can be uniquely defined in space, it is therefore immaterial whether the existing register is based on deeds or titles because other types of land information can be added or attached to this basic parcel. The next section reviews the concepts of the multipurpose cadastres, LIS and GIS.
2.5 Multipurpose Cadastres, LIS and GIS

This section attempts to identify the distinguishing characteristics of the multipurpose cadastre, land information systems (LIS) and geographical information systems (GIS) which are often associated with the management of land information. Dale and McLaughlin (1988, p.231) argued that it was incorrect to use the terms ‘multipurpose cadastre’ and ‘land information system’ synonymously and opined that:

"A multipurpose cadastre is a comprehensive set of land records, based upon the land parcel. It is the latter characteristics that distinguishes it from land information systems in general. The compilation of such a cadastre is often an extension to or combination of the proprietary and the fixed registers. The advantage of using the latter is that the records should cover a whole country".

Various definitions as to what constitutes a GIS exist but the heart of any GIS is essentially a combination of a data base containing attribute data sets and a graphics or drawing package that can ‘communicate’ with each other. The two packages may also be developed into a single system. Its main strength besides being a tool for the efficient data capture, storage, manipulation, checking, displaying and retrieval of these land related data, is the capability to perform complex spatial analysis or modelling and to respond to a wide range of questions from users by integrating either in whole or in part, the associative data sets. The United Nations (UN) Education, Scientific and Cultural Organisation (UNESCO) team responsible for proposing and drawing up the guidelines for the establishment of GIS in developing countries acknowledges that GIS is within the domain of information systems in general in terms of their institutional setting and system support services, but distinguishes them from other information systems as a subset due to their dependence on spatially referenced data (Borley, 1991).

While the definition of a GIS is more varied and encompasses many areas relating to the management of data that are spatially referenced, the FIG has the following definition for a LIS (Hamilton and Williamson, 1984):

"A Land Information System is a tool for legal, administrative and economic decision making and an aid for planning and development, which consists on the one hand of a database spatially referenced data and on the other hand of procedures and techniques for the systematic collection, updating, processing and distribution of the data. The base
of the LIS is a uniform spatial referencing system for the data in the system, which also facilitates the linking of data within the system with other land related data”.

Whether GIS is the generic term with LIS as a subset or vice versa has been the subject of some debate in the past (Marble, 1984). It does appear however that a GIS mainly utilises small scale data that cover a larger area, i.e. reduced detail, and thematic type systems relating to natural resources and land use management systems.

The concepts and algorithms as to how a GIS handles and maintains raster, vector and attribute data as well as their spatial topology or relationships are discussed in most of the literature on GIS such as Berry (1993) and Maguire et al (1991). The relative advantages and disadvantages of certain data structures such as the oft-reported raster-vector dichotomy, the merits of a relational database and their efficiency in storage and retrieval of data, the need for a database management system (DBMS), whether to employ a centralized or distributed database, the meaning of GIS terms such as connectivity, proximity, etc. and other common issues of a GIS are also discussed in the listed bibliography and will not be elaborated in this work. Suffice it to state that the actual software construction of a GIS is similar to other software developments and requires competent computer software engineers, scientists or programmers who should understand and appreciate how real world data are captured and how their spatial relationships are best represented in terms of storage, access and also accommodate the integration of other data sources, e.g. satellite data images, into the database. The skills of the surveyor, photogrammetrist, cartographer and statistician in data capture and analysis need to be recognised and their limitations comprehended if a fully capable and workable GIS is contemplated.

It is notable that well-known conference proceedings in Great Britain e.g. the annual Association of Geographic Information (AGI) conference, have almost exclusively used the term GIS to report applications in many land management related tasks, except for cadastral information. This is probably to be expected as England does not practice the Torrens system of boundary surveying. It does however lead one to the point that the legal attachments such as boundary definitions, land value and other components with legal connotations normally associated with a land parcel based LIS are notable characteristics that distinguish it from a GIS, which relatively is a more generalised tool.
Dale (1994) also indicated that LIS is an analytical tool that may consist of only textual data with no graphics component such as the Swedish Land Data Bank System (LDBS). This was implemented to facilitate the registration of real property and land as well as to make the information more readily available for other purposes such as urban and regional planning and taxation (Ottoson and Rystedt, 1991; Lievesley and Masser, 1993). It could also be inferred from the literature that LIS are usually used at the operational planning stages and as such may not necessarily utilise remote sensing data for boundary definitions due to the coarseness of their imagery outputs. With large area uses or 'small scale' GIS applications such as for the planning and management of natural resources or land use evaluation in environmental planning however, the use of remote sensed imageries is a common form of data input.

One point seems manifest; the promotion of the term LIS and the development of its application stems from the traditional land surveying profession whereas GIS was coined as an assemblage from the other earth sciences such as geography, agriculture, planners, development economists and other professionals utilising spatially related data. Rhind (1989) argued this distinction as "wholly artificial and unnecessary" and opined that this was probably due to:

"the vested interest and 'turf battles', with surveyors trying to preserve and extend their traditional near-monopoly on land related information and geographers, cartographers and others expanding out of a traditional concern with spatially distributed phenomena, often stored and displayed in map form."

He further noted that while there were distinctions in skills taught to particular disciplines in the past, e.g. data collection and analysis among surveyors and photogrammetrists as opposed to analytical methodologies among geographers, such distinctions were rapidly disappearing in revised courses and in research orientations. Rhind (1989) concluded that "nothing much differs between application areas except those people trained in the old ways".

Williamson (1994b) however was more specific in recognising the fundamental differences between LIS and GIS. He argued for example, that:
"... land information systems tend to be parcel based, large scale, dynamic, administrative systems having very high integrity and accuracy of data. They include cadastral system\(^1\) as a key component and almost always have grown out of an existing cadastral system. They are typically major administrative systems which support government or semi-government activities such as land registration, land tax, land subdivision, local government administration and the management of utilities and services."

Whereas GIS, were on the other hand:

"... typically medium to small scale, more often than not use raster rather than vector data, are generally one-off or project oriented and are usually concerned with a lower integrity and accuracy of data as is common in environmental and natural resource systems."

There thus appears to be a distinction between LIS and GIS although the promotion of one term over the other backed by the relevant spheres of influence can only be expected in the light of the business, planning and academic opportunities that computers offer professions involved in the management of land information. For the purposes of this thesis however, the term LIS will be preferred due to its direct reference to land, as opposed to general geographic data, which is more wide ranging in term. The comment by Barnes (1988) that GIS can be bought is also thought provoking. The use of LIS in this respect will be centred around the legal cadastre and the other associated supporting systems, processes and components and in particular land titling, cadastral surveying and land registration.

### 2.6 Uses of Land Information in Developing Countries

Most studies relating to LIS in developing countries centre within or around the cadastre and some influential work includes that by Dale and McLaughlin (1988), Feder (1987) and Williamson (1985). The work by Feder et al (1988) has mainly studied the benefits associated with land titling or the 'knock-on' effects of improving security of tenure.

LIS can be used to yield benefits to society in different ways. These may range from planning e.g. in land use zoning, land taxation, private sector uses in decision making

\(^1\) Cadastral System - This has been defined by Williamson (1983) as a component of the cadastre.
encompassing individual purchases of land or properties, to the identification of suitable land for development. The uses of LIS in the following will be discussed in two broad categories:

- urban applications,
- rural applications, including the impact on rural land markets

Urban applications are in general concerned with the management of properties as well as the maintenance of core services and infrastructure which are normally linked with local authorities or local government in the management of cities. Rural applications meanwhile are mainly concerned with the effective management of land and its use or more specifically, with aiding the rural and usually agricultural population by granting and protecting their claims to rights in land, i.e. ownership. Another application area is in the promotion and creation of a land market. ‘Land markets’ in this context refers to the use of land information to support the mechanisms normally associated with the activities of the land markets, i.e. concerned with the transactions such as the transfer, lease, sell, rent, mortgages, etc. of land or properties.

2.6.1 Urban Uses of LIS in Developing Countries

There are many uses of LIS in an urban area and this takes on added significance when the problems of a typical developing country are considered. The urban problems faced by planners and managers of the cities in the developing world have been tersely stated by Devas and Rakodi (1993, p.1):

"The planners and managers of the cities in the developing world face an enormous task. The world’s urban population is growing at a phenomenal rate: in some cities more than a quarter of a million people are added to the total each year, overwhelming all the efforts to improve conditions, while cities which are already larger than any known in the past continue to expand without any apparent limit. This poses a huge challenge to those responsible for the management of urban development and the provision of services."

The rapid growth of urban populations has obvious implications for the infrastructure and service needs of cities, e.g. in water supplies, sanitation systems, housing supply and
transportation. What this suggests for those in government and involved in monitoring and controlling these issues is that with progress, there is even greater need for them to use or access up to date, reliable and accurate land information in supporting their strategic planning and management activities. This is essential because it affects their ability to respond to or otherwise cope with the generated needs of urban development which usually translates to ensuring equitable access to land, shelter and essential services for all its occupants. It would thus be useful to examine some of the roles that a LIS infrastructure can provide to the urban scenario.

One generalised approach for analysing how the LIS can contribute to the planning process and management of urban development is by examining the informational requirements at the various stages of a development project, e.g. in the construction of new roads, housing, etc. According to Devas and Rakodi (1993) and similarly implied by Holstein (1992), planning in an urban environment can be regarded as a linear sequence of: Survey – Analysis – Plan Implementation. In each stage of any such project, the immediate and longer term information needs will vary; these are indicated in Table 2.2 below.
TABLE 2.2: Land Information Management in the Urban Development project Cycle (Adapted from Holstein, 1992)

<table>
<thead>
<tr>
<th>PROJECT PHASES</th>
<th>EXAMPLES OF APPLICATION REQUIREMENTS</th>
<th>TYPES OF SURVEY AND INFORMATION REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDENTIFICATION</td>
<td>- Land use and resource inventory and planning</td>
<td>- Broad urban information</td>
</tr>
<tr>
<td></td>
<td>- Major infrastructure deficiency estimation</td>
<td>- Latest non-detailed maps of whole urban area (i.e. medium¹ scale maps)</td>
</tr>
<tr>
<td></td>
<td>- Spatial trends in urban growth determination</td>
<td>- Medium scale aerial photography and satellite maps</td>
</tr>
<tr>
<td></td>
<td>- Urban policy Formulation</td>
<td>- Socio-economic, census and statistical mapping</td>
</tr>
<tr>
<td></td>
<td>- Urban Planning</td>
<td>- Land market information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Typical scale requirement 1:20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Broad urban information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Latest non-detailed maps of whole urban area (i.e. medium¹ scale maps)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Medium scale aerial photography and satellite maps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Socio-economic, census and statistical mapping</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Land market information</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Typical scale requirement 1:20,000</td>
<td></td>
</tr>
<tr>
<td>PREPARATION</td>
<td>- Route selection planning for highways and pipelines</td>
<td>- Detailed information [specialised]</td>
</tr>
<tr>
<td></td>
<td>- Area design</td>
<td>- Large² scale base maps, typical scales 1:2,000 to 1:5,000</td>
</tr>
<tr>
<td></td>
<td>- Land development design [subdivision]</td>
<td>- Land use information</td>
</tr>
<tr>
<td></td>
<td>- Environmental impact studies</td>
<td>- Housing type and demographic information</td>
</tr>
<tr>
<td></td>
<td>- Town and Utility Planning</td>
<td></td>
</tr>
<tr>
<td>IMPLEMENTATION</td>
<td>- Real property inventories and mapping</td>
<td>- Small area detailed information</td>
</tr>
<tr>
<td></td>
<td>- Utility inventories</td>
<td>- Cadastral maps</td>
</tr>
<tr>
<td></td>
<td>- Civil engineering design and construction plans</td>
<td>- Large scale maps -scale 1:500 to 1:1,000</td>
</tr>
<tr>
<td></td>
<td>- Development approvals</td>
<td>- Special purpose economic surveys</td>
</tr>
<tr>
<td>OPERATION</td>
<td>- Subdivision approvals</td>
<td>As implementation plans</td>
</tr>
<tr>
<td></td>
<td>- Utility maintenance</td>
<td>- “As constructed plans” of civil works and infrastructure placement</td>
</tr>
<tr>
<td></td>
<td>- Transport maintenance systems</td>
<td>- Cadastral maps</td>
</tr>
<tr>
<td></td>
<td>- Leak detection information</td>
<td>- Large scale land-use maps</td>
</tr>
</tbody>
</table>

Note: ¹ - Medium scale, i.e. 1:10,000 to 1:50,000 [ 1mm = 10 metres to 50 metres]  
² - Large scale, i.e. 1:500 to 1:10,000 [ 1mm = 0.5 metres to 10 metres]

It is a widely accepted view that cities and towns in developing countries are the generators of economic growth. Being centres of national or regional economic activity, LIS can contribute in a number of application areas. According to Dale and McLaughlin (1988) for example, the land information required to support urban development can be classified based on its principal uses which are summarised in Figure 2.1. below:

- land administration and property taxation;
- the management of the environment and natural resources;
- engineering tasks of development and the subsequent operations maintenance; and
- other aspects of socio-economic and demographic development.
FIGURE 2.1: Land Information required for Urban Development Classified by Function (Adapted from Holstein, 1992).

<table>
<thead>
<tr>
<th>Land Administration and Property Taxes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>This category includes information on private, public, and communal property rights or tenure status; land availability; urban growth; land use status and controls (existing and planned—zoning, special zoning), development approvals and rights; physical constraints on development; land market operations; land valuation; administration areas, including local government boundaries, electoral areas, postal areas, and water district boundaries.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management of Environment and Natural Resources.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and natural resources cannot be adequately managed without information on an area’s geology, topography (suitability for settlement—land slip risk zones), and buildings; water catchment and flood-prone regions; degree of environmental sensitivity; and soils, vegetation, land use, and land capability.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Engineering Aspects of Infrastructure Development and Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical infrastructure problems cannot be managed without information on water catchment areas, storm-water drainage, water reticulation, street facilities, existing investments in sanitary sewers, electricity, gas, and telephone facilities; transportation, including traffic routes, bus routes. Parking, and condition of the pavement; public buildings; and solid waste management (e.g., for land-fill site selection).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Socio-economic and Demographic Components of Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>The information used here includes census data; data from special-purpose population surveys, economic, and commercial surveys; industry and manufacture locations and surveys; housing types and density; employment location; and distance to work.</td>
</tr>
</tbody>
</table>

In the classification above, it is clear that although the uses of land information will ultimately depend on the users, the lack of specific or appropriate land information will affect the implementation of a project, the effectiveness of its policies, or even the success or failure of a venture. In land administration and property taxation for example, it may be problematic for governments to legally support property rights or to acquire land without the necessary information. Similarly, land owners may find it difficult to substantiate their claims of ownership of particular land parcels by usage or occupation. The effective management of environmental and natural resources can also be hindered by the lack of land related information because the assessment and accountability studies of potential developmental impacts on the existing and future state of the environment and population for example, depend to a large extent on spatial based data. This includes topographic maps or other data sources on water resources, catchment areas, vegetation, flood-prone areas, population, cultural rights, etc.

The need for diverse engineering information in the development and management of infrastructure is central to those involved because without them, the effectiveness of e.g. strategies and solutions, or efficiency in resource use in all the major phases of project
management cannot be assured. Similar with other applications or uses, the informational needs may range from the aggregate to the more detailed or the most recent, depending on the project implementation stages. During the operations stage and in long term program development, it may be necessary to regularly update information.

Information for socio-economic and demographic development is usually obtained from census and special purpose surveys conducted either cyclically or to meet specific needs. The data that these provide are usually generalisations or estimates including themes such as population sizes, location of employment, consumer demands, crime rates, distance from work, etc., most of which are locational.

In the area of municipal management, the land information required will depend on the functions and mandates of the local government or authority, which varies between and within countries. Generally however these may include solid waste management, town planning, sub-divisional and development approvals, revenue collection for supporting services, road and traffic maintenance and the provision of some social services. In supporting these functions, the data required can be discussed in terms of the level of data aggregation, e.g. resolution, scale, currency, positional accuracy, or in terms of its usage during the management stages of policy and strategic planning, development, design, operations and maintenance (Holstein, 1992).

Another LIS application concerns its use with land market assessments, aiding urban planning departments in the management and development of their land (Dowall, 1995; UNCHS, 1996). Land market assessments are used to provide accurate and up to date information on land prices, the supply of serviced land for present and future land projects, housing typologies, and other aspects of the housing and land market. According to the UNCHS (1996, p.301), these can be used to support four activities: government planning and decision making; the evaluation of government policies and actions (including urban planning); private sector investment and development decisions and structuring of land-based taxation systems. Hence, one of its main aims is to provide a concrete foundation for defining appropriate strategies for improving land market performance. While a land market assessment data bank can be established with modest staff and limited technical resources, in some instances these can be incorporated within a
land information system. This has the advantage of enabling to merge the locational attributes with the relevant graphical elements.

The foregoing has reviewed some of the common land information uses in the urban environment with emphasis on what are the typical needs. In general, the main uses of a LIS in the urban environment in developing countries can be summarised as a repository of land related information that has the potential for rapid and simultaneous access, integration or analysis. Its importance is based upon the underlying premise that all forms of human activity relating to the use of land require pre-requisite information on any built improvements on or beneath its surface.

The usefulness of a computerised LIS however will obviously be limited by the amount and quality of data that are accessible to the users, as well as the willingness by those responsible to share their information. The core data sets may come from many sources, ranging from mapping organisations, the land registry, public utilities and census offices, to national and local administrations. Hence, the key issue in the success or otherwise of a modern computerised LIS in the urban sector may ultimately be that of collaboration and its extent among the major stakeholders; some of these issues will be discussed in later chapters.

2.6.2 Rural Uses or Applications of LIS in Developing Countries

One often reported use of LIS in the rural area concerns the management of land records and other documentation that consist of information pertaining to land titles, whose chief aim is the provision of tenure security. The generally accepted belief has been surmised by the World Bank (1989):

"The legal recognition of property rights - that is, right of exclusive use and control over particular resources - gives owners incentives to use resources efficiently. Without the rights to exclude others from their land, farmers do not have an incentive to plough, sow, weed and harvest. Without land tenure, they have no incentive to invest in irrigation or other improvements that would repay the investment over time. Efficiency can be further served by making property rights transferable."
The study by Feder et al (1988) which set out to investigate how ownership security affects the behaviour and performance of farmers, demonstrated that there was a difference in investment patterns (and hence, productivity) between farmers who have secure ownership and those who have not. In addition, the study also highlighted the importance of institutional credit, to which farmers with legal ownership had access because land titles could be used as collateral. The general findings are summarised in Figure 2.2 below.

The view expressed by Manning (1992) further indicated the hopes that were attached to the on-going rural land titling project in Thailand:

"Among the benefits ... especially in respect of rural land, is that by resolving the many existing doubts about farm ownership and boundaries, and in the knowledge that they would then have secure unassailable title to their land, the farmers will be encouraged, as they were in Taiwan, to adopt improved farm practices, to use more fertilisers and insecticides, to plant more permanent crops such as fruit trees or sugar cane, or to purchase, sometimes in cooperation with their neighbours, more effective and labour saving farm implements ... This in turn should lead to greater national farm output, an important aim since some 55 per cent of Thailand's export income depends upon rural farm production in such commodities as rice, palm oil, cane sugar, fresh and canned fruit, rubber and tapioca."

From the perspective of the public sector, the use of LIS technology in the provision of a proficient, well organised and up-to-date user inventory of land rights allows for rapid identification and use allocation of existing state land resources; these will centre around improvements in the land administration, public planning and development capabilities of government. By providing up to date information on e.g. land rights, state land may be located and allocated to those who are without land or alternatively, developed for public purposes. A responsive LIS can therefore facilitate stewardship of state owned resources by making available information on the nature and extent of these resources. In addition, a LIS can aid in the identification of ecologically sensitive areas such as water catchment areas which is essential for the protection of long term public interests.
More specifically however, the uses of a LIS can be related to the "processes" involved in land titling. Its main advantage in this respect can be based on its core component, which is the land information itself. As implied by the FIG definition on LIS, it is a land 'administrative tool' that includes a 'database or records of land information', as well as 'procedures and techniques' for the collection of these data. If these core data components are stored digitally and available within a network of users and providers, then modern LIS computer tools allow for linkages in the basic record registers to be made with the associated cadastral parcel instantaneously. What this means is that from the immediate access and integration of these records, far more ad-hoc responses, queries
and analysis can be made. While it is appreciated that the output function e.g. a cadastral map, may not change even if the maps were computerised, the multipurpose use of these maps when used in combination with other land related data and registers should result in more applications and benefit; these other uses would otherwise have been impossible or costly with hitherto ‘uncomputerised’ land information.

Similarly for automated procedures and techniques in the collection and management of land related data, potential benefits can result from automating the surveying and mapping procedures. In using computers in the cadastral process in the state of Johor in Malaysia for example, productivity in computations and plan drawing were increased by factors of six and four respectively, when compared to the manual system (Mohammed, 1994). The implemented Computer Assisted Land Survey (CALS) system within the Department of Survey and Mapping in Peninsular Malaysia also allowed the production of maps at varying scales which was previously costly and time consuming. More significantly, Mohammed (1994) states that “the system creates, for the first time in the history of the department, a current digital cadastral database as well as a historical database that keeps track of the history of a particular parcel of land (lot), identified by its unique identifier, the lot number”. Hence, the use of computers within an existing land information management environment may shorten production line processes and increase productivity by mechanising previously manual repetitive tasks e.g. computation of cadastral survey data, plotting of plans and reducing the subsequent checking.

A further use of an up to date LIS that records the status of rural (and urban) land taxes is that this can provide a more complete, extensive and across the board land revenue monitoring system. Monitoring rents or taxes due from the use of a land parcel could thus be improved and may also benefit the land holders. In Sabah for example, the computerisation of all land revenue records by the State’s Lands and Surveys Department has enabled land owners to pay their land taxes from any of the Land District Offices distributed in the state.

Other potential uses or benefits of a LIS that follow from quicker access to land information include (Dale and McLaughlin, 1988; Barnes, 1988; Williamson, 1994b):

- Improvements in land valuation capability
• Simplifying and facilitating land acquisition for public purposes
• Improvements in public planning by establishing the basis for more effective land use controls e.g. taxing, and the collection of socio-economic or census data.
• Less corruption due to tighter controls, checks and the implied support of a 'flatter' organisational hierarchy.
• Greater systematic efficiency leading to increased use of land information in decision-making.
• Decreased cost resulting from more efficient procedures and less duplication of effort.
• Promotes a land registration system which ensures that ownership can be easily identified and transferred and that property taxes can be assessed and collected.

A further elaboration of the benefits will be discussed in chapter five. The main intention above has been to indicate the possible usefulness of a modern user based land information system that fuses Information Technology (IT) into existing systems and processes of land information management. Thus, the applications mentioned above are indicative rather than exhaustive and their broader social benefits will not be examined further. However, based on the foregoing discussions, it will be assumed that the investment and implementation of an appropriate and effective LIS would be beneficial to the instituting agency and the country.

Broadly, the core LIS uses can be summarised as improvements in economies or efficiencies, as well as enhancing the effectiveness of an organisation to respond to informational needs. There is however a difference between identifying their uses and benefits, and assessing the potential consequences of inadequacies in land information to the end users. This latter issue is one of the main concerns tackled in this research and will be further discussed in the following chapters. It is however worthwhile to consider the comments by Williamson (1994b) which neatly summarises the uses of urban and rural LIS discussed above:

"Whereas national LISs [including urban and rural] are typically concerned with land ownership and land taxation, urban LISs are more concerned with local government activities, the provision of urban services and the management of utilities."
Accessible land information thus provides the potential to improve decision making at the various levels of land related resource management and planning. However, it may equally be useful to consider and analyse the impacts or consequences in scenarios where land information is inadequate, due to e.g. time-consuming bureaucracies in delivering the final land information output, inflexible laws that are unresponsive to meet present demands, or sub-optimal systems of managing, accessing and sharing land information. This is discussed next.

2.7 Consequences of Inadequate Land Information

In the urban context, the observation by Holstein (1992, p.17) on the consequences of incomplete land information merits mentioning:

"Urban projects that are designed, implemented, and operated without adequate land information stand a good chance of failing. They are usually hampered by inefficiency, and the duplication of efforts tends to waste their resources and contribute to community groups not achieving equal access to project benefits."

Holstein (1992) elaborated that the lack of adequate land information can vastly increase the management costs of major physical infrastructure including bridges, highways, airports, underground railways, commercial and industrial centres. This is necessary not only to avoid social conflicts e.g. who owns what and where, but also locational decisions such as the location of a factory require critical information, e.g. can the existing capacity of piped water or the provision of other utilities cope with the future demands and if not, what are the consequences or what actions need to be taken? Similarly, other related projects such as water drainage, sewerage and water supply can fail without the necessary data on topography, building, street locations and existing underground services.

The lack of land information can also cause delays in development projects that may incur expenses. For example, in the installation of underground services where no information is available on the existing states of the natural and built surroundings of a specified location, Holstein (1992) stated that delays of up to 12-18 months in developing countries can occur. Clearly, these are at a cost to the users because time is money and investments can be held back from being circulated in the local economy. Some specific examples were given by Holstein (1992, p.19):
"... utility services are frequently interrupted in developing countries because of breaks in an underground telephone or electricity cable, which in turn may be due to the lack of land information about the position of the cables. Such breaks can halt the business of a city for days and cost millions of dollars. In Cairo, it was estimated in 1990 that the cost of damage to underground cables was US$25 million per year much due to the informational deficiencies... Inefficiency in the form of lost time and higher costs can also be found in the transport industry in large urban areas such as the mega-cities of Asia and Latin America, which cover areas of 600 to 1,200 square kilometres. Transport operators in these countries cannot be expected to know all the streets, but few have adequate urban road maps and take far longer to reach their destinations resulting in higher transportation costs."

The uses of land information in the management of the environment have been implied earlier. The lack of such information may also result in investment decisions being based on inaccurate physical information that can lead to inappropriate land use and cause environmental degradation. Land information is necessary for identifying environmental problems at the local, regional and national levels, as well as in analysing possible impact scenarios by estimating from existing topographical information or other relevant forms of spatial data sets. These in turn can lead to the development of appropriate strategies not only for the project intended but also, in implementing the sustainable development concept, discussed earlier. As indicated by Holstein (1992, p.23):

"Experience in developed countries suggests that without good information, governments cannot set wise environmental policies, and community and interest groups cannot monitor them effectively. Although there is in general an awareness in most developing countries that all development projects should be environmentally conscious, it appears however that information management has not been accorded similar recognition".

Another consequence resulting from the lack of land information that has been implied earlier is the duplication of work involved in its collection, management and use, that often results in duplicated records. While these may be due to overlapping responsibilities (Dale and McLaughlin, 1988) it is clear that these are at a cost to the agencies involved that can usually be traced back to the state who in turn, are funded by tax-payers. Public agencies, e.g. the public works department, the fiscal and legal cadastral agencies, frequently waste time and money collecting and storing the same urban information. The cases mentioned by Holstein (1992) prove this point:
"... in 1980 in the state of Western Australia some 44 cadastral map series in 13 government departments were maintained. A total of 425 persons per year were needed to maintain basic land records - for a state with a population of just 1.3 million. Also in Singapore before 1988, 12 agencies collected and maintained up-to-date basic map information including land parcel boundaries and the outlines of roads and buildings, without reference to each other; the cost of this duplication has been estimated to be US$2-3 million annually."

It is self-evident that any such duplication should be identified and minimised, and that strategies be formulated to overcome these inefficiencies. One such approach may be by information networking between such agencies of their core data sets, although as observed by Dale and McLaughlin (1988, p.191), the relationships and exchange of information between those responsible for handling land information is often complex and compartmentalised, due to the differing ministries and departments involved in formulating land related policies.

Another significant consequence of inadequate land information is the impact on the land markets. Unavailability of information to the public may result in the potential market players, e.g. those who intend to acquire or dispose of rights in land, operating informally through middle persons, by word of mouth, etc. This usually results in loss of revenue to the state or contributes to higher transaction costs, as evidenced in the Thailand land titling study where landowners without certified titles approached informal money lenders for loans, even though these lenders usually charged higher interest rates than formal institutions (Feder, 1987; Feder et al, 1988). Such a scenario was also observed in the area studied for this research. The general observation here is that without a free flow of land related information to the users, it is difficult to minimise the role of the informal economy, which operates by and large, without paying taxes to the government and is inequitable.

2.8 Conclusions

This chapter has reviewed some of the core concepts associated with a LIS and defined most of the terms that will be dominant in the following chapters. While the management of land related data dates back a few thousand years, the evolution of the modern cadastre has taken shape only in the past 200 years or so, which coincided with the beginning of the agricultural revolution. The initial emphasis on the fiscal cadastre has been transferred
to the legal cadastre because of societal developments and influences that attach importance to individual property rights.

It was also argued that many types of land information exist and that their use will differ according to the purpose, context and environment in which they are applied. In developing countries, the pressures of population growth and developments on urban and rural land and the moral obligations of the state in ensuring the socio-economic well being of the populace are increasingly forcing those involved, e.g. decision makers in government, local authorities, etc. to be more aware of their informational needs. The opportunities that a LIS infrastructure offers were also reviewed, resulting in the general finding that there are costs from inefficiencies and ineffectiveness in the management of land related data.

Within the present context, a legal cadastre is useful because it uses land parcels as the basic unit of reference. This provides the basis for integrating other forms of land information to a unique and identifiable location and promotes the concept of a parcel based LIS, which if computerised, i.e. with digitised data sets, offers a wide range of economic, effectiveness and societal benefits. The next chapter will further develop the arguments associated with the valuation of land information and other theoretical issues related with its collection and management.
Chapter Three
Economics of Land Information - A Theoretical Approach

3.1 Introduction

This chapter investigates the major economic principles that have been applied to land information management by governments in the past, and the major changes that may affect the way it will be managed in the future. It also investigates procedures commonly used to assess the value of information with some case studies.

3.2 Overview of Information as a Public Good

The following attempts to clarify some of the economic concepts of information in general, and how as a consequence, the use, value, pricing and availability of land related information are affected.

Information has often been argued to be and classified as, a public good, e.g. in work by Arrow (1979, 1984), King et al (1983), Lamberton (1971) and Machlup (1984). Such researches and other related work have traditionally been under the domain of economists. The thesis by Hoogsteden (1988) on the value for money for topographic mapping is however an exception and of particular interest to the spatial information manager.

A pure public good is defined as a good or service whose total cost is completely unaffected by the number of persons served. Two of the most important properties of a public good are:

- Non-rivalry in consumption which means that its use by one does not ‘reduce’ its amount available or enjoyment to others. Pearce (1993, p.4) in explaining the public good characteristic of the environment, termed this aspect as ‘jointness of supply’;
- Non-excludability, which holds the view that goods supplied to one user can also be available to others, i.e. it is not possible to exclude one from enjoying its benefits.
Pure public good displays the dual characteristics above. Other types of good exist between the two extremes, i.e. private good and public good, as discussed by Hoogsteden (1988); these however will not be discussed in this thesis. Machlup (1984, p.159) provides an immediate test and succinct commentary on types of information that can be classified as a public good:

"If a public or social good is defined as one that can be used by additional persons without causing any additional costs, then such a good is of the purest type."

A further point associated with public good is that of the consequences that can occur beyond its actual use. These are termed ‘externalities’ by economists, and are impacts on producers or consumers which can take the form of ‘external’ costs or benefits resulting from the production of a good (Machlup, 1984, p.122-123; Hoogsteden 1989, p. 105 and Blakemore and Singh, 1992). The outcome is often expressed as the free rider problem, third party or spill-over effects. Externalities affect the value of information because users, when asked, will tend to downplay its true value; these free rider users of spatial data are also common for most public goods including the information industry.

Public goods are also often associated with “market failures” in a free market system or competitive economy. The Coopers and Lybrand (1996, p.12) report for the Ordnance Survey of Great Britain states that market failures arise due to:

"Problems arise in making goods non-excludable (e.g. stopping illegal copying of intellectual properties)... users have no incentive to reveal their true marginal valuation of the good; they realise it is worth suppliers reducing their price to cover short run marginal costs or dissemination costs once major investment in the public good has been made... this leads to under-provision of a public good in a free market"

Within the present context, the public good concept and externalities of information are important issues to land information managers because they affect efforts to attach realistic costs and values to land related data. These problems stem from the lack of an identifiable common unitary value of information, i.e. where land informational goods can be given a unit, parcelled out, priced and sold. As stated by Dale and McLaughlin (1988, p.170):
Information has special characteristics that distinguish it from other goods. It is not consumable and hence remains however much it is used; yet it can be destroyed or corrupted. It can be transferred; yet it remains with the transferor. It is indivisible; yet it can be accumulated. It has social and cultural value but, on its own, its value is only tangible when it is used in conjunction with other tangible products.

A further issue implied above is that land information is frequently of limited use and value unless it is used in combination with other information geo-referenced or positioned within a consistent reference framework. For example, cadastral survey measurement data of a land parcel may serve the purpose for one survey party or the owner but may be of little use to other users, e.g. to those involved in planning and economic application, unless other information such as the ownership, building, street names, topographic details, market value or land use information are attached to the core data. For combined data sets, the determination of a 'value' of a specific set or unit of information thus becomes even more complicated and does not lend itself to convenient generalisations; it can only be realistically inferred from the users.

3.3 Reasons for State Funding of Land Information Management Activities

The provision of surveying and mapping products has traditionally been funded by the state for reasons related to:

- the public goods concept, as discussed above
- its necessity in the management of natural resources, as well as for planning and development
- driven by other 'national interests' such as security, lack of alternative supplies, and
- assumed past roles or historical precedence

This section will analyse the last three arguments above.

The importance of land related records to the management of natural resources including rights to land has been emphasised in the earlier classic study by Binns (1953) who stated among others that (p.4):
"Accurate knowledge of natural resources and accurate description and record of such knowledge are the first essentials to their rational use and conservation...no progressive country can afford to deny itself the advantages which derive from an accurate large scale survey of its land and from a precise and up to date record of the rights held therein."

Hence, the state as the custodian of its natural resources, has a vested interest in knowing its assets. The study by Binns (1953) also stressed that the accurate knowledge of natural resources in land depicted on maps should also include human relationships with land, as represented by the various public, communal and individual rights in land. The main reason for this is that varying forms of rights to land e.g. ownership, conditional and public rights, exist for the different entities which affect the access to and use of land.

In addition, it is widely held that most land information assembled by the state is also essential for purposes related to planning and development. Viewed in this respect, it follows that expenditure on survey and mapping programs is a necessary form of capital investment. These costs have conventionally been borne by government not only out of necessity in the planning and development process but also, for facilitating all matters of national administration activities. The assembly of information on the physical aspects of a country can therefore be considered as an investment that involves outlays of money that will yield a return in the future. Some uses of such information as summarised by Herfindahl (1969) consist of:

- The evaluation of investment opportunities, both from the public and private sectors point of view.
- Improvement of current production operations involving natural resources and other capital.
- Satisfaction of direct consumer demands for information e.g. maps for recreational purposes.
- Aid in the discharge of governmental functions not related to investment or improvement of current production e.g. for land taxation purposes.

If viewed as an investment, the expenditure on information collection should ideally be evaluated as any other form of capital venture, i.e. that the benefits outweigh the costs, to ensure its sustainability. As implied earlier however, this has not always been the common
scenario where land information management is concerned. Other national interest views adopted by the state are also taken into consideration, although most of these arguments are related to the public good concept.

The military for example, has always been connected with mapping activities, for instance in the delineation of national territories and their maintenance, and where needed, as a form of document for ascertaining the limits and bounds of land ownership (Hoogsteden, 1988). Some governments in the developing world today still consider that the interests of the military and national security in topographical mapping over-ride the civilian aims and thus basic scale maps are considered confidential. For example, unlike the case in the UK where large and medium scale maps can be bought at the nearest book shop, it would not be possible to buy or access such maps in Malaysia without proper clearance from the police or military.

Historical precedence in the surveying and mapping practices is also relevant to the discussion. The strength of the view that surveying and mapping provision is best administered by government is largely a matter of past history, particularly colonialism, and practicality. In developing countries which were once a part of the British Empire or in other territories where they have had a major impact in their discovery, development and expansion, the role of the British cannot be ignored as noted by McGrath (1983); they helped to foster the thought that surveying and mapping should be funded by the state.

Knowing the importance and value of land related data to the state’s responsibility of governance and administration of matters regarding land, this premise has therefore in the past, been based on real foundations. The high costs associated with assembling, recording and maintaining land related data records reinforced the view that the state is in the most appropriate position to carry out this responsibility. The development of the Torrens system in South Australia where the state guarantees the data held in the registers further strengthened this stand because cadastral surveying which is an important form of spatial data collection, is an essential component of the Torrens system. The fact that the system has spread to most parts of the world today has consolidated the view that surveying and mapping should be an activity by governments.
The assumed efficiency of the state and the high costs involved in data collection have also contributed to the attitude that the provision of services and products in surveying and mapping should be affiliated with the state.

In the past and as is still common at present, these activities have been funded by taxpayers via mechanisms such as supply or development funds, grants or allocations. Trends in the developed world however indicate that there is an increasingly accepted view that governments are playing decreasing roles in terms of providing services and expenditure, with previous state responsibilities in land information management being delegated (e.g. via contracts, privatisation, partnerships, etc.) to the private sector. This implies that future policies and the funding structures of government agencies previously enjoying continuous support from the state will not only change but also, that they may soon be on the road to partial or full cost recovery. This essentially means that eventually these must be self supporting or funded from core activities. For a mapping agency or department, there are advantages and disadvantages from the overall viewpoint, and there are also options that should be considered on how best to approach the new environment. These will be discussed in the next section.

3.4 Changing State Roles and Consequences to Surveying and Mapping

At present, there is a shift in the management, collection, co-ordination and dissemination of spatially related data driven by the forces of technology, new initiatives and political factors world wide as reported in e.g. the 1995 Cambridge Conference for National Mapping Organisations. This section will review the traditional underpinning roles of land information management within governments, the nature of these changes and the factors involved in the pricing of information.

One of the earliest theories by Adam Smith that had a big impact on the roles of the state was quoted by Hoogsteden (1988, p.93):

"According to the system of natural liberty, the sovereignty has only three duties to attend to; three duties of great importance, indeed, but plain and intelligible to common understandings: first, the duty of protecting the society from the violence and invasion of other independent societies; secondly, the duty of protecting, as far as possible, every member of society from the injustice or oppression of every other member of it, or the
duty of establishing an exact administration of justice; and thirdly, the duty of erecting and maintaining certain public works and certain public institutions, which it can never be for the interest of any individual, or small number of individuals, to erect and maintain, because the profit could never repay the expense of any individual or small number of individuals, though it may frequently do much more than repay it to a great society."

These basic principles still apply to a large extent although current thinking and evidences on the perspectives of the state indicate that the users of any state provided service should pay for it.

Under the specific context of land information management, other arguments within the broader sense of data gathering exist. Within the UK for example, four primary reasons for Executive Agencies to collect information on behalf of the government are (Coopers and Lybrand, 1996, p.42):

- it is central to government's role in policy making and resource allocation;
- it is essential for reasons of "national interest" and to support the activities of other public bodies (e.g. Lands and Surveys Offices, Meteorological Office, Hydrographic Office, Statistics Office);
- it is required for regulatory purposes to support the smooth running of a market economy or to impose standards (e.g. Land Registry, Companies House and Registers of Scotland);
- it helps address "market failures" and provide data for commercial users.

However, the scenario where the state has traditionally performed the functions above is rapidly changing, essentially because of the common desire by governments world wide to reduce the share of the economy occupied by the public sector. This as stated by Hoogsteden (1995) is due to the ongoing failure over the past few decades to control the economy (particularly public expenditure), which led to increasingly successful attacks from economists, management scientists and others on the basic role of the state itself. There is thus a significant shift in political philosophy where the perceived role of the state has now become that of a minimalist regulator and facilitator for the markets rather than seeking to improve the relative efficiency of government operations.
The level of government involvement or funding in the management of mapping and surveying services worldwide may thus be changing to adapt to *inter alia* the changed economic environment, shifting priorities in the public sector activities, advent of the information age and meeting the needs of the users; this situation is also affecting developing countries and economies in transition. The increasing attention to e.g. curtailing public spending and the creation or emphasis on more value added products and services, has shifted the emphasis from mapping as an end in itself, i.e. being supply driven, to the efficiency and appropriateness of the final information product. As stated by Rhind (1992b):

"In the 1980s it was usual for government to seek to reduce the financial burden on the population by minimising net outgoing: information collected by government is therefore increasingly treated as a commodity and is traded to recover some fraction of the costs of assembly and dissemination."

This in turn implies the need for the attachment of a price to spatial data sets with the primary concerns being 'how much will it cost and what are the benefits', quantified monetarily. As noted by some prominent figures, the focus of recent land information management is shifting towards a demand driven and proactive environment (e.g. Williamson, 1996; Hoogsteden, 1995 and Rhind, 1996).

The point discussed earlier on information as a public good is one of the main reasons why charging for the full cost of information has been under-priced or minimal in the past; it is however hard to imagine the sustainability of such views judging from international trends and thinking on the subject particularly with the high cost of data conversion and the increased usage of land or geographical information systems. The promotion of concepts such as computerisation, privatisation, the ‘user pays’ principle, outsourcing, accountability of government, free market economics, tightening budgets, etc. have ‘forced’ most governments to re-evaluate and consider the need for implementing cost recovery principles and charges for information (Gartner, 1995). For surveying and mapping departments, this implies that a ‘business oriented stance’ may need to be adopted, i.e. pricing for services and change of strategies.

The general view is that markets should be given a larger role in the provision of services and wealth creation activities. Obviously, such philosophical changes will affect most if
not all government agencies in executing their primary roles, functions and duties; the main impact being the implicit promotion to a commercial environment where the internal structures of provider agencies are geared towards a ‘demand driven approach’ and higher awareness for the ‘accountability of expenses’.

Consequently, some noticeable traits can be recognised. For example, there may be the need to be more efficient and effective in the management of human and other resources which may result in the reduction of staff, changes in the skills requirement and a reorganisation of internal operations. In the Ordnance Survey (OS) of Great Britain for example, Rhind (1995) states that the significant changes have been the shorter planning horizons, heavier reliance on revenue, the inability to guarantee the delivery of previous products or services, and the focus on greater income from the core activities.

Cases in the developed world also point to the increased awareness of data pricing and the treatment of information as a commodity, e.g. in the USA (Eaton, 1995), New Zealand (Hoogsteden, 1995; Gartner, 1995) and Australia (Hoogsteden and Williamson, 1990). The next section discusses some of the main issues associated with land information pricing.

### 3.5 Pricing for Land Information

As implied earlier, some of the influencing factors in charging for land information are due to *inter alia*, the institutional pressure of reduced funding which implies eventual financial self sufficiency or increased revenues from those affected. While it is widely accepted that the supply of spatial information has tended to be focused on the core functions of data-gathering, recording, analysis and archiving purposes, significant changes in approach that are more user, client and market oriented can be expected in the future. Among the major consequences are (Hoogsteden, 1995; McLaughlin, 1992; Gartner, 1995; Rhind, 1995; Williamson, 1995):

- charging for the provision of government services or user charges
- privatisation of viable services
- market testing of products and services
• purchaser-provider arrangements
• performance related rewards
• contracting or outsourcing
• increasing use of financial arrangements, e.g. cost centres
• deregulation
• increasing emphasis on Copyright for reasons related to cost recovery
• higher co-operation within different levels of the organisation and between departments
• major institutional reform with the trend of bringing spatial information activities together in one organisation.
• downsizing in government as technology replaces people
• governments adopting a risk management approach in managing spatial data, including cadastral systems
• the impact of the information society on the surveying and mapping industry, resulting in it being seen as part of the IT industry
• adoption of quality assurance and Total Quality Management practices
• internationalisation causing more global thinking in the industry with an emphasis on export and wealth creation

The environment within which the traditional domains of surveying and mapping have operated is therefore changing into one which is more dynamic rather than stagnant; proactive rather than re-active; customer driven rather than production driven; the diversification of products, services and activities, all of which require flexibility in the acceptance of new management policies and technologies. As noted by Gartner (1995) of the experience in New Zealand for example:

"This incremental change... involves focusing our attention on clients rather than production, setting up specific business streams to increase efficiency and effectiveness in customer servicing, providing career development for the staff and involving them directly in the day to day operations."

Some of the changes within the public sector in general have been well documented in "Re-inventing Government" by Osborne and Gaebler (1992).
For pricing digital land related data, some of the issues from the perspective of the OS of Great Britain have been stated by Rhind (1992a):

"The move towards digital products complicates pricing since it enlarges the range of activities for which the information can be used and hence diversifies the market. We in OS (Ordnance Survey) understand that different sectors use our information and have different capacities to pay: there is however no clear correlation between sophistication of use and ability to pay. In reviewing our approach to charging within OS, we have studied what is being done by other national mapping agencies whose government have similar views to our own, including France, New Zealand and Sweden. Nowhere have we found a single, logical, equitable, simple and widely accepted method of assessing the charges levied for different customers. Indeed, there is good reason to believe this cannot exist since charging is essentially a ‘zero sum game’; savings for one customer mean increased cost for another - unless the cost is met from general taxation."

The issues therefore are far from straightforward because the determinants in the structure and level of prices are many and varied. In most instances, setting the pricing level needs to consider the beneficiaries’ willingness or ability to pay, as well as a multiplicity of other objectives, often pursued by other stakeholders. Rhind (1992a) states these as:

- the nature and magnitude of the task required to provide a product;
- costs and efficiency in carrying out the necessary work;
- anticipated market size;
- marketing policy decision;
- the need for equity treatment of customers consistent with the position of the mapping agency;
- external factors such as national policies or within the UK, directives from the European Community;
- the need to ensure prices are as low as possible overall to maximise the use of the asset;
- the desirability of future pricing being reasonably predictable;
- the impact of loss revenue due to unauthorised uses.

The need to have individual pricing schemes has to be considered because of the different capacities or ability to pay of the different customers and users such as the private sector, government departments, non-governmental organisations (NGOs), and special interest groups, e.g. universities. As further stated by Rhind (1992a);
"Charges will need to be made on an organisation specific basis because of their choice of payment method and changes in the structure of copyright charging over the years"

The external factors mentioned above must also be taken into account when formulating pricing policies, i.e. the effects or constraints of existing acts or regulations in which a mapping organisation operates. This will affect government data providers in terms of e.g. their limits to setting prices, extent of joint working relationships with the user community, financial management of their department, and the overall strategic, marketing and operational guidelines within which they must conform (Gartner, 1995; Tosta, 1995).

The characteristics and nature of land information mentioned in the foregoing implies that it is difficult to devise a single charging scheme for land related data sets. The basis for charging land information products and services will to a great extent, be a matter of the individual jurisdictions and organisations to determine. Each will have a different operating environment, driven by different target motives and constrained by existing regulations and obligations to the user community within their respective governments or to other users. Some of the probable issues that may need to be considered include those proposed by the then Australian Land Information Council (now Australia New Zealand Land Information Council, ANZLIC) contained in their Issue Paper No. 3 (ALIC, 1992):

- a provision to recover all direct costs involved in the supply of information at the time of delivery including e.g. tape duplication costs, computer time related to the specific request and direct labour, raw materials and other computer charges;
- a provision to recover all or some proportion of indirect costs; in addition to normal overheads such as employment on-costs including administrative and social overheads, indirect costs can be taken as including items such as amortisation of the costs of creating and maintaining the data base and provision for research and development and future technology upgrades;
- reasonable profit margin depending upon jurisdictional policy;
- other matters including volume of the data supplied, product form, whether the intended use is for public benefit or profit, statutory charges or requirements,
legislative arrangements, reciprocal arrangements for data exchange between data custodians or with users arising from joint development, product market value, etc.

From the providers' perspectives, it is thus difficult to impose a charging scheme whereby all the customer's needs, expectations and abilities to pay are met while at the same time ensuring that at the minimum, operations should be self financing or receive minimal grants and allocations from the government (via full or partial cost recovery), as well as being equitable in its distribution.

Meanwhile, in a separate examination of the costs and benefits of the land and geographic infrastructure in Australia over the past five years, two main approaches for pricing government's spatial data, based on two separate data groups or classes, have been identified by Price Waterhouse (1995):

- The first group includes 'basic or primitive' data that were traditionally compiled as a core function for government. It was argued by the report and elsewhere (e.g. Shepherd, 1993) that the pricing for this level of information should be at the unavoidable cost of extraction and distribution in order to maximise usage and to attain the highest level of social benefit to the populace.

- The second group covers 'value added or elaborately transformed' data. From the perspectives of a national mapping agency with monopolistic qualities, this essentially means that data should be priced at full cost recovery. Where there is competition, pricing at the equilibrium level was proposed.

There are thus many factors that have to be considered in the pricing of land related data. For example, the pricing mechanism can be classified as that of direct selling and leasing. The latter appears to be preferable from the users' point of view because of the dynamic environment of spatial data sets which must continually be updated to maintain their value. For digital data however, other additional elements of the pricing structure apply, i.e. a purchase price, annual maintenance and a 'use charge' (Rhind, 1992). In such instances, charges could be based on a direct charge for a particular service, a periodic license fee with or without update charges, and based on the level of data usage. However, an important aspect in all charging is that ownership of spatial data should
remain with the provider, i.e. be copyrighted, to ensure its continued demand and that efforts in data collection are not misused by others.

From the arguments above, two significant factors emerge for considering the pricing strategies for spatially related data:

- the costs involved in rendering a product or service and the range of terms under which the product is made available and
- determining what value to the user is the information product.

The former is influenced by the returns that are expected from the transaction which is easier to quantify. The latter on the other hand, is harder to determine outright and any methods will involve assumptions or estimates in the variables; this will be discussed in more detail later. As stated by Gartner (1995) however, it is important from the providers' perspectives, not to under value the data as these are costly to collect and even costlier to maintain.

3.6 Consequences to the Users of the Changing Environment of Land Related Information.

In the present context, the changing environment of land related information refers to the availability of digital data that can be accessed rapidly, compared with the alternative situation. The impact of digital land related data and the pricing mechanism adopted can generally be viewed from the perspectives of the main users, i.e. the private users and within other government departments or agencies. The consequences can range from one of mutual benefit to both providers and users, to one where duplication of efforts, unfulfilled expectations and waste of resources can occur.

Where data are concerned, the main interest to private users is naturally related to costs and value for money, as well as the increased expectations and demands for better data. In Australia for example, the availability of Digital Cadastral Data Bases (DCDB) is now common and one in which the emphasis is more on their maintenance rather than on their
creation. As a consequence, the following demands from the users have been noted by Wan and Williamson, (1995):

1. **Completeness of information** - the ability to provide a complete coverage.
2. **Currency** - where information must be up to date.
3. **Data quality and data integrity** - data should be clean, correct and consistent.
4. **Data structure and topology** - the provision of unique identifiers for all points, lines and polygons.
5. **Timeliness** - information must be provided in a timely manner.
6. **Accuracy** - survey accurate information is required by some but not all.
7. **Additional attributes** such as location of easements are required by many.
8. **Data access and exchange method** - a consistent and standardised exchange format is necessary and on-line data access is preferred.
9. **Meta data is highly desirable** - an accuracy indicator and historic information are the most important.

Wan and Williamson (1995) further opined that the deficiencies in the areas of data quality, data structure, data access, data transfer and data maintenance are a reflection of the improved sophistication of the users. Meanwhile, other institutional and policy responses to the digital land information environment include (UN, 1990):

- Pricing of information, as discussed above
- Access to information, where the capability to retrieve, compare and merge different government records remotely is causing many jurisdictions to reassess their policy regarding access to information
- Legal liability, whereby providers of digital data may be held liable for decisions based on incorrect, inconsistent or unreliable land records. This issue has become more complex as data collected from more than one source are integrated by another party.
- Education and research commonly covering either applications to a particular discipline, or the technology itself. The UN (1990) document however recognised the need for students to be given LIS/GIS exposure from three different perspective, i.e. spatial information theory, applications research, and information management and policy examinations.

The determination of information value however, is a complex issue. This is due to the many definitions of information and value, which can be interpreted differently, depending
on the user, the information product or service, and the environment in which it is applied. These issues are further discussed in the following.

### 3.7 Salient Aspects of Information

The importance of information has gained momentum with the wide spread use of digital data, the implementation of various information systems and the dawn of the information age, as noted by Eaton (1988, p.1):

"Within the last forty years, information has undergone a remarkable elevation. It has risen from a comparatively marginal intellectual status to a point where it is freely and frequently described as a 'resource' or 'commodity'. Some writers have confidently forecast that it will fulfil a vital role in the new 'information society' or 'post-industrial society' which is said to characterise the present era. In the model of this new society, information and knowledge have become centralised as the strategic resources which offer the keys to increased productivity and wealth."

Before proceeding with the discussion of information, it is useful to define information because it has been a matter of considerable debate in the literature. The Collins (1995) dictionary definition of information is:

1. knowledge acquired through experience or study
2. knowledge of specific and timely events or situations; news
3. the act of informing or the condition of being informed.
4. (Computers) a. The meaning given to data by the way it is interpreted. b. Another word for data.

From this dictionary definition, information can thus be associated with one’s increased knowledge through its acquisition, how it is inferred and used. The concepts of data, information and knowledge are often associated with each other, as observed by Benyon (1990, p.4), where information is produced from data and knowledge is derived from information by integrating that information with existing knowledge. Larner (1996) meanwhile argues that any message (i.e. data), once in physical form, becomes another object, i.e. data are records of fact whose interpretation results in the creation of information in the mind of the interpreter.
However, the definition of information can take on new or added meanings when viewed from the perspective of varying users, products or services. Its definition for example, ranges from its use as a resource or commodity, to an economic product. The literature is almost equivocal in associating the definition of information with data, knowledge, communication and process. Hoogsteden (1988, p.17) remarked that knowledge, information and data all form part of a larger process termed communication and that each can be interpreted in terms of the different perspectives, content of the information, communication and level of detail, depending on the users' beliefs and leanings. Some definitions of information view it from the contribution that it makes to the particular process, while others may define it in terms of its content, its communicational ability, and its use.

Machlup (1984) made the information distinction between its ‘content or knowledge’ and its ‘use’, i.e. the object delivered and the act of delivering, which are two separate elements. A problem with its valuation is the lack of an identifiable unit that can be used as a measure of decrease or increase in its consumption and use. For example, the value from the use of a certain amount of information familiar to one user may be readily estimated but it is harder to determine the value of an ‘extra’ piece or bit of information. This complicates the valuation of information. Machlup (1984) was sceptical as to the possibility of arriving at a quantitative assessment of the social benefits and costs of information and he stressed that the use of information is a process of transforming it into knowledge.

Another definition of information involves considering it at various levels. Tricker (1982, p.29) for example views information at four levels:

- **Level One** - Information as basic or raw data. This recognises a record of primary transaction or situation, or a primary reflection of fundamental processes or states. This forms the building blocks that contain potential information but requires further processing.
- **Level Two** - Information as a message. It occurs when the basic raw data have been classified or arranged in suitable form, e.g. book, report, picture, etc. Minimal concern
is given to the needs of the recipient of the message; information at this level is seen as a function of the data or message alone.

- **Level Three - Information in use.** This refers to interpreted data by the user and hence, the roles that the language, semantic and symbols by the sender to the recipient have added significance. Identical messages may have different meanings for different people as intelligence, education, training in the language and notation used in the data, previous relevant experience and perceptual abilities can affect the meaning derived from data.

- **Level Four - Valuable information,** which is concerned with the meaning that the user actually derives from the source data and the extent to which the uncertainty is reduced and knowledge increased. Tricker (1982, p.33) stressed that the recognition of the user and appreciation of his or her organisational role and expectations needs to be considered. At this level, information \( I \) is thus a function of the message \( (d) \), user \( (u) \) and user's organisational situation \( (s) \), i.e. \( I = f(d, u, s) \).

Tricker's (1982) model or definition of information above provides a useful classification of information which emphasises the linkages of information with the communication process, its content, use and the environment. The following features of information reviewed by Repo (1987, p.4) deserve mentioning and reiterating because they relate to later discussions:

- information products cannot be replaced with other information products if the information contents are not identical
- information products add value, but their benefits also depend on the ability of the user to exploit them
- information does not deteriorate through use
- information is not a constant, and generally it cannot be quantified
- information is an abstraction, i.e. it is produced, disseminated, stored and used through different devices and services
- new information is produced mainly with public funds but the total production costs are rarely included in its market price and
- the real benefit of information is difficult to measure because it is tied to its use, the extent of which is unpredictable.
However, it will be beyond the scope of this study to explore the various definitions associated with information in great detail. Some of the problems associated with defining information have been discussed e.g. by Best (1996), Cronin and Davenport (1991), Eaton (1988), Machlup (1984), King et al (1983) and McPherson (1994). As stated by Hoogsteden (1988, p.48):

“Identification and quantification of information uses depend not only on the way in which individuals process information, but also on the political, ideological, administrative, bureaucratic and value based environments within which people live and work... There is a strong likelihood that the actual products and services derived from information will pose similar difficulties for objective measurement of usage.”

Latterly, information as a resource has been gaining widespread acceptance judging from the growing literature devoted to information management (e.g. Best, 1996; Orna, 1990; CCTA, 1990). It is also increasingly preferable, though not always necessary, that some form of estimate for the value of information be adopted or approaches developed to quantify it, particularly when an investment in an information system is contemplated. It is widely accepted for example that information services and products have commonly been used for:

- supporting and improving decision making;
- reducing uncertainty and risk, which reduces the possibility of future losses due to e.g. ill-formed judgements of future developments and the non-delivery of output.

From the literature reviews, discussions with other professionals and during the data collection phase conducted during this research, it can be surmised that the value of information as a resource is a highly subjective matter. Different decision makers, organisations or even among individuals related horizontally and vertically within an organisation have varying perspectives on the value of identical data or information. As with the environment (e.g. cleaner air, less noise pollution) however, there is increasing need to account for the costs and assess the benefits of this resource.

The increasing use of computers is shifting the focus of management towards this ‘fourth resource’, as termed by Best (1996). Digital information is the core of any Information
System (IS) and in order to achieve its optimum use, the value that information contributes will need to be quantified as part of the justification process in IT investment. As stated by Broadbent and Lofgren (1993, p.684):

"As information and its management become a major activity, the question of value becomes critical as the costs become apparent and pervasive. There is also argument that as the proportion of organisational resources devoted to information function increases, these functions can no longer be treated as unallocated costs"

The CCTA (1990, p.3) publication on managing information stated that information possesses the properties that are associated with resources:

- it is essential to every aspect of Government business
- it incurs costs (often hidden) in collection, storage, processing, etc.
- it belongs to the organisation as a whole.

The study further argued that effective use of information adds value to all the activities of government departments by:

- improving the quality of information for policy makers and planners
- enabling more effective discharge of operational functions and higher quality of service to the public
- producing more accurate, cost-effective management information
- reducing expenditure on the collection, communication and storage of unnecessary data
- better focus on IS investment
- exploitation for wider business opportunities

The points mentioned above apply to most organisations but are particularly relevant to the management of land related data or geographical information, which can be classified e.g. in terms of layers or scale. The definition of land information for the purposes of this research as mentioned in the previous chapter, consists of data or information that can be related spatially or geo-referenced in space within a specified co-ordinated reference frame; the information may consist of inter alia, signs, symbols, points, lines, areas, other graphics, alphanumeric and numeric characters, which represent the natural or human made features on the earth or the environment.
From the discussion above and as reviewed in the earlier chapter on land information needs in developing countries, land information will be regarded as a resource within the scope of this research. There is therefore a case for its valuation and this will be described in the following.

3.8 Determining the Value or Utility of Land Information.

As with information, value also possesses varying characteristics of its own. Generally, it can be regarded as the expression of one’s preference about any object or good, product or service, a situation, an event, an equivalence for something else or simply a preference for something. The Collins (1995) Dictionary definitions of value are:

1. *The desirability of a thing, often in respect of some property such as usefulness or exchangeability.*
2. *An amount, especially a material or monetary one, considered to be a fair exchange in return for a thing.*
3. *Satisfaction, value for money.*

The key words above include ‘desirability’, ‘usefulness’, ‘fair exchange’ or ‘equivalent to something else’, and ‘satisfaction’. Some related words as espoused by Roget’s Thesaurus (Kirkpatrick, 1987) are: utility, employability, serviceability and handiness. Thus, determining the value of information will not be an easy or straight forward matter; both ‘value’ and ‘information’ have wide forms of interpretation and expression.

On the other hand however, it is useful to consider the consequences of not appreciating the value that information contributes to an organisation, i.e. the result of its inefficient use. This failure to specify, identify and quantify what constitutes essential information for the organisational base can lead to *inter alia* (Best, 1996, p.24; CCTA, 1990,p.4):

- missed opportunities of bringing together relevant information from different sources to bear on urgent problems, or to create new products
- failure to spot potential threats in time because of a lack of intelligence gathering and correlation
- failure in attempts to innovate
- persistence in inappropriate and wasteful information activities
• information which is collected but not needed
• information stored long after it is needed
• information disseminated more widely than is necessary
• inefficient methods used to collect, analyse, store and retrieve information
• collection of the same basic information by more than one group of people in the same
department
• duplicated storage of the same basic information.

These consequences have often been underestimated by organisations involved in the use
and management of information. They are not easy to identify because most costs are
hidden and moreover, individual users and providers have varying notions of value.

3.8.1 Problems of Information Valuation

The problems of information valuation have been well surmised by Best (1996, p.14):

“...fixing a value is always an indirect process that involves finding appropriate
equivalents and standards, not necessarily or always in money terms, and the estimation
of those who use it has to be taken into account as well... features of the concept of value
explain why the process of valuing is a difficult one.”

Information costs have often been connected with the value of information, e.g. the higher
the costs, the higher its value. However, relating the cost of amassing information with its
value is also arguable because the relationship between information cost and utility or
value, is not a direct one. As argued by Orna (1990, p.58):

“The difficulty with monetary ratios lies in finding a meaningful way of converting the
qualitative assessment of values into a numeric form that can be compared with the cost
figures... The only case in which monetary ratios would be appropriate and easily
applied is that in which the enterprise sells information products or services on the
market; there the units of cost and value are the same, and no conversion is involved.”

Hence, it will not be easy to develop an embracing model that can be applied to any
situation as well as being independent of the individual user. As acknowledged by Best on
the issues involved in determining appropriate criteria for estimating the value of things
"the actual business of determining appropriate criteria is hard intellectual work, in which both thinking and feeling are involved, in which conflicting interests can play a part; while the application of the criteria so as to arrive at a reliable evaluation can be a complex process where multiple criteria are involved (as they are in organisational context) - so complex as to be beyond the unaided capacity of the human memory."

There are however studies to value information services and products by different professions serving different purposes, e.g. those from the information services (such as libraries) as well as by economists and those in business (e.g. Bysouth, 1987; King et al, 1983, Parker et al, 1988). Such studies prove that despite the problems with the lack of clear pay-off for information, there is nevertheless a need to quantify its value because all of its services or products consume resources which must be justified.

3.9 Perspectives of Information Value

The valuation of information can be approached from varying angles but ultimately, any method will seek to quantify the individual content and the use of information. There are however many perspectives from which one can indicate value. For example, Orma (1990, p.58) states that information value can be expressed in terms of:

1. **Quality of information** - Degree of accuracy, comprehensiveness, credibility, relevance, simplicity, validity
2. **Utility of information holdings** - Degree of intellectual and physical accessibility, ease of use, flexibility, presentation
3. **Impact on productivity of organisation** - Contribution to improvement in decision making, product quality, efficiency of operation, or working conditions, time saving, promotion of timely action
4. **Impact of effectiveness of organisation** - Contribution to new markets, improved customer satisfaction, meeting targets and objectives, promoting more harmonious relationships
5. **Impact of financial position** - Contribution to cost reduction or cost saving, substitution for more expensive resource inputs, increased profits, return on investment.

From the business perspective, Parker et al (1988, p.65) noted that the value of information can be based on the advantage achieved over the competition, reflected in current and future business performance and could for example be assessed from the improving markets, provide product and company differentiation, facilitate new product
and service introductions, or introduce operational efficiencies. The various viewpoints on what constitutes information values above demonstrates the wide range of approaches from which it can be perceived. Each of the ‘value elements’ above can also be viewed and argued as the benefits of information; some literature combine the meanings and use them interchangeably. In business applications of information, it essentially means that it will be related to profits and business advantage whereas for the government or public sector, information value in terms of efficiency and effectiveness to the product and service will be important. One conclusion however seems manifest, i.e. that in the majority of cases the information values are non monetary or qualitative.

3.10 Approaches to Valuing Information

The following attempts to discuss and address the quantification issues of information. Although the techniques reviewed and proposed are applicable to any value assessment of information associated with the provision of informational services or products, the solutions discussed assume that the value arises as a result of the introduction, adoption and use of an IS or IT infrastructure within the organisation, i.e. digital data.

Classification of the available methods for valuing information varies. Orna (1990, p.25) for example categorises them by the ‘direct attack’ and ‘oblique approaches’, while Curtis (1995, p.12) approaches the problem by classifying them as quantifiable and non-quantifiable. Silk (1991, p.69) meanwhile categorises them as ‘hard’ and ‘soft’. For the purposes of this research, the various methods will be categorised into two forms:

- tangible methods and
- intangible methods

Most approaches usually begin by identifying the contribution that information makes, i.e. those related to cost savings or avoided costs, better decision making and reducing uncertainty. Use of the word ‘benefits’ of information is unavoidable in measuring its ‘value’ although for the present context, a difference is assumed; the former usually accounts for the processes involved with the use of information, while the latter is concerned with the information itself.
There is a wide range of approaches for measuring the value of information depending on
the tangible and intangible returns that result from the use of that particular information.
Three of the common generic benefits of IT/IS are efficiency, effectiveness and strategic
advantage (Silk, 1991, p.69). The quantification of these information values in terms of
difficulty progresses in similar order, i.e. ranging from the ‘tangibles/hard’ to
‘intangibles/soft’ values. Figure 3.1 below depicts the ranges or classification.

FIGURE 3.1: Classification of Information Value Measurement (Modified from
Silk, 1991)

<table>
<thead>
<tr>
<th>Nature of Benefit</th>
<th>Tangibles/Hard</th>
<th>Intangibles/Soft</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Causal Logic</td>
<td>2. Causal Logic</td>
</tr>
<tr>
<td></td>
<td>5. Assess value of change</td>
<td>5. Assess value of change</td>
</tr>
</tbody>
</table>

3.10.1 Tangible Approaches to Valuing Information

As opposed to intangible methods, tangible values of information have a higher relative
rate of calculable variables, such as the organisational efficiency (e.g. cost savings and
avoided costs) analysis that relates the function of information to the organisation.

The observables in these approaches include the effort spent (time, willingness to pay,
savings) on information collection, and the impact that the information has on the output
which are estimated monetarily. Similar with other approaches that will be discussed in
the following, the consequences of not having information, e.g. the amount of money
spent in searching, acquiring and using it, are subsequently compared with the scenario
where information is available. These techniques can be successful if the information used
is produced internally because of the better identification of costs attributable to the
informational products, i.e. there is minimal external information involved or that the
information value is mainly confined to the internal users (i.e. the modelled information products and services are internal).

Orna (1996, p.26) quotes that the observables analysed in this technique include;

- value of the information to the organisation in terms of value of the time (measured by salary and overhead) that users are willing to expend on them
- the additional costs incurred if there were no in-house information services and data had to be acquired from somewhere and,
- the savings that would be lost and the costs of acquiring the required information from elsewhere.

In these forms of analysis, Broadbent and Lofgren (1993, p.697) emphasised the importance of quantifying the outputs and outcomes that key players regard as important. The identification and ranking of the possible information value is therefore a major part of this approach.

The measure of indicators (e.g. time and cost savings) used in the tangible approaches are among the most ‘concrete’ values that can be computed and directly attributable to information. Such analyses are useful because they identify to a great extent, the costs incurred that result from rapid access to information and its impact to the processes. These techniques are therefore important for assessing the benefits of any information system and are commonly used in the justification and feasibility stages of an investment; these will be further investigated in the next chapter covering the benefits of LIS.

Statistical techniques can also be applied for determining information value (Ein-Dor and Jones, 1985). Statistical decision theories are used for analysing decisions when the outcome of the actions taken are not certain. In this case, they refer to the valuation of information for modelling impact evaluation. This involves the use of probabilities to expected outcomes and also involves the use of decision trees to display all elements or choices of the problems. However, no probabilities are associated with decisions since it is assumed that there is no uncertainty about them. The value of information in this respect is measured by the difference in the expected outcome from a decision made with
complete information, against one in which there is none or incomplete information. The outcomes are expressed explicitly.

One of the advantages of statistical decision analysis is that it aids in analysing possible scenarios and important decision nodes by the construction of decision trees. As emphasised by Smith (1988, p.12), decision analysts identify the objectives and decisions of an analysis and quantify uncertainties by the use of probabilities, and the costs of viable decisions. The techniques can thus be used to value informational decision trade-offs, i.e. by analysing the possible options and impact.

In practice however, this technique is seldom used by senior decision makers who rely more on experience and ‘gut feelings’, for assessing the value of information. As stated by Isenberg (1988, p.531) who made a survey of how top decision makers make decisions:

“Most senior executives are familiar with the formal decision analysis models and tools, and those that occasionally use such systematic methods for reaching decisions are weary of solutions that these methods suggest that run counter to their sense of the correct course of action”.

Further, as argued by Ein-Dor and Jones (1985), although statistical decision theories provide answers to questions about the economic feasibility of information systems, it does not reveal the nature of the information system, i.e. its inputs and processes are not considered. In addition, the individual preferences and experiences of the decision makers and other external factors are normally excluded in such analysis.

From the discussion above, it can be deduced that tangible methods for valuing information are more applicable to situations and scenarios with readily available supporting data. An expansion of benefits assessment of a LIS will be further expanded in chapter five.

3.10.2 Intangible Methods

Intangible methods of valuing information are normally market-type surveys which seek to infer the monetary consequences of information resulting from its use. However, it is worthy to note where LIS implementation in developing countries is concerned, studies
that focus on determining the value of information on its own have seldom been reported.
The intangible values of information are usually depicted qualitatively, due to the difficulty in measuring them. As stated by McPherson (1994, p.210):

"Intangible value is different from monetary value; it is difficult to think about, difficult to measure, difficult to combine both within itself and with monetary value."

McPherson (1994) further argued that this conceptual difficulty occurs because:

- it is customary to think of 'value' in terms of the single money dimension
- the unfamiliarity and difficulty of most people to think in more than one dimension, i.e. requiring a facility for spatial visualisation associated with multi-dimensional spaces.
- constraints of the legal audited account and balance sheets which rarely include intangible values

It is also noteworthy that no common model for measuring the intangible value of information exists at present. As stated by Best (1996, p.31):

"...putting a reliable and acceptable value to information is a mighty difficult task, and that, while there is plenty of indirect evidence to suggest it has a positive value to those who know how to use it, no one has found a direct method applicable across a wide range of situations."

In general, this difficulty can be attributed to three factors:

- the nature of information itself
- the varying perspective that users adopt for valuing or appreciating information, as discussed in the foregoing.
- the lack of direct linkage identification factors the information to its consequences, e.g. more information resulting in better decision making.

Approaches to model the intangible value of information services and products are continually being developed and updated, e.g. Broadbent and Lofgren (1993), Menou (1995a), Hares and Royle (1994) and McPherson (1994). These are however mainly confined to those involved in the information services such as libraries where 'packets' of information are relatively more quantifiable.
The main impact of information, i.e. the consequences to the business or organisation resulting from information use is broad and applicable to a wide range of scenarios. The intangible values could include e.g. better decision making and reducing uncertainty, promoting competitiveness, productivity, innovation, improved organisational products and services, increase in the range of outputs and more timely information (Best, 1996, p. 26; Broadbent and Lofgren, 1993; Parker et al, 1988). From the business perspectives, Curtis (1995, p.14) includes customer confidence, the ability to attract new customers and retain existing ones, as the intangible values of information.

Any approach to model the intangible values or benefits of information should begin with the identification of the benefits and impacts resulting from its use, and linking these with the sources. The guideline criteria for a post-evaluation study of assessing the intangible information value outlined in Figure 3.2 shows a proposed line of enquiry that aims to evaluate the intangible information impact to the users.

The first point mentions causal logic. It identifies and classifies the benefit of the perceived information values, e.g. in the order of their importance, impact, costs, etc. in an orderly manner. The identified values as perceived by the users are associated with the range of possible sources by linking them via a cause and effect methodology.
FIGURE 3.2: Guideline Criteria for Determining Intangible Information Values
(Modified from Silk, 1991)

1. Identifying and classifying the benefits.

2. Identifying the reasons which link the cause and effect chain by causal logic, i.e. linking the perceived values or benefits that can be attributed to information, and ranking them in a suitable order. This does not identify how big the impacts are but merely relates them to the source.

3. Determining the direction of change, e.g. the increase in better decision making or competitive advantage, and identifying the variables that cause or promote the changes. It will inevitably involve the comparison of past data against current changes.

4. Monitoring the size of the change. This extends the previous step and defines the observable quantities that need to be measured, verified and related to the impacts. The data on existing observables will be necessary in order to relate the causes to the consequences attained or expected.

5. Assess the value of change. Subjective judgement e.g. weightings, will be required and attached to the necessary linkages and compared with the other value perceptions. These can be obtained from past experience or by the ‘Delphi’ technique.

6. Assess the financial impact by allocating a financial value to the benefits. It follows that if this can be estimated, the impact of the information value can be calculated.

Criteria for ascertaining the unit of measure for values, and lines of questioning that lead to their determination, need to be formulated independently within the organisation. These can change e.g. over time, under different priorities, different users and thus should continually be updated and adapted as more data are obtained. The essential element is that the leading questions or lines of reasoning should always be based on the users’ perspectives.

The initial criteria could include e.g. interactively prioritising the problems solved with information within a given time frame, determining whether the information is a product or as part of a process, or whether the users use the information only under a specific circumstance. Such information is necessary for classification purposes and aids in identifying and isolating other related variables. A further issue that must also be addressed involves identifying other stakeholders concerned with the information flow process, for assessing the varying perceived values of similar information. These data are necessary when inter-agency use of information is contemplated particularly in government agencies with horizontal and vertical relationships.

After the intangible values have been explicitly determined and stated e.g. by statements, these should then be ranked and categorised in some specific order depending e.g. on the
user, individual problem solved and the environment. Categorisation procedures may include indicating whether they are readily quantifiable or not, whether the information is directly or indirectly used from one source, whether the resulting advantage is internal or external, etc. Table 3.1 below shows a simple classification matrix of value added benefits with the implementation of a LIS.

After constructing the benefits matrix, it is necessary to validate their relative importance and significance with the various users within the organisation (Menou, 1995a, p. 470). This can be obtained from further interviews, using the 'Delphi' technique, or other discussions involving the users and other expert professionals. The Delphi technique entails the recording of opinions, analysis and summarising by the investigators, and subsequent requisitioning of each expert combined with further feedback concerning the responses of other experts (Bridge, 1989, p.207). The final output should be a set of information values or benefits prioritised and agreed upon by consensus.

In step three of Figure 3.2, monitoring the direction of change resulting from information will depend on the purpose or main business activity of the stakeholders; this needs to be identified, appraised and determined internally as it may differ significantly between organisations. For example, a private land surveying firm will tend to monitor its performance in terms of increased contract, customer base, enhanced public image, etc. whereas a national mapping agency may consider its performance in terms of effectiveness in achieving its goals, wider range of services and improved accountability to the public. For complex relationships, i.e. when a direct causal effect is not possible or where there are no available data, statistical techniques (e.g. hypothesis testing) may be used to validate the relationship. Assessing the size of the impact involves estimating 'a priori' the size of the change, i.e. without or with lesser information, and comparing the observable quantities, when the system is in operation. Access to historical data will again be necessary for cross checking purposes. It will however require agreement among the various benefactors because any implied monetary values will be estimates and in some cases, a realistic range may be sufficient.
### TABLE 3.1: The Service Benefits of GIS (Adapted from CCTA (1995, p.34))

<table>
<thead>
<tr>
<th>INDIRECT</th>
<th>FINANCIAL</th>
<th>NON-FINANCIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT</td>
<td>INDIRECT</td>
<td>FINANCIAL</td>
</tr>
<tr>
<td>FINANCIAL</td>
<td>Avoided</td>
<td>Speed of</td>
</tr>
<tr>
<td></td>
<td>Costs</td>
<td>Resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Speed of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presentation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information</td>
</tr>
<tr>
<td>NON-</td>
<td>Data</td>
<td>Data Access</td>
</tr>
<tr>
<td>FINANCIAL</td>
<td>Integrity</td>
<td>Distribution</td>
</tr>
<tr>
<td></td>
<td>Accuracy</td>
<td>and Analysis</td>
</tr>
<tr>
<td></td>
<td>Currency</td>
<td></td>
</tr>
</tbody>
</table>

The value of change can be estimated by attaching estimated weightings to the observable quantities so that the different types of benefit can be compared with each other. The weights can be obtained or generalised e.g. from the user interviews, questionnaires or discussions carried out at the earlier causal logic stages.

The final stage involves computing the financial impact of change, by giving each benefit or value a monetary amount. In theory, the overall impact on the performance measures are calculable; in practice however, only some of the identified intangible values can assessed financially with a high level of confidence. Final estimates may also take the form of a ‘possible range of values’.

Such analysis serves an important objective, i.e. if the process is carried out to completion, the management team or decision makers should have a clearer view of the added value that information makes to the organisation. Figure 3.3 below models the process involved in determining the intangible values of information. The middle processes require a high level of interaction and communication between the investigators.
and different users in order to narrow down the broad factors involved and also, to refine the lines of reasoning. Depending on the type of information, it may be necessary to relate the various informational value or benefits identified, to the cost areas that are associated with the process of providing, obtaining and using the related information (Menou, 1995a, p.470). Cost related data in the information flow procedures of an organisation are important for assessing both the ‘soft and hard’ values of information and in some cases, they may be necessary. However, they can also be the hardest to obtain.

**FIGURE 3.3: Model for Determining Information Value.**

3.11 Comments on the Evaluation of Tangible and Intangible Values of Information

The main issue that determines the success of the evaluation process of information can to a large extent, be attributed to the approach adopted in framing the leading questions and also, on the availability of related data. In addition, other critical success factors such as the amount of effort spent on data collection and interpretation of the findings can also
play significant roles. The analysis will involve assessing the combination of subjective judgements and quantitative data for estimating the likely consequences in monetary form. Obtaining and gaining access to the relevant data will be a crucial factor in the evaluation study. However, organisations may be reluctant to release information that includes financial data, flows of transaction or those that relay performance indicators and probably explain why comprehensive evaluations of results of IT/IS benefit studies are seldom available in the public domain.

From the foregoing, attaching a reliable and acceptable value to information is therefore not an easy matter. As implied above, a significant amount of time, effort and cost will be required in order to analyse and estimate the indirect benefits that result from having more and better access to information (e.g. more user interviews, meetings and analysis).

There is also a limit where no matter how deep the level of thinking or effort spent in correlating the causes and effects of the intangible values of information, some consequences will not prove easy to quantify and interpret in accurate monetary terms. This occurs when there is lack of credible association of the sources and consequences, or the unavailability of crucial input data. However, this should not deter the effort; failure to estimate the potential of information may result in missing opportunities from the information system, to the detriment of the overall business strategy, organisation and potential users (Willcocks, 1994, p.370). This results in more costly efforts, inefficiency, ineffectiveness and higher risks, through utilising narrow evaluation methods that fail to clarify and assess the less tangible inputs and benefits.

The analysis of the intangible methods above can equally apply to the valuation of tangible methods and can be carried out 'a priori' or 'a posteriori'. Judging from trends of LIS implementation in e.g. the UK, Australia and Canada, the former have been widely carried out as part of a cost benefits analysis or investment appraisal (LGMB, 1989; Tomlinson Associates, 1993a; McLaughlin, 1975). Case studies on the values of implemented systems are few and far between, probably owing to the sensitivity of the information or decision makers may see no reason for evaluating successful projects. Furthermore, evaluating them requires effort, considerable perseverance (Silk, 1991) and may also be unsuccessful. However, experience from such an analysis would enable the organisation to sharpen the business case, and estimate the size, value and financial impact of the
changes brought about by the system. At the very least, studies into the intangible values of information may aid in deciding whether a system is worthwhile or determine whether changes were caused by the introduction of the system, or connected with other variables; it may also lead to a wider appreciation of the perspectives involved within the evaluation process or direct attention to other information flows and processes that may otherwise have been ignored.

For an integrated land information system involving inter-agency data exchange, cooperation and multiple uses across different users and authorities, the optimum capability of the system may be unrealisable without an analysis of both the tangible and intangible values of information. Moreover, the very process of evaluating all the possible beneficial aspects of information may be beneficial in itself, regardless of the achievement rate. As stated by Willcocks (1994, p.377):

"...much depends on the careful interpretation of the results, and much of the value for decision makers and stakeholders may well come from the raised awareness of issues from undergoing the process of evaluation rather than from its statistical outcome"

3.12 Approaches for Valuing Land/Geographic Data in Practice

The following reviews some of the approaches that can be considered as part of the process for determining the value of land related data or geographical information. Such analysis or studies are normally carried out to assess the land information needs as part of a modernisation process or for reviewing the current health of the existing systems involved in the acquisition, processing, dissemination and management of land related information. The discussion focuses on the data collection phase of their needs and values.

3.12.1 Studies in Great Britain

In Great Britain, one of the earlier studies of GIS implementation in Local Authorities involved the Northamptonshire County Council and Hertsmere London Borough (LGMB, 1989). The studies essentially ascertained the GIS needs, costs and potential benefits in both local authorities.
Interviews with those responsible formed a major part of the process. In the studies of the Local Authorities above, the needs were determined from initial discussions for assessing the map usage and user requirements in terms of information held, maintained, manipulated and analysed. Two interview stages were conducted. The first stage attained background information on the current position, future needs and areas of significant costs and benefits in sufficient detail to establish feasibility (LGMB, 1989, p.3). When the case arose for computerisation of potential and actual uses, then a second series of interviews was conducted. These established inter alia, the detailed requirements, transaction volumes, the required response time for certain types of analytical operations for graphic manipulation and other general inquiries. The findings formed the basis for subsequent detailed CBA and determined whether the case to proceed to the system specification stage arose.

Of interest here are the results of the initial interview of map use study which provided data for framing further interviews. These questions include the determination of:

- departmental or section objectives
- the work involved
- officer responsibility
- examples of information received and output
- how the department relates to others within the organisation

A further aspect was that these interviews were backed by appropriate documents, e.g. long and medium term departmental plans, and examples for both internal and external users. The need for proper, complete and thorough recording of the interviews was stressed, which were recorded immediately after the interviews. Analyses from the interviews were classified as needs and requirements. The former identified spatial analysis, calculation of needs and data holding requirements while the latter included classification of digitised maps, data structure, corporate access methods, user access methods, raster data, modelling and linkages to other systems and organisations.

This procedure typifies the most common and effective approach for valuing data, albeit limited to tangible valuation of information needs that are related to the operations of the
organisation. Such analysis may be sufficient from a single user or provider point of view, i.e. the value of the land related data acquired, used and held was perceived wholly from within the organisation and assumed minimal external involvement in its valuation. For inter-agency scenarios or for purposes of data commercialisation however, a more detailed analysis of how the data attains value will be necessary.

From the example above, the interview approach is a means for obtaining and ascertaining data on how the users value land information. Quantifiable or monetary forms of value are easier to relate to the flows, uses and costs of information from within the organisation. In both of the case studies above, no quantitative assessment of the possible intangible values was carried out.

The requirements for a national level LIS or GIS necessitates a different approach for assessing the value of land related information. The need e.g. to balance the costs of the adopted survey against the detailed level of data required becomes essential, as is the identification of the individual target users with their relevant background qualification and experience. In 1992 the National Land Information System (NLIS) market study of Great Britain conducted a potential market survey for establishing the likely users, usage levels and possible markets for land related information utilising two forms of data collection (Sabel, 1992, p.18):

- a market potential questionnaire survey
- a supplementary postal survey

The user categories studied included developers, agents, lawyers, financial agents, local government, landowners, investors, retailers, academics, executive agencies and professional societies, GIS vendors, the utilities, house builders, environmentalists and research consultants. The first stage involved interviews with the aid of questionnaires of 105 organisations and individuals, with emphasis on the property sector; the argument being that earlier experience from the Swedish Land Data Bank proved that these sectors were the initial main users of the system.
The principles behind the survey were: to obtain a spread of organisations loosely connected with the property sector; a geographical distribution of organisations; and including a range of firms ranging from small, medium to large multi-national companies to take into account the varying requirements.

At the interviewing stages, a factor that the NLIS study considered essential was the choice of individual persons interviewed and their position within the organisation. While those at the upper echelons and senior levels of management brought more authority to the responses, they were detached from the day to day operations and hence, argued Sabel (1992, p.19), they struggled to identify the advantages of the proposed system. A person lower in the hierarchy while lacking authority and ability to think laterally, may instead offer more comments on the immediate applications. Similar problems were mentioned regarding the specific sections of the organisation, where their experience and perspectives may not represent the corporate views. Clearly therefore, the varying individual user perspectives mentioned earlier play a significant role in determining the value of land information.

The supplementary postal survey which received 66 responses out of a possible 200, aimed to approach users who were least represented in the main research, i.e. the utilities, central government department and agencies, academics and local authorities. The significant finding of the above was the difference in results of the two approaches. Differences observed in terms of sampling, quality of responses and the results were such that they required separate analysis even though items in the postal survey questionnaire were covered during the face to face interviews. This suggests that care must be practised not only in identifying target users but also, the manner in conducting the study; a combination of approaches may produce different results. The NLIS approach can be considered as an 'a priori' approach which lays the base for assessing the needs for developing a proposed LIS.

3.12.2 Australian Studies.

In terms of approach, a similar technique was adopted by the Economic Studies and Strategic Unit of Price Waterhouse for conducting a benefits study in Australia (Price
Waterhouse, 1995). The study aimed to examine the economic gains from developing, maintaining, improving and providing access to land and geographic data infrastructure at the national level. The study which was commissioned by ANZLIC also sought to determine and prioritise the steps that data supplying organisations in Australia should take in order to maximise potential infrastructure benefits.

The survey questionnaire approach included 80 major suppliers of land and geographically related data, and over 350 major data users, which were supplemented by phone contact with principal data suppliers. An extra element in the Australian study was the conduct of two workshops to discuss the survey results and their interpretation.

The method used to value the benefits was the cost effectiveness approach, as opposed to a cost benefits analysis (CBA). The main reason cited was the significant practical task of identifying and quantifying the full range of national benefits arising from land and geographical information, i.e. the need to consider the suppliers, users and community benefits and other major players (Price Waterhouse, 1995). The adopted cost effectiveness approach provided a partial solution to the problem by narrowing benefits to a small number of indicators that reflected the overall advantages that a data infrastructure provide. As stated by Price Waterhouse (1995, p.22):

"A cost effectiveness approach ranks competing methods for establishing or maintaining a given capability, using relative costs as a guide. The costs associated with each method are calculated in the same way as in a traditional CBA. Benefits, however, are measured in terms of the difference between the costs of the already established or most preferred method and the cost of the next-best alternative."

Strategies for obtaining the data in the study however were designed such that they were suitable for cost benefit and cost effectiveness analysis with the final choice decided by the quality of survey returns.

The examples above therefore suggest that there is a commonality in approaches adopted for determining the values of land related data, i.e. from market style research. The general conclusions that can be derived from the cases above are the following:
• Assessment of the economic value of land related data should be obtained during the feasibility study stages that seek to assess the need for implementing land or geographical information systems. As mentioned earlier, not many studies have been done for the purpose of post-implementation evaluation and are unlikely unless driven by other greater needs, such as justifying a further investment to an existing system.

• Approaches can be divided into two general scenarios, i.e. the national case and the business case, with the main differences being the coverage magnitude of the survey and the detail level of the questioning methods.

• Common methods of data collection are interviews and discussions, questionnaire surveys, phone surveys and reviewing related documentation and literature.


The approach used for assessing land related information in this research was by discussion and interviews with the main custodians and users of land related data in the area studied, i.e. in Sabah, Malaysia. In addition, an analysis of existing documents and available literature concerning land, their values and the operations of the major state departments involved with land information management was also carried out.

A considerable extent of this study is based upon the author’s in-depth interviews and extensive discussion with over 60 senior officers¹ concerned with the management of land related information during the research attachment period. This was aided by questionnaire notes that were used as a base for all interviews to obtain comparable data and information (Appendix A). Most of the answers and comments were recorded spontaneously at the time of interviewing; some were recorded immediately after each interview, if it were felt that the informant was too self-conscious or reluctant to give answers when the questionnaire was in sight. In view of the nature of the data collected and the limited amount of time and funding allocated for this research, this study did not employ a systematic statistical sampling procedure. There are also other reasons, discussed below.

¹ Mainly from the Lands and Surveys department but also from other state agencies, local authorities and the private sector.
Firstly is the fact that in the area studied in Sabah, the awareness that information has value and should be treated as a resource is yet to materialise. Almost all of the persons interviewed during the data collection phase of the study could not provide realistic values for the land information that they used and managed daily. Some even avoided the question and the most common reply was that they were ‘working for the government’. Guiding the users towards a range of possible values was considered unrealistic in the case study because they had little idea of the value concept as applied to information. This may be due to the fact that the civil officers operated in a supplier driven environment in their provision of services and products, as opposed to a user or customer driven one and hence seldom thought about the issue of valuing information. The importance or need for justifying every dollar spent on accessing information was either not high on their list of priorities, or had never been considered. Moreover, this went against the approach of the thesis, i.e. to develop a user driven approach in LIS justification for developing states to consider.

Secondly, there is the nature of the data required from the major players that were mainly cost related. It would not have been possible to elicit such data from a questionnaire survey, owing to their sensitivity. Personal interviews and informal discussions provided a more conducive atmosphere to obtain the co-operation of government officers to part with their information. It was also discovered that some of the officers concerned were more willing to be co-operative in the presence of the interviewer. However, even the face to face informal discussions had problems because many individuals and officers were reluctant to release information that was considered confidential, particularly the amount spent on acquiring IT.

Thirdly, there is the significant cost and time that a national survey of land information needs would have entailed. Within the restrained grant and time set for this research, there was insufficient time and resources to interview all the various land related data players and stakeholders in the state.

A compromise therefore had to be reached. Part of the data collection phase involved interviewing selected individuals representing most of the agencies involved with geospatial data, while the rest, which mainly involved cost related data, involved data gathering from confidential government sources and reports. Where such confidential data
and information are quoted and used in this thesis, these of necessity, will be referred to as non-attributable sources.

3.14 Conclusions

This chapter has reviewed issues related to the idea of information as a public good and why it has in the past been provided by the state. The trend world wide however suggests that land related information may be going through a transformation in terms of its availability and use, as well as in its handling and management, from the perspectives of the user and provider. This is mainly due to the changing roles of the state, development in economic thinking world wide and the increasing use of digital data which is transforming the manner in which information was traditionally perceived, managed and used. Some aspects of the impact on the state and the user have also been mentioned.

A discussion of the method for assessing the value of information was necessary because it is a matter often not considered in LIS implementation studies but nevertheless is gaining attention due to among others, the issues covered earlier. An approach was proposed for determining the values of information. It should be stressed however that the general evaluation process developed can only be effective with the proper involvement of the users and access to relevant data, essentially because the assessment hinges on identifying the proper mechanisms that link the impact of information on end products and services. Although the information valuation issues raised are more inclined towards the single user or provider environment, it nevertheless forms an essential part in any assessment study.

Within the justification process of a LIS, this chapter has thus examined what can be considered as the two extremes, i.e. the changing role of the state or environment within which land information is used, and the value of information itself. The next chapter will analyse the other factors between these two extremes, i.e. costs and benefits, and examine relevant issues in the area studied.
Chapter Four
Costing Issues of LIS

4.1 Introduction

The economic implementation and evaluation process of an information system usually involves identifying four main criteria, i.e. those related to its value, costs, benefits and risks. Value has been investigated in the previous chapter. The following will discuss the cost related issues of LIS and develop a model for its classification. It also examines how funding for modernising the present LIS in Sabah may be funded by the Federal Government in Malaysia and particularly, by the State Government.

4.2 Cost Factors and Literature Review of LIS

Many factors affect the total cost of a LIS and these have been classified under various headings by different authors. While some are relatively easy to determine, e.g. the costs of hardware and software acquisition, other cost issues that emerge during the life cycle of the system, e.g. extra operational demands in hardware and software and expenses for staff upgrading skills, are harder to model. In addition, there are also social and political consequences resulting from LIS programs that should be anticipated and considered in advance. All these factors contribute in one way or another, to the total LIS costs and failure to identify and model them may have a significant impact on the budget, as stated by Keen (1995, p.114):

"The costs of IT are paradoxical. On the one hand the price of software and hardware drops 20-30 per cent per year. On the other, over the past three decades, information systems budgets have grown at a rate of 15 per cent per year."

The main challenge in assessing the costs of a LIS involves ascertaining the ‘appropriate’ use of existing means and resources to achieve the desired aims, and ensuring that total benefits outweigh total costs, i.e. benefits maximised in relation to costs. Before exploring the problem further, it is necessary to review some LIS cost classification schemes.
The classification of LIS costs varies in the literature, although some obvious cost components are common. Holstein's (1990) World Bank discussion paper on land information management in support of urban development in developing countries classified LIS costs as consisting of development and operational costs, as shown in Figure 4.1 below.

**FIGURE 4.1: LIS Costs as classified by Holstein (1990)**

<table>
<thead>
<tr>
<th>LIS COST</th>
<th>Developmental</th>
<th>Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>User Needs Survey</td>
<td>Office Rental</td>
</tr>
<tr>
<td></td>
<td>Staff Skills Upgrading</td>
<td>Staff Salaries</td>
</tr>
<tr>
<td></td>
<td>Staff Salaries</td>
<td>Ongoing Staff training</td>
</tr>
<tr>
<td></td>
<td>Office Rental and Upgrading</td>
<td>Data Maintenance</td>
</tr>
<tr>
<td></td>
<td>Data Acquisition/Conversion Cost</td>
<td>Maintenance and Equipment</td>
</tr>
<tr>
<td></td>
<td>New Equipment</td>
<td>Replacements</td>
</tr>
</tbody>
</table>

It was argued by Holstein (1990) that LIS costs consist of three main components, i.e. human resources, data, and equipment, of which the most significant are those related to the first two, i.e. human skills development and data conversion. It was further noted by Holstein's World Bank Paper that these can represent 80 per cent of the total project cost with the remaining 20 per cent attributable to other costs. The emphasis on human resources is significant for a developing country where qualified technicians and professionals in LIS management are generally lacking. In terms of costs and LIS success, these have far reaching consequences.

In another investigation, the UK's Local Government Management Board (LGMB, 1989) studies for evaluating Geographical Information Systems (GIS) for local government distinguished cost elements as consisting of capital and revenue costs. This is summarised in Figure 4.2 below. The LGMB GIS cost components were derived from interviews conducted at the requirement study stages. They represent potential expenditure for the system connected to the implementation plan and are spread over a number of years. Although similar in some aspects, both cases show that the cost components of a LIS differ for different users or providers; Holstein's (1990) model is more generalised as opposed to the LGMB model which is more specific for local authorities in the UK.
FIGURE 4.2: The LGMB (1989) Cost Model

<table>
<thead>
<tr>
<th>COST</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>Equipment Maintenance</td>
</tr>
<tr>
<td>Software</td>
<td>Software/Hardware</td>
</tr>
<tr>
<td>Communications/Networks</td>
<td>OS Digital Maps</td>
</tr>
<tr>
<td>Data Conversion</td>
<td>Address Gazetteer</td>
</tr>
<tr>
<td>OS Digital Maps</td>
<td>Central Map Management Unit</td>
</tr>
<tr>
<td>Raster Maps Creation</td>
<td>Staff</td>
</tr>
<tr>
<td>Additional Gazetteer</td>
<td>Training</td>
</tr>
<tr>
<td>Other Capital Costs</td>
<td></td>
</tr>
<tr>
<td>Central Map Management Unit</td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
</tr>
<tr>
<td>Contingency (10-20%)</td>
<td></td>
</tr>
</tbody>
</table>

It is noteworthy that there is no common LIS cost scheme in the literature. The lack of a widely used national LIS cost model or standard is significant for developing countries because it highlights two deficiencies in the LIS literature and may cast doubts on its effectiveness for improving land records management. Firstly, it shows that there is a lack of awareness by implementers of the true and complete costs of investment in modern land information management techniques and what these costs entail. Secondly, without a cost model that considers all the major cost components, there may be higher risks of decision makers in developing countries to over-invest their resources in a particular cost component, e.g. hardware, while under-investing in other cost factors that although they may not be as substantial monetarily, may prove to be crucial success factors, e.g. training of staff and cultivation of support.

One probable reason for this lack of a universal LIS cost classification scheme is the wide variety of spatial data environments within which LIS can be implemented. If these needs were translated to hardware and software requirements, then each organisation will have varying LIS costs. Also, major differences in the level of data access, availability of digital data, level of IT awareness and the existing data infrastructure arrangements affect the release of information and experience in LIS cost management; hence, the benefit of sharing experience is minimal. As observed by Marble (1995), "... problems in this area are rampant throughout the GIS industry since there is little collective experience available with respect to cost estimation and nearly nothing on the estimation of benefits."
All of these factors contribute to the difficulty in developing models that are adequate enough to cater for all the unique demands of the spatial data environments. Moreover, the dissimilarity of land information management and administration procedures requires significant cost data that are usually confidential for the formulation of a cost and benefit model. However, in order to manage the costs of LIS, it is necessary to group the major cost components in some order. The following attempts to identify and discuss the major LIS costs that should be considered before a developing country invests in a LIS.

4.3 Proposed LIS Cost Schema

At a general level, the costs of a LIS consist of two major components, i.e. the one-off or fixed initial payment on computer peripheral acquisition, and its ongoing maintenance. As will be explained in the following however, there are many other costs attached with acquisition and maintenance. Moreover, although most of the literature indicate the major costs, few indicate what systems are appropriate to the user or provide guidelines on how to ascertain that the costs are minimised. For a developing country, each cost element is important because of the limitations in resources, and the ‘state of preparedness’ to adopt and effectively utilise the technology. For the purposes of this thesis, costs will be divided into three broad categories:

- System acquisition costs
- Human and organisational costs
- Digital data development costs

Figure 4.3 below attempts to illustrate the different levels of LIS costs. It indicates that each major cost category has other sub-levels of cost components. In the case study, most of these detailed cost records were not available but will nevertheless be estimated based on available data in the ensuing model developed. Classification of these costs is essential not only for providing management with a better perspective but also acts as a guide for assessing the cost consequences of adopting the LIS technology. These ‘second level’ (Figure 4.3) costs are often underestimated in the literature.
It should also be noted that any cost classification scheme may not always be a reliable indicator because the prices of computer components and their associated services change fairly rapidly and are continuously evolving. This is due to the unstable nature of the market where improvements to hardware and software are always outstripping the market price. There are important implications for this and other similar research studies; the amount of costs and therefore benefits, may not withstand the test of time because price changes occur every few months. However, reductions in price may have future implications, as noted by Potter (1995, p. 264):

"Today many vendors are stripping out memory and taking away features, pulling off backup ports, or selling products that cannot be easily upgraded in the field, all in order to market attractive price points. Over the life of the equipment, the hidden costs of the savings is likely to exceed the original small savings."

It would therefore be fair to assume the general rule that although price decreases in computers will continue to occur in the foreseeable future, the increase in requirements tends to counter this balance. Hence, the investment decision depends on how the justifications have been analysed and portrayed vis-à-vis the existing land information management costs. The following analyses the major cost components, as classified above.
4.3.1 System Acquisition Costs.

System acquisition essentially refers to the computer related peripherals and the appropriate software required for data management and manipulation. Where costs are concerned, existing computer infrastructure assets should be integrated with the proposed LIS. The Victorian State GIS study in Australia (Tomlinson Associates, 1993b, p.66) on hardware requirements provides a useful classification:

- Access terminals
- Input devices
- Output devices
- Servers
- Networking hardware
- Furniture

This model will be adopted for this thesis, albeit with some modifications. However, the environment in which land related data are used is seldom a static one. Costs for extensibility, flexibility and expandability should also be considered in system acquisition. Respectively, these refer to the ability to connect and deliver data across different databases and services, the ability to support changes in operational environment, e.g. in the organisational structure, emergence of new policies, physical relocation, and the capability to meet future data processing and demands.

Computers can range from mainframes, a workstation, a standard micro-computer PC and dumb terminals, depending on the purposes and data processing requirements. Additionally, these should also anticipate the significant memory requirements of modern software for spatial analysis and modelling, i.e. ensuring that the system is capable of handling the minimum requirement for data delivery, manipulation and storage. Some of the main components of the information required to determine hardware acquisition including those identified by Tomlinson Associates (1993b) are:

- the expected utilisation demand, e.g. finding out how often are the data going to be used, and who are the users.
- service or product outputs from the intended system and
• computer usage, including e.g. common use terminals or individual computers for staff, their distribution, size of data storage, anticipated delivery time for processing, printout sizes, etc.

In some cases, a client server computing environment may be appropriate where a ‘server’ such as a workstation, provides data and services to ‘clients’. Networking of LIS allows immediate sharing, exchange of data and access at or from remote locations. The additional costs for this, i.e. administration and telecommunication service charges and equipment, will need to be considered against the potential benefits and other human technical expertise requirements.

Remote office networking capabilities also offer added benefits such as systems development within the corporate environment, de-centralised computing, remote up-date and storage. From the business perspective, Potter (1995, p.257) states that networking benefits include “better customer service through faster access to centrally located data, support of a flatter organisation structure, or faster retrieval of data generated at remote offices”. These are equally applicable to the land information management scenario. Some of the networking costs identified by Potter (1995, p.258) include planning, design and installation, network administration, design configuration, line fees, installation fees and access charges.

Based on observation during the research attachments in Australia and Sabah during this study, it was observed that individual organisations have different requirements for software. Broadly, this depends on the two ends of the spectrum, i.e. the data needs of the user, and the supporting function of the software. Tomlinson Associates (1993b) state that in order to estimate the requirements of computer software, it is necessary to classify data needs during the user study stages into two components, i.e. those that are necessary and desirable, or vital and optional; this aids in determining the needs for the software and also the hardware. Data considered necessary are those that are essential to the users, while ‘desirable’ is used here to mean data or functions that are not necessary and do not directly benefit the decision making process or the information product at present, but may, in the future, be useful; this issue will be further discussed in Section 4.4.3.
The software should effectively perform all the defined tasks that it was intended to achieve, although other extra functions e.g. in terms of manipulation and analysis of the core data sets resulting in more variable products, should be examined and developed. The study by the LGMB (1991) on LIS [GIS] software product functional requirement specifications included data handling, management, manipulation and spatial analysis, geographical access, drawing facilities, display, printing, communications, security and bench-marking. According to Huxhold and Levinsohn (1995, p.225), the annual cost and maintenance of software can range from 8 to 12 per cent.

Some authors have voiced the need for a wider approach in software selection implying common software applications. For example, Poletto et al (1992) proposed the need for a comprehensive software strategy and for a corporate solution to ensure integration with other systems. In practice however, this is difficult to implement without the proper directives from the highest authorities or from agreed institutional arrangements. Moreover, because of the wide variation in the data environment and demands, the LIS software market is consequently quite saturated where each is offering its unique strengths, weaknesses and after sales services in order to gain a share of the market. Hence, it is quite a challenge to implement a common software strategy.
TABLE 4.1: A Simplified LIS Cost Model

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terminal Type:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A (Dumb Terminal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type B (Personal Computer)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type C (Workstation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type D (Mainframe)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Functions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Input Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digitiser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scanner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alpha-Numeric Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output Devices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4 Laser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3 Laser</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2 B-Jet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A0 B-Jet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A0 Electrostatic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site Preparation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Overheads</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total System Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LIS Staffing Costs (Including all staffs involved in the LIS project)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Overheads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data (Refer Table 4.3)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-House Conversion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outsourcing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL EST. COST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The LIS cost model shown in Table 4.1 depicts the costs at a more detailed level. If undertaken before any major computer purchase, i.e. prior to implementation or during the feasibility stages, such an approach may provide a useful framework for classifying the costs. It should be emphasised however that these do not include other related IT costs, which as stated by Hochstrasser (1994, p.156) include:
“additional hardware accessories (e.g. secondary data storage devices), installation and configuration costs (often needing expensive outside consultancy), environmental costs (e.g. under floor wiring, air conditioning, new lighting or additional furniture), running costs (the power consumption of colour screens, laser printers, and plotters is considerable), maintenance costs (service contracts for software - systems engineers spend up to 70% of their time trying to understand code already written before being able to install new functions), systems breakdown (can seriously harm ongoing business), security costs (e.g. protection against systems abuse and viruses), networking costs (e.g. access times to external information systems can be expensive), training costs (consistently underestimated) and the costs of phasing out at the end of its lifespan.”

4.3.2 LIS Staffing Costs.

Costs of LIS staff essentially refer to the strategic, managerial and operational costs of employees involved in all the developmental aspects of a LIS program, which may include e.g. the costs for managing, providing training, digitising, etc. For assessing the overall staffing costs, the main observables are the salaries and the amount of direct or indirect time spent on the particular aspect of the LIS, where roles may range e.g. from that of an advisor, to a full time digitiser. The following cost model in Table 4.2 shows how such costs may be assessed, which was adapted from a paper by the Malaysian Ministry of Land and Cooperative Development (LCDM, 1995). The example illustrates how the average costs of three staff with varying salary and expertise levels involved in a LIS attribute data collection or conversion project may be assessed.

**TABLE 4.2: Cost Model for Assessing Costs of Employee Involvement in a Land Information System Project (Adapted from LCDM, 1995).**

<table>
<thead>
<tr>
<th>Personnel (Assumes a 192 hour month)</th>
<th>% of effective time spent on project/month</th>
<th>Salary MR per month</th>
<th>Rate MR per person hour</th>
<th>Total cost per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Programmer</td>
<td>35%, i.e. 67.2 hours/month</td>
<td>1500</td>
<td>7.8</td>
<td>524</td>
</tr>
<tr>
<td>Technician</td>
<td>50%, i.e. 96 hours/month</td>
<td>1000</td>
<td>5.2</td>
<td>500</td>
</tr>
<tr>
<td>System Analyst</td>
<td>15%, i.e. 28.8 hours/month</td>
<td>2000</td>
<td>10.4</td>
<td>300</td>
</tr>
<tr>
<td>Total</td>
<td>100% or 192 hours</td>
<td></td>
<td></td>
<td>1324</td>
</tr>
</tbody>
</table>

The example in Table 4.2. assumes 192 hours per month for all staff and that each spends a varying amount of time contributing to the project e.g. advising, digitising, maintaining the computers, etc. If the number of person hours spent on the data conversion project by those involved were calculated, e.g. the system programmer spends 35% of his time...
improving the conversion software or providing advice to the technician, etc. then the average hourly rate (for all the workers) can be assessed by a simple two step procedure - firstly, by estimating all the average hour contribution of each staff and secondly, by cumulating together the total hours spent on the project. This second step allows the computation of the total cost, based on the number of hours spent and the staff salary levels, i.e. dividing the total cost with the assumed standard hours per month: MR1324/192 = MR7 per person. Hence, it can be concluded that the average cost for the attribute data collection or conversion program involving all the various categories of expertise and their salary level is between MR5 to MR10 per hour.

The method thus estimates the direct input of personnel time spent on the LIS project by defining the salary of each person on different pay schemes at the unit hour level. However, any staff employment may require 25% addition to the basic salary for payments made for national insurance or pension schemes (UN, 1995), although appreciably, this amount may differ between organisations or states.

There is a variation in the estimate of overheads in the literature. For example, Willcocks (1994, p.8) reports that in the US Department of Defense, for every $1 spent on equipment, a further $7 needed to be spent on people and training. Meanwhile, Hochstrasser (1994, p.156) estimates that indirect human and organisational costs can be three to four times higher than hardware/equipment costs. This takes into account the management and staff time spent on successfully integrating a new system into current work practices.

Organisational costs could also be termed as institutional, although the latter is used to refer to changes that affect an agency, e.g. its policies, function or responsibilities, as opposed to the former which is more concerned with the operations and relationships of the human resource environment. These refer to, for example, the costs of re-organising staff to a different section or even to another department. A good example of institutional changes as a direct result of LIS is in the Victoria State of Australia where a separate agency, the Office of Geographic Data Co-ordination (OGDC), was created to facilitate the development of the Victorian LIS. As stated by Chan and Williamson (1995):
Thus, the formation of a new agency to support and facilitate the LIS implementation process may serve some useful purposes. However, a critical issue in the formation of such agencies is the composition and balance of its staff. If for instance the agency was dominated by one profession e.g. administrators or engineers, then any decisions taken will be biased according to their leanings and particular professional background. The concentration of any particular profession may not necessarily be conducive to the LIS development process; there is the possibility that with their professions’ own standard operating procedures (SOP), they may be ignorant or insensitive to the needs and viewpoints of other spatial data providers or users. Hence, it is essential that any newly formed LIS agency or committee be represented by the widest range of affected users including e.g. planners, lawyers, land surveyors, engineers, computer scientists and the private sectors.

Another LIS staffing cost concerns education and training. Nijkemp and de Jong (1987) point out that in order for a LIS to be sustainable in developing countries, self supporting educational systems need to be established. In an integrated LIS the issue gains added weight because educational schemes must be developed in e.g. the selection of appropriate staff for vendor training, secondment from or to other agencies, or even the need for graduate level education for qualified staff (Borley, 1991; Williamson, 1990). Organisational costs require different strategies depending on the system chosen, e.g. in a centralised or de-centralised environment.

4.4 Investment Issues in Digital Data

Bernhardsen (1992, p.250) states that the average useful lifetime of the major LIS components are:
Figure 4.4 above clearly implies that data have a longer useful life-time. The following will discuss the main issues associated with data conversion, which essentially refers to the process of translating existing or future collected land related data into digital form. At present, the most common forms of converting existing land related data include digitising (which results in vector based data) and alpha-numeric input, which are both tedious tasks. Another form of converting data is scanning, which is much quicker and results in raster based data; these are limited in terms of their automated selectivity of geometry and attribute (Burrough, 1986). Digital data conversion is the most expensive cost element in the implementation process of a LIS, albeit a crucial success factor. For instance, in the UK’s Ordnance Survey digitisation program, it was quoted by Thompson (1989) that 60% of the project cost was due to digitising since the project initiation in 1973 until 1984. Such estimates agree with the observations by e.g. Bernhardsen (1992), Huxhold and Levinsohn (1995), Korte (1994), Nordic Kvantif (1988), and Holstein (1992) who suggested that data conversion costs alone can account for 60-80 per cent of the total project cost. For a single user agency, the data conversion needs are easier to define but for inter-agency use of data, many other factors will need to be considered. The following considers both scenarios.

Within a single or multiple user environment, the initial step in assessing data conversion costs involves studying the existing data infrastructure state within the agency or region concerned. Tomlinson Associates (1993b, p.39) states that “geographic data conversion involves either conversion from analog (paper maps) to digital format (data set automation) or conversion from one LIS [GIS] software database structure to another (data set translation)”. In the conversion of spatial data sets for varying agencies, the individual data themes or layers identified, e.g. attribute data, cadastral boundaries, zoning areas, building lots, etc., should also have the highest number of users and applications although ideally, all data layers should be converted. In addition, these should preferably be in a similar format, projection and coordinate referencing system.

<table>
<thead>
<tr>
<th>Part of LIS facility</th>
<th>Average Useful Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Equipment</td>
<td>2-5 years</td>
</tr>
<tr>
<td>Software Programs</td>
<td>3-6 years</td>
</tr>
<tr>
<td>Data</td>
<td>15-20 years or more</td>
</tr>
</tbody>
</table>
For inter-agency use or data sharing purposes, digital conversion mechanisms will be necessary if the duplication process of primary data conversion is to be avoided. Several categories of data related costs were identified by Tomlinson Associates (1993b, p.41):

- **Production cost:** Includes source information acquisition and design cost as well as costs of automation (digitising, key punching, scanning), attribute data entry and data validation activities.
- **Link cost:** Where various data sets must be linked to create the required product, there is a need to ensure that standard identification of features exist, as well as the need for access arrangements. Link costs include the cost of the related design and programming activities.
- **Purchase, acquisition and updating costs:** Applies in situations where data sets can be bought, e.g. in the UK, users may buy or lease digital data (with periodic updates) from the OS.

Hence, the data conversion process must also consider other issues related to the current data use or supply environment of the organisations involved. As indicated above, the state of the data required may vary, e.g. it may be incomplete, currently in analog or paper based form, presently undergoing conversion, or may be available in a computer readable format. Prior to automation data that are incomplete require collection by other means, e.g. buying from other suppliers or collection by traditional techniques such as land surveying or photogrammetry. Data undergoing digitisation processes may need to be further improved or structured in terms of their topologic relationships of graphical and attribute data components to ensure their compatibility with other systems, i.e. the ability to be translated and used across different software applications to suit different users.

Other conversion issues have also been mentioned in the literature. For example, the Joint Nordic Project (Nordic Kvantif, 1988) noted two influencing factors in the economics of a system investment when an organisation switches to a new technology:

- the Critical Mass and
- the Experience Curve
Critical mass, according to the study, is a state where a significant amount of digital data conversion has been achieved that allows them to be used. Experience in the context of this thesis refers to the ability of users to effectively use the digitised data sets functionally in their daily tasks with confidence and minimal problems. Both are affected by the level of investment, although to a certain extent, the experience curve may be affected by how fast the individual organisation learns and adapts to the new working environment. To quote from the Nordic Project (Nordic Kvantif, 1987, p. 184):

"The central trade-off, when deciding the level of the investment, is to find the level reaching a reasonable benefit level by passing the critical mass, but not being so big and intensive, that the yield becomes too low at the beginning of the system's life span, due to lack of experience."

Assuming that a need to implement a computerised form of land information management via a land information system arises, some theoretical issues must be addressed. Two such issues affect the LIS investment in data, i.e. the intensity and coverage. These will be discussed in the following.

4.4.1 Investment Intensity in LIS

The Joint Nordic study (1988) argued that for each investment, there is a theoretical limit for how much benefit can be attained. The study further states that if the size of the investment is increased from a low level, the theoretical benefit does not increase proportionally, but in a stepwise fashion (Figure 4.5). Such leaps of the curve occur when critical mass is attained and also implies their use by the system's users. As shown in Figure 4.5, several leaps are possible but each step decreases in size, as the technology's adoption matures.
The diagram above also implies that just before and after critical mass is reached, there are periods or gaps of investment where the benefit remains almost stagnant, and does not increase by the desirable ‘leaps’. According to the Nordic study (1988), this is due to the unavailability of the required digital data, which depends on the investment intensity; hence, the higher the critical mass desired, the higher the investment intensity required. However, Bromley and Coulson (1989) also stated that:

"Investment levels below the first critical mass are considered to have a benefit cost ratio of zero or less. So it can be seen that an organisation will not necessarily benefit from a big initial investment because the staff will not be able to handle the investment."

Therefore, the leaps also depend on the experience curve, i.e. whether or how the system is effectively applied and used for appropriate tasks and decision making, or alternatively, the extent to which it displaces previous manual methods. The investment decision must also consider the need for users to learn and accept digital data as a better alternative to existing procedures, i.e. the diffusion process. Obermeyer and Pinto (1994, p.13) used the term diffusion and implementation interchangeably, where the former referred to “the acceptance and use by some subset of the general population of scientific or technological innovations”, and the latter “derived from the acceptance within organisation of new technology progress or models.” According to Rogers (1993, p.15), the main elements in
the diffusion of new ideas are: “(1) an innovation, (2) which is communicated through
certain channels, (3) over time, (4) among the members of a social system” and whose
attributes are “relative advantage, compatibility, complexity, trialability and observability”.
The LIS diffusion process is shown in Figure 4.6 below.

**FIGURE 4.6: The rate of adoption for LIS (Adapted from Rogers, 1993, p.21)**

<table>
<thead>
<tr>
<th>Percent of Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Usual S-shaped Diffusion Curve</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>“Critical Mass” occurs here</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Time</strong></td>
</tr>
</tbody>
</table>

Investments in LIS must therefore consider the experience of the users; a higher
investment in e.g. data conversion will not necessarily mean that benefits will accrue
sooner. The Joint Nordic study proposed instead that in some cases, it may be better to
choose an investment alternative below the critical mass, i.e. not high, in order to “benefit
from a higher start value and further experience diffusion, which is only possible at lower
investment intensity and complexity.” To quote from the Nordic Kvantif (1988, p.184):

*"If the investment is small and uncomplicated, the yield will be relatively high from the
beginning, and will reach the theoretical level quite soon. A high investment intensity
means a greater investment and higher complexity. The yield will start from a lower level
and increase more slowly."

It can also be seen that the ‘S’ shaped diffusion curve also has a critical mass stage,
similar with the investment level shown in Figure 4.5. It illustrates that over time, the level
of benefit that can be expected from an investment in data is closely linked with that of the
LIS usage or rate of adoption within an organisation. The expected changes when they
occur, will only be after a gradual ‘difficult phase’.
4.4.2 Coverage of the LIS resource base

A further issue about LIS data conversion is the coverage of the database, i.e. whether to invest in a wider coverage or focusing instead on a limited particular theme or application area. According to the Joint Nordic Project (Nordic Kvantif, 1988, p.187):

"The trade-off can be seen here in two crossing dimensions: one deals with specialism vs. generalism, in one end of the scale benefiting from focusing and in the other end from flexibility, and the other dimension deals with economies of scope, the ability to discover and combine a particular set of application domains, which together create positive synergy"

A wider LIS coverage base obviously will cost more, but has wider application scope. One way of minimising the costs is by “combining applications that are similar in type and that focus on a strategically and mutually supporting idea” (Nordic Kvantif, 1988, p.188). For a developing country, this comment suggests coverage for areas where LIS uses can be intensive, i.e. in urbanised areas with high population densities or cities, as discussed earlier in chapter two. Recognising the importance of LIS coverage in areas of high economic activity, it is therefore important that investment be concentrated in such areas. Information needs in these domains are not only higher but will also encourage user participants and hence, aid in supporting the diffusion process. However, the problem of how much to invest must be based on the needs of the users and for an integrated LIS, will depend on the agreement and co-operation of the major stakeholders, e.g. the local authorities and other government agencies or departments.

4.4.3 Other issues in the data conversion process.

Due consideration must be accorded to the data conversion process as data form the heart of the LIS and that any strategy should consider both their immediate and long term use. The Tomlinson Associates study (1993b, p.44) proposed that the following questions associated with digital data conversion and translations be considered for each data set application and agency:

- Does the schedule for investment in data conversion lead to the production of information products with the highest benefits?
Has the design of the data base ensured that all the necessary data components will be available? This includes both attribute and topologic information

Will the data custodian be able to protect sensitive data?

Are digital data conversion requirements accommodated within the source data set?

Is the appropriate meta-data being conveyed? Important details include map projection, scale and currency information.

However, there is also a need to ensure that the data attains a standard acceptable to all the data users and providers involved in their collection, use, dissemination, etc. “Data standard” is used here to mean some or all of the following data aspects. As stated earlier, some data aspects will be necessary while others may be desirable in a data sharing environment; these are categorised accordingly although this will differ to suit the needs of the organisation:

**Necessary**

- Common geo-referencing. All spatial data should be positioned in a common coordinate referencing system, preferably at the parcel level for a LIS.
- Complete. The information product must provide all necessary data required for the targeted decision-making process with minimal reference to other sources, i.e. minimal ambiguity.
- Accurate and relevant. This is necessary to avoid possible erroneous interpretations of the data and prevent further verification and checking procedures.
- Up to date and timely. Information value deteriorates with usage and time. Thus, data must continuously be maintained and changes incorporated into the database records, preferably with the shortest time delay, and under the responsibility of the data custodian.

**Desirable**

- Official. The LIS informational product and services output needs to be accepted as an official document to increase its usability, and hence its value. In short, it should inspire the users' confidence and reliability of the data.
- Security. There must be a form of control over the information from being altered, disclosed, destroyed and abused by unauthorised users. One method to avoid this is the use of appropriate copyright laws. These however must recognise that in an integrated environment, parts of the data may belong to different providers and the
limits of modification allowed on the data sets must be indicated. There is also a need to develop security and data back-up measures of the digitised data sets.

- **Data Standards.** Data standards should be developed to ensure uniformity within and across data sets produced by the various suppliers. Depending on the level of inter-agency co-operation, a common framework of spatial data representation may need to be developed and implemented, e.g. common naming conventions, standard protocol, data dictionaries, etc.

- **Cost effective.** Essentially information that is collected, maintained and shared should not cost more than its perceived value. Otherwise, alternative arrangements must be sought.

However, the data aspects above are indicative and do not necessarily apply to all LIS data investment scenarios. For example, where confidential data are concerned, security may be a necessity rather than desirable. Any check measures should however consider the key points above although determining e.g. what ideals are necessary, how these should be incorporated, who are responsible, etc. depends on the individual implementing agency.

### 4.4.4 Cost and Data Sharing Issues

The sharing of digital spatial data costs should be the eventual ideal of any LIS implementation program within government departments and agencies. The issue gains added weight in developing countries because of the benefits and advantages in reducing duplicative costs and efforts in data collection. Calkins (1992, p. 283) states two reasons for sharing spatial data, i.e. those related to cost, and the possibility of access to a wider range of spatial data. Sharing of data, according to Calkins (1992), provides access to additional data at marginal cost via the reduction of e.g. accessing or travelling costs. Although no digital data sharing scheme was encountered in this case study, the strategic cost implications and practical significance of data sharing merits discussion. The definition of spatial data sharing in this context adopts the definition by Calkins (1992, p.284), which is the: "... electronic transfer of spatial data between two or more organisational units where there is independence between the holders of the data and the prospective user".
In developing countries where there are generally scarce resources, principal agencies involved in the management of land information can save costs by adopting cost sharing measures. Although there may be some data related hurdles that needs to be overcome e.g. relating to data access, data documentation or meta data, liability, inter-organisational agreements, legal authority and individual data sets tending to be too specific in terms of coverage, format, scale and applications, the eventual advantages of cost sharing and minimising effort duplication appear to outweigh these initial difficulties. Huxhold and Levinsohn (1995) opined that all geographic data contain elements that are common to the varying users and proposed that these should be identified and used as a basis on which to integrate the other varying data sets. Holstein (1992) for example states that cost sharing allows real demand and priorities to be established and proposed two circumstances for the sharing of costs for land information products:

- Where costs are shared between the land information management agency and the user, e.g. in larger municipalities and infrastructure agencies which can contribute in part or whole, to the cost of supplying land information.
- Where a group of user agencies share the total cost of specific products, i.e. when a group of users request a provider (public or private) to undertake a land information task, e.g. aerial photogrammetry or base mapping. The main cost determinants include the users needs, up-date frequency, accuracy and amount of data.

The Mapping Science Committee (MSC, 1993) of the United States quote two examples of successful data sharing and co-operation programs of spatial data. One case involved the National Geodetic Survey (NGS) where the data donors, i.e. the private, county, state and other federal organisations, provided vertical and horizontal control points for inclusion in the National Geodetic Reference System (NGRS). Since 1980, the NGS has received 65,000 horizontal control points and 36,000 km of geodetic levelling from other organisations, with cost savings estimated at about $79.4 million (65,000 points X $1000 per horizontal point = $65,000,000 and 36,000 km X $400/km of vertical data = $14,400,000). Future plans are afoot for the inclusion of gravity data and for improving geoid height modelling which are essential for accurate GPS-derived orthometric heights. The second case involved the North Carolina land records management program, which
resulted in legislation that "provided for financial and technical assistance to local governments in the areas of base maps, cadastral maps, a uniform system of parcel identifiers, and automation of land records".

Some interesting points arose from their process of developing standards for the base and cadastral mapping that lead to a uniform parcel identifier. For example, the collaboration and development of orthophoto maps resulted in identifying unsurveyed areas and conflicts in property boundaries. The resultant surveys were used to update the cadastral maps and data files. Also, co-operation between the federal, state and counties evolved and as the North Carolina state moved into digital mapping, "duplication of effort in the soils mapping area was eliminated and sharing of soils files was effected".

Cost sharing and data sharing can therefore be considered as linked issues. One of the main principles in cost sharing is for the end users of these information products or services to reimburse part or all of the data collection and transaction costs of the provider. Data sharing meanwhile is primarily driven by the need to minimise costs in the collection and maintenance of land related data. This may be initiated resulting from the realisation that much of the information required by the varying users is common and that data sharing can eliminate the redundancy in data collection and its maintenance.

One of the essential requirements for any data sharing arrangements however is the availability of standards and data quality control mechanisms on the spatial data. Otherwise, data that are provided, exchanged or used by the users and providers may not be in a suitable format for integration. The US MSC (1993, p.102) noted that, "The benefit of the standardization of data to all government agencies - federal, state, and local - and to the private sector is such that this incremental cost will be recovered to the federal treasury over time as direct savings in government programs and in increased efficiency in the private sector." A further aspect is the knowledge or information about the land related data's existence, contents and fitness for an application, i.e. metadata. As stated by the MSC (1993, p.97), "Metadata support data sharing by providing information on many aspects of spatial data, each aspect having meaning in particular application contexts. Metadata that describe data base contents include data dictionaries and definition, attribute ranges, and data types. The origin and ancestry data is critical for ascertaining the validity and suitability of data".
Data sharing and the incentive to donate information however may need to be driven by “a public sense of responsibility and a recognition that in many instances the beneficiaries of the program will be the data donors themselves” (MSC, 1993, p.102). The research attachment in Sabah noted that this was a significant issue at the interdepartmental level because some data owners preferred to retain sole custodianship of their data; this indicated their lack of appreciation on the costs of non-integration and co-operation, and the tendency to view information as a source of authority.

The MSC’s (1993, p.94) report on the co-ordinated spatial data infrastructure for the United States proposed the model in Figure 4.7 for a spatial data sharing program. The main policy areas include data standards policy, depository policy, distribution policy, and cost sharing policy.

**FIGURE 4.7: Components of a Spatial Data Sharing Program. (Adapted from MSC, 1993, p.95)**

---

1 FGDC - Federal Geographic Data Committee
If full cost recovery cannot be implemented due to legislation or other constraints, then alternatives such as cost sharing consortia may aid in reducing the LIS investment burden. They could include arrangements between the data users, owners and custodians at the various administrative levels. Some of the legal issues in cost recovery have been reviewed by Salmon (1989) and include:

- existence of legal authority to permit such undertakings, e.g. constitutional or statutory grants
- provisions on what constitutes a public record
- whether any agency records can be exempted
- what provisions have to be made for copying records and how much agencies can charge
- issue of system control and its products
- whether system managers will always be able to meet stated deadlines for providing required copies
- liability, e.g. issues of reasonable care and quality in information products and services, disclaimers, and security.

4.5 Cost Assessment

The foregoing have covered what the main LIS cost components are. This section attempts to explain how the costs can be estimated and emphasises the importance of a user driven approach.

The selection of computer peripherals should not only meet present spatial data management needs but also, have the capacity and flexibility for future improvements or upgrading. This is essential because developments in computers are likely to result in efficiencies and effectiveness that may prove beneficial if these are continuously absorbed into any existing system. A method of ensuring this is may be by stipulating in the computer acquisition or contract agreements, so that vendors are bound or responsible to continually upgrade the system with the technology changes. If this is not possible, then the hardware should, at the minimum, handle the present and future anticipated amount of information processed manually.

In the selection of computer hardware, due consideration must also be accorded to users who will eventually operate the system, i.e. those who are directly involved in data input,
access, use, analysis and presentation. In principle, computer use should reduce the time involved in transacting information for conducting these various tasks, ranging from simple transactions to more complex analysis and integration. Thus, if optimum computer management of land information also depends on the amount of digitised data, user data needs and information products or services should form the linkage between the hardware requirements and their selection criteria. As stated by Tomlinson Associates (1993b, p.69) on the determination of computer units in the Australian GIS study in the State of Victoria:

"The number of computer units required ... is determined from the information products, specifically, through the integration of functional requirements and the frequency of information product generation, weighted by the average time needed to perform each function. The computer hardware acquisitions schedule is shaped by data availability and other development requirements."

Hence, the ideal means of assessing LIS costs should be driven by the information needs of the users, and translating each separate need into relevant technical requirements of the users, e.g. appropriate hardware and software configurations, data sources, their accuracy, manipulation, storage and the kind of informational products expected and required from the system. In general three forms of supporting information may be required:

- Functional information needs or requirements. Among the issues that need to be considered include e.g. what information do the users or implementers expect to obtain from the working system, their delivery times, an indication of the type of analysis that they expect to do, whether the output is required in a hard copy format (size) or will a display on the screen terminal be sufficient, etc. The identification of these requirements should help towards determining the specification of the hardware and software required for the organisation.

- Sources of information and products required for making decisions. Questions such as how and where do current users obtain information and in what form (e.g. documents, maps, records, etc.) will aid in estimating the amount of data conversion required for the system. In addition, the coverage of the data must also be assessed particularly if the LIS requires new data collection.
• Ascertaining the existing computing knowledge of the organisation. An analysis of the existing situation should aid in determining e.g. the amount and level of training necessary, how many extra staff are required, whether outside expertise is needed, etc.

It is appreciated that the classification above provides only general indications and that many other levels and sub-levels can be developed. The amount of information required however will depend on the unique environment of the organisations as each will differ in terms of their information needs and their functional requirements. For an inter-agency study, the multiple needs and informational products of the various users should be assembled and classified in their order of importance and priority. This should determine inter alia, the common tasks that can be computerised, identify areas where effort duplication may exist, current informational or mapping needs, etc. It will also aid system implementers to prioritise computer requirements and avoid misallocation of resources in computerising work processes that may not be necessary or offer substantial advantages. Such needs can be classified as an 'information needs matrix', which displays the interrelationships and common needs of all relevant actors (Huxhold and Levinsohn, 1995).

In developing countries, the use of external consultants for professional advice on systems development may need to be considered if local experts are unavailable. However, the use of suppliers to undertake consultancy should be considered with care because as stated by the LGMB (1993, p.49) study on GIS in the UK, they “are likely to focus the investigation towards a particular solution.” This was experienced in the LS department in Sabah where vendors tended to promote solutions that required extra acquisition of future peripherals and services. The employment of contractors for outsourcing of certain services, e.g. data collection and data conversion, may however be an option and may allow faster returns in terms of digital data compilation. This will be discussed in Section 4.9.

In general therefore, the costs of any proposed LIS should not only be closely driven by the ‘visions’ at strategic level but also, the management and operational user needs; the investment decision must balance both viewpoints because users can provide realistic and representational inputs concerning the information required and the present inadequacies. Moreover, having their input into any decision making process that affects them allows
staff to understand and appreciate why computer methodologies are beneficial and consequently, may earn their future co-operation and commitment to the project.

4.6 A Generalised LIS Data Collection Cost Model for a Developing Country

From the foregoing discussions, it is obvious that a developing country intending to invest in a LIS must consider many cost factors, although the most significant costs will be data related. Costs of LIS data depend on e.g. their availability, acquisition and conversion whereas in some instances, data may need to be collected by a combination of ground surveys, photogrammetry and remote sensing. This section addresses the costing issues by classifying the cost factors normally associated with a LIS.

Three of the significant factors involved in developing a cost model are the data types or layers, their extent of coverage and the unit costs. Spatial based data can be categorised in terms of the separate ‘data layers’, e.g. cadastral, geodetic controls, roads, utilities, vegetation cover, etc. within the area of interest. In many instances, these data sets will already have existed in some form or another, maintained by a particular agency or government body. An important criterion to improving existing data sets is whether these are adequate, e.g. in terms of coverage, currency, level of detail, etc. Any data inadequacies will have a bearing on the additional costs required to enhance the existing data sets via, e.g. scanning, digitising, aerial photogrammetry, conventional ground surveys, remote sensing, attribute data collection, integration, etc. In the following, the major cost components normally associated with the data collection for a LIS are identified.

4.6.1 Scanning

A scanner transforms physical source images into electronic digitised images. The data source can be graphical or textual or a combination of both. In a tender document presented to the Land and Co-operative Development Ministry in Malaysia (LCDM, 1995) for the digital data capture of the National Land Information System (NALIS) pilot project around the vicinity of the Federal capital in Kuala Lumpur, charges were based on
the area coverage of the map sheets. The scanning rate for the Federal Territory which covered an area of 243 sq. Km was a standard rate of Ringgit Malaysia (MR) 50.00 per A0 sheet (approximately 1,000,000 sq. mm.). The calculations allowed charges to be made on a per sq. Km basis. For a scale of e.g. 1:50,000 and a scanning size per A0 sheet at 841 x 1189 mm, the following rates were calculated:

Map coverage (1:50,000 scale): \(0.000841 \times 0.001189 \times 50,000 = 2,500 \text{ sq. Km}\)
Rate: \(\frac{50}{2,500} = \text{MR 0.02 /sq. Km.}\)

This enabled the rates of other scales to be computed; some designated areas may have larger scale coverage. In practice, the number of sheets required will depend on the number of agencies involved and the amount of data layers. This costing method thus provides a simple but useful method for assessing the unit cost of data conversion from scanning existing maps and plans.

### 4.6.2 Digitising and Attribute Data Collection costs

This includes the conversion by manual digitisation of maps, ortho-rectified aerial photos and satellite imagery, usually into the local co-ordinate system. Costs will depend on the local rates or can be estimated by measuring the required time to complete a particular task based on e.g. the number of map sheets, appropriate area coverage or the number of points digitised. In the LCDM (1995) proposal, the rate was at MR250/A1 sheet of scale 1:1000 and similar with the scanning procedure above, the unit cost for digitising per square km can be computed.

Within the LS department in Sabah, all digitising work on the cadastral sheets was executed internally where staff were set specified target points of 800 per month and where the digitisers were required to include inter alia, distances and bearings, sheet number, etc. into each record (Tong, 1996). This official target was set as an incentive under the New Remuneration Scheme (SSB) where on attainment, staff would qualify for salary increments. However, based on interviews and discussions with the officers who were directly involved in plan and map digitising at the LS department, this is a high target which very few attained and they suggested a lower target of 600 points.
Some form of manual entry of non-spatial data may be necessary for all agencies as
digitised data, as opposed to scanned, are easier to modify, integrate and are generally
more structured. Its cost however can only be generalised since the skill levels of
personnel involved may vary; the cost model illustrated earlier for the costing of staff
involved with a LIS applies (Table 4.2).

4.6.3 Aerial Surveys

Aerial surveys provide an economical means of mapping over a large area. The costs
involved may include photo taking, processing, ortho-rectification and subsequent
digitisation by scanning or digitising. Each cost element however varies between
countries.

For the purposes of discussion, an earlier work by Jerie (1973) on the planning of
photogrammetric work merits mentioning. He observed that the choices available for
executing photogrammetric projects should be governed by two objectives, i.e. that the
product must satisfy the specifications, and that the most efficient or economical
procedure for achieving this should be selected. While acknowledging the difficulties
involved in establishing the required cost and performance models and to achieve a
suitable quantification of all influencing factors and parameters involved, Jerie (1973)
distinguished these into four categories:

- the product specification
- the process parameters
- factors pertaining to the subject area
- factors present within the organisation executing the work

However, the influencing factors vary considerably for different projects and thus, every
photogrammetric project requires individual treatment. According to Jerie (1973) the
general cost model includes two main components:

1. Basic cost factors, i.e. unit cost for personnel, equipment material, etc. that include the
   following:
   - Salaries: of all personnel, including social insurance, cost of overtime, costs of
     recruitment and training, bonus, etc.
- Equipment: purchasing cost, import duties and taxes, costs of installation maintenance. The costs have to be distributed over a realistic period of use, i.e. accounting for rate of depreciation and loss of interest per year.
- Material: purchase cost, allowances for waste, etc.
- Building: Amortisation of purchase cost or rent, maintenance, heating, air-conditioning, power supply, water, etc.
- Other cost items: e.g. for research, consultancy, profit, risk, etc.

2. Production rates, being the required personnel time, equipment time, etc. for producing or achieving certain production units. These can be determined from analysing past work outputs over long periods to represent normal production routines.

In Sabah, the LS Department charges photogrammetric work for other Federal Departments or private organisations based on the costs for aerial triangulation and digital mapping, using the following variables (Wan, 1996):

- Basic Salary of operators (including hours spent for aerial triangulation and digital mapping)
- Depreciation of Instruments, assuming a useful life span of 10 years, i.e. 20160 hours.
- Allowance
- Number of hours spent
- Overhead charges, which was fixed at 50 per cent of the total costs.

In the LS department, no specific air survey was carried out for the purposes of data capture as most of the data sources were digitised from cadastral sheets, although plans are afoot for the creation of DTM from soft-copy photogrammetry (Wan, Personal Communications, 1996).

4.6.4 Control Points Survey

This refers to the fixation of control points for the aerial surveys, i.e. connections to trigonometric stations, that provided accuracy and reliability to the derived data. In the LCDM document (1995), it was assumed that 5 survey points per km. will be required at an assumed fixed rate of MR 350 per control point; hence, the anticipated cost for
providing control points in the Kuala Lumpur Federal Territory with an area of 243 sq. km. was MR350 x 5 x 243 = MR 425,250.00.

The calculation for these rates will obviously depend on the local rates and charges that are normally fixed by the state or the governing professional bodies of the land surveying profession. In Malaysia and hence Sabah for example, the official rate charges of all land survey related work are set out by the Institution of Surveyors, Malaysia (ISM), whose rates are documented in the *Schedule of Survey Fees for Land Surveys*.

**4.6.5 Conventional Land Surveying**

Land surveying is the most expensive form of data capture. It is therefore seldom considered as a form of data capture for digital data bases, except in rare cases where no alternatives are available, or the level of accuracy required necessitates it. Costs may be fixed according to the site or area surveyed, and rates should be available from local survey regulations. Dale (1976, p.102) proposes a general formula for estimating the cost of survey:

\[
COST = k \cdot X \cdot Y / 1500
\]

where,  
\( k \) is a measure of overhead rates (2.5 to 3.5)  
\( X \) salary of the individual concerned and  
\( Y \) is the number of hours he/she spends on the job.

The figure 1500 is the average hour that a surveyor works in a year, "excluding time lost through sickness, holidays and unproductive employment". There is however a proportional relationship between the costs and the precision of the survey; how much should be invested depends on the extent of the area, availability of local controls and the costs of labour. The investment above may also need to consider cost overheads, which can be significant in some cases. Dale (1976, p.102) quotes overhead rates as ranging from 2.5 to 3.5 for surveying costs, which was supported by Laroche and Hamilton (1989) who proposed similar estimates.

Cadastral survey is one of the main tasks of most survey departments and in Sabah's case, the industry is heavily subsidised by the government. This cost factor will not be accorded
further treatment in this research because cadastral land surveying is viewed as a somewhat fixed cost item within the LS department.

4.6.6 Remote Sensing

In Malaysia, the rates for a scene coverage of satellite imagery can be obtained from the national Remote Sensing Centre or alternatively, from other international commercial providers. The images are usually supplied in standard formats with fixed costs. In the pilot project in Kuala Lumpur, one digital image (185 Km x 185 Km) was sufficient to cover the area concerned and the rate was MR 2,100 per image (LCDM, 1995).

A Remote Sensing section was established within the LS Department in 1994 (Lands and Survey, 1994) and provides some useful experiences. Although a costly investment, i.e. approximately MR1.4 million, its development stages particularly in terms of output have not matched its cost and until mid-1996, no real outputs have materialised. The costs charged by the consultant included the acquisition of Synthetic Aperture Radar (SAR) images for the whole state at 1:250,000 scale, a three week training course for three officers in Canada and the provision of a workstation. The failure to produce outputs within the department can mainly be attributed to inexperience, i.e. not realising the difficulties and technical expertise involved in the treatment and analysis of satellite based data. Staff assigned to the section were not only insufficient but were unqualified and had little experience with computers. In contrast, the amount spent for the Canadian course as part of the deal to implement a remote sensing system could have sponsored two or three research students or six postgraduate studies in Remote Sensing in the UK. It appears likely that the cost incurred by the LS department for this particular project may have been unjustifiable.

4.6.7 Summary of LIS Cost

There are therefore many possible cost components for a LIS, if one were to “start from scratch”. These possible costs are summarised in Appendix B, which is the cost model for the LIS pilot study in the Malaysian Federal Capital, Kuala Lumpur. As indicated earlier, these may not always be necessary because it is likely that some form of land records will
already have existed and most LIS needs may be met by converting existing data sets; it may however be useful when comparisons between differing region or country is contemplated. There are also other issues, which is discussed in the following.

### 4.7 Consideration for Across Region Comparisons

An important requirement for the meaningful comparison of the costs and benefits of a LIS is the availability of a common unit cost for data. However, even with this information, it would still not be possible to directly compare the findings due to *inter alia*, the fluctuation in the exchange rates which affect the labour costs and items, variations in skill levels, basic salary levels, etc. Moreover, as stated by Laroche and Hamilton (1989) and Dale and McLaughlin (1988, p.177), there are other major factors that influence mapping production in terms of time and costs:

1. **Production specifications:** type of product, map scale, photo scale, map content, contour interval, map accuracy and quality of final product;
2. **Area covered:** topography, vegetation, density of natural and man-made features;
3. **Organisation:** efficiency of organisation, equipment, procedure, personnel skill, man-power cost;
4. **Process:** completed in-house, completed by contract, partially completed by contract.
5. Variations in different parts of a country
6. **Lack of adequate reporting of time and expenditure**
7. **Failure to separate information costs from overall costs**
8. **Difficulties in accommodating costs between different government departments and the exclusion of updating, maintenance, overheads and training costs from the initial production costs**

Among the pioneering work in this area was a study by Hamilton et al (1985), who proposed four principles for determining the unit costs of land information products:

1. For each product, two unit costs are essential, i.e. unit cost of initial production and unit cost of maintenance;
2. An inflation factor must be incorporated and all figures must be translated to a base year;
3. Unit costs may be developed in any defined units but a factor for conversion to person hours should also be derived;
4. All person hours should be normalised and the skill level and the salary should be clearly stated.
Application of the concepts above and an analysis of map production costs by different mapping organisations by Laroche and Hamilton (1989) have led to the development of the “Laroche-Hamilton” unit cost function, which was proposed as a universal relationship between the cost and scale factor for topographic mapping. This function has been established as:

\[ C_n = C_i \times EF^{1.4} \]

where,
- \( C_i \) = Unit cost/km\(^2\) (Currency or person hours) for the production of topographic mapping.
- \( C_n \) = Unit cost/km\(^2\) of any larger scale.
- \( EF \) = scale enlargement factor on a reference scale basis (e.g. if \( C_i \) is 1:50 000 and \( C_n \) is 10 000, then \( EF \) is 5).

The caveat in the relationship above is that the type of terrain, the quality control and the type of end product are all comparable, and that for the particular case when the scale factor is doubled, the relationship predicts that the cost will increase by a factor of 2.5. The relationship provides a useful method for estimating a generalised cost figure, provided the costs of producing mapping products at a particular scale are known (Laroche and Hamilton, 1989). This is where the technique has its limitation; the localised nature of data collection techniques, terrain and labour costs.

### 4.8 Intangible Costs in LIS

The cost models discussed above do not include intangible costs which essentially are hidden costs. The Tomlinson report (1993a, p.5) stated the following as requirements for realising the full benefits of LIS [GIS] in the Victoria State [all emphasis added]:

- adequate resourcing of geographic data co-ordination and agency GIS [LIS] implementation programs
- the recommendations made that have validity now will be lost if uncoordinated decisions are made in many agencies in the absence of an overall strategy.
- the cost and benefit estimates ... assumes low cost availability of government data between government agencies in Victoria ...
- the private sector should be heavily used in the creation and maintenance of data through the competitive contracting process ...
• the design, prototyping and implementation of a data architecture for geographic data structure and access in Victoria must proceed now before agencies make substantial further investments in uncoordinated database design.

All of the underlined words above constitute some of the intangible costs involved in LIS implementation. For instance, co-ordination, low cost availability, design, prototyping and implementation above will involve real costs before they are realised; these however are seldom included in any cost benefit analysis. How much they cost and to what degree they can be quantified, are questions that rarely have outright solutions and are among the qualities that qualify them as strictly intangible costs. Developing co-ordination for example, may involve the forging of corporate visions, arrangements, etc. that require meetings, necessary background preparations, and involve time, effort and hence, money. Low cost data sharing may necessitate the development of special mechanisms such as standards, administrative and legal framework, or other acceptable arrangements; these also constitute cost and are rarely quantified because they can seldom be anticipated. Other forms of intangible costs also exist. For example, according to a UN document (1995) on land administration guidelines, intangible costs include:

"worker resistance to new technology, traditional attitudes to job security, changes in work patterns and levels of responsibility within an organisation."

It is clear that these costs involve subjective individual human values and their attitude to changes, i.e. their motivation to work. Their response and performance in carrying out new or different tasks resulting from any modernisation may not always be certain and hence, may affect the cost and success of the system. For example, their motives may be driven by economic interest or concerns for the existing social structure defined by procedures at the workplace.

There are also costs that are political. Political costs of LIS have also been termed as institutional and organisational issues in the literature, e.g. as stated by Dale and McLaughlin (1988) and Ayers (1985). Their inclusion in any LIS strategy planning is essential in developing countries because of their impact and consequences to the overall effectiveness and efficiencies of the LIS program.
The political costs used in this thesis concern costs that can arise due to e.g. resistance by key staff to co-operate in computerisation efforts, reluctance to participate in data sharing procedures, political interference that affects a government officer's duty, etc. all of which affect the LIS build-up process; these costs are also intangibles and unanticipated in most cases. In a developing country, political factors affect any land information management process or their modernisation program, due to their far-reaching influence in the administration hierarchy, e.g. a change in the political officials may result in alterations to the original LIS agenda or changes via transfer of key personnel. Any of these consequences can radically alter and sway the initial plans or objectives. It is important therefore that political support be attained and sustained. Preferably, an integrated LIS project that incurs substantial costs in systems, data conversion and human resources should have the support from the highest levels of government. Williamson (1991) in discussing the Thailand land titling project for example, states that:

"The political support for the project in any country is always critical, particularly in the long term. It is very beneficial for example if the project is highlighted in the countries' national plan. But maybe more important is the ability and willingness of the key government officials and politicians to effect the necessary legislative changes"

This obviously recognises the reality that in most developing countries, projects approved by one government may be revoked if a new government comes into power or that resources (e.g. for particular tasks) previously allocated may be redistributed due to the political ties and links by those in power. The issue may also become important in an inter-agency LIS because the possibility that sharing relevant spatial information, which is a form and source of authority, may be affected with the change of administration; any resulting disruption and delays to the project can result in tangible costs. This case is particularly relevant to Sabah because a change in elected government usually results in major transfers and revamp of key government officials. The difficult process of convincing new officials of investing in any modernisation may thus have to be repeated (Lojikip, Personal Communication, 1996). As stated by Obermeyer and Pinto (1994, p.71):

"Gaining the acceptance or commitment to new technology and innovation from members or organisations can be a frustrating, time consuming process. The achievement of these factors depends on a number of factors, among them technical, financial and political conditions, as well as bureaucratic structures that influence the adoption of new innovations."
They went on to demonstrate the hypothesis that an organisation's reliance on standard operating procedures, professional training and socialisation often hamper the adoption of GIS related technology, which has the potential of upsetting well defined task relationships and lines of responsibility. While the assessment of these possible 'costs' and pitfalls may be impossible, strategies should be reserved to address them particularly in developing countries where there may be higher incidences of political instability.

In practice, any estimation of intangible costs can best be carried out by learning from experience, or by interviewing those involved and affected. These qualitative studies with the main observable being the impact to the affected processes, e.g. delays in delivery times, effects on performance outputs and unnecessary costs incurred, may provide useful insight into the issues involved. Their impacts can be minimised by ensuring that the technology or a new working procedure continues to deliver the intended service and product outputs and other benefits, which can be sustained by e.g. continual assessment or improvements, providing incentives, or by continual motivation of those involved. An accurate model for the intangible costs would thus be difficult to formulate because of inter alia, the amount of uncertainty involved, and the localised nature of each circumstance. It is also clear that there are many internal and external factors involved in deciding the level and intensity of the investment process. These range from costs that are relatively easy to assess, to those that are intangible and difficult, if not impossible, to quantify accurately.

4.9 Outsourcing in LIS

The development of the concept of outsourcing relates to privatisation. As indicated in the previous chapter, privatisation refers to the contracting out to non-government entire sets of activities or parts of them that were presently performed by government agencies. According to Woodsworth and Williams (1993, p.21), one of the main reasons for governments and corporations to either contract out or sell parts of their operations are cost-cutting and income generation. They argued that in the information services, it holds promise in the creation of a competitive environment that bring economies, efficiencies
and effectiveness. In addition, contracts also permit an unprecedented degree of flexibility to change directions, objectives and services. Other advantages include:

- defining previous tasks more accurately for inclusion in the contracts specifications
- costs are fixed for some time within the outsourcing period, or can be curtailed more easily compared with internal budgets

In the context of this research, outsourcing is used to mean the contracting out of certain tasks that may be required in the LIS implementation process, i.e. the necessary capture of digital data or the digital conversion of existing land information records. Although not encountered during the research attachments in Sabah, it deserves discussion because it is an option for all developing countries that should not be overlooked.

Data conversion as stated earlier is a time consuming process. In the Sabah LS Department, the conversion of graphical data has almost neared completion in mid-1996, where 95% digital coverage of all the standard 1:2,500 cadastral sheets has been attained (LS Department, 1996). The process however took more than four years to achieve, and in addition, the conversion for the textual attributes (land title details) approached only 35 per cent over the same period. Although no official cost documentation for this conversion exists, it is anticipated that with around 15 full time staff involved, the total salaries alone would have amounted to MR 0.9 million to the state. A proposal was floated by the implementers for a scanning equipment to be bought for scanning all the land titles held by the department (Chong, 1996).

This example shows that data conversion is a time consuming, expensive process whose costs incur not only staffing costs but also expensive equipment, its maintenance and overheads. More important is the fact that because LIS depends on the amount of data converted, i.e. critical mass, it delays the benefits. If this particular component of the project were contracted out by the LS department at competitive bidding prices, then the possibility that the conversion might have been achieved at lower costs and in lesser time, may have been advantageous. The benefits of outsourcing, e.g. in digitising the cadastral boundaries, would have accrued sooner and costs in recruiting new staff may have been

---

2 This estimation assumes that a technicians salary was MR1,000/month with 25% overheads.
avoided. This would also have reduced the department’s burden in terms of managing the ‘teething problems’, albeit invaluable, of in-house training and experience in data conversion.

However, the experience from the in-house conversion does provide some useful lessons for future outsourcing activities in terms of experience. As acknowledged by Woodsworth and Williams (1993, p.28), ‘outsourcing the entire activity will not be of much help in determining unit costs for specific information products’. They further quoted that outsourcing conditions exist:

- when information technology expenses are growing faster than budgets;
- when demand for the quantity and quality of services outstrips an organisation’s ability to provide them;
- when the skills to evaluate, implement, and manage new technologies do not exist;
- when the time and energy devoted to managing information technology interferes with its ability to focus on the central mission.

Owing to the necessary nature of digital data conversion for a computerised LIS, the option of outsourcing data conversion should be considered in the modernisation of land information management in developing countries. Interviews with senior officers of the Sabah LS department on its experience of cadastral sheet conversion supports the notion that outsourcing this aspect of the implementation process at the outset might have been beneficial (Jamal, Personal Communications, 1996).

4.10 Review of Funding Approaches for LIS in Developing Countries

LIS incur costs that must be funded for acquiring the necessary systems hardware and software, in the collection and conversion of data, as well as in human resources. In addition, these investments require maintenance in order to keep up with the technology, maintain the currency of data, as well as the provision for continuous professional development of staff in order to improve and acquire the necessary expertise. A continuous funding scheme may therefore be necessary at the initial stages of a LIS programs. Dale (1988) states three ways for funding a LIS:

- making savings in current expenditure
• **increasing revenue from current products and services or by marketing new products using existing resources**
• **by grant or loan either from central funds or from development agencies.**

LIS investments may for example be obtained from savings in current expenditures in environments where land related data have been collected in the past. As noted in a document by the United Nations Centre for Human Settlements (Habitat) in 1990, the 'first registration' of interests in land are usually subsidised by the state or through subsequent dealings. It argued that further investments can be funded out of revenues rather than further subsidies, provided that 'any surplus income that can be generated is allowed to be reinvested in the organisation' (UNCHS, 1990, p.43).

Other factors may also trigger the need for government organisations to initiate savings, e.g. cost recovery schemes, down-sizing of budgets from central governments or the economic restructuring of funding. Hence, the need for controlling expenditures in surveys and mapping agencies may consequently be one of the driving motives for instituting modern mapping techniques or LIS because of the efficiency savings that can be achieved. In New Zealand for example, Robertson and Aitken (1991) report that funding for the Department of Survey and Land Information (DOSLI) topographic base mapping was obtained from:

- the government's Treasury (40%),
- map sales (37%),
- copyright (13%) and
- the rest (10%) from the Defence Department's contribution.

There are however conflicting views. Smith (1995) argued for example that direct funding from the central government was the most appropriate and equitable source to maintain the New Zealand cadastral survey system and quoted how the cessation of funding by Congress to the National Geodetic Reference System in the USA was causing the system to be lost 'by attrition despite the fact that billions of taxpayers dollars had previously been invested'. This example shows that while savings may be desirable, it is also essential that the existing level of service or product be maintained; any negative impact of saving measures on public goods or services such as the land information industry in most countries will arouse attention in the affected sectors of the society. Funding modernisation programs via savings in expenditure and increasing revenue from products
and services therefore requires an analysis of current procedures and methodologies. Such analyses will involve *inter alia*, viewing existing tasks from a more commercial perspective and the realisation that to achieve benefits and improvements in efficiencies and effectiveness, funding may need to be supported from existing core activities.

In the case of Sabah, funding from central funds is the usual method of acquiring funds for a government agency, including computerisation. Although the LS Department is a revenue making department for the state there is little financial manoeuvre available to the department, apart from the re-distribution or the virement of allocated funds; more of this will be discussed later in the chapter.

Another approach to funding LIS projects is by gaining the co-operation of all state agencies involved in the use and management of land related data. However, this is seldom easy to achieve in any LIS funding arrangements because as stated by Dale (1988) and Williamson (1992) for example, institutional problems including political, organisational and human factors, rather than technical, are difficult issues to resolve. As indicated earlier also, distributed data custodians may be reluctant to share and integrate their data for fear of loss of authority and power.

Still another available option for funding a LIS project involves the private sector. For example, Hendrix and Logan (1996) report an approach involving public-private partnerships in a reform of the Ontario land registry in Canada, where the government 'sought to establish a solid relationship with the private sector'. To quote from Hendrix and Logan (1996):

"A private consortium of major companies is contracted through a competitive bidding process to form a joint partnership using private incorporation as the corporate structure. That new company is allowed to keep any fees generated from the registry, but only from the portion of the registry already modernized by the company. This provides for cost recovery and quality assurance... the result of the partnership was Teranet Land Information Services Inc. which in turn contracted with government to automate, implement and operate the land registration services."

Two main benefits of such an approach were mentioned. Firstly was that there was no benefit for the private company until the government also started to perceive a benefit; this implied risk sharing and mutual interests. The second benefit was that at the end of
the contract period, the 'government was [is] left with a modernized, technologically-

sound registry without further investment of any government funds'. The role of
government as the data owner remained unchanged and throughout the partnership, it
maintained a significant amount of control, i.e. it set the statutory fees, operated the land
registry counter services, and reviewed all value-added products. The company on the
other hand managed the data, supported data communications, enjoyed the production of
spin-off products, e.g. street centreline maps, various thematic maps, time series data for
environmental analysis and a variety of land related information reports, as well as
marketing its own information services.

Another funding source of LIS projects in developing countries is via development aid or
assistance e.g. the AusAID (previously AIDAB, the Australian International Development
Assistance Bureau), the UN or the World Bank. Development aid, funded through both
repayable loans and non-repayable development grants according to McGrath and Ruane
(1987), involves survey, mapping and land tenure in one of two ways:

- Direct support to the organisation responsible for the national archive, which may take
  the form of institution building through the provision of technical assistance and co-
  operation, the supply of equipment, and the training of staff at home and overseas, and
- The supply of survey, mapping and land tenure data, information and services as an
  input to a development project so that it may be completed successfully on time.

In Thailand for example, funding for the 20 year land titling project (Angus Leppan and
Williamson (1985a, 1985b)) involved the Thailand government, loans from the World
Bank and the Australian government via the AusAID (Manning, 1992). According to
Angus Leppan and Williamson (1985b, p.71);

"Support for the above programme will be in the form of external financing, through the
World Bank, for new buildings and improvements to existing buildings; equipment for
field surveying, mapping and land administration; and vehicles, in support of survey and
adjudication operations. This will amount to nearly 50 per cent of the cost. Technical
assistance in photogrammetric mapping, management reviews and support, and advice
and training in valuation is expected to be provided in the form of bilateral aid from
AIDAB [AusAID]. Costs of a non-capital nature, such as salaries and materials, will be
covered by "counterpart funds" provided by Thailand."
Based on the discussions above, there are thus a few funding options available for developing countries intending to modernise their land information management processes. Realistically however, grants or loans from international agencies should only be considered as a last resort because few countries are eligible for such aid. There are also political complexities involved in such methods, such as the arms for aid scandal between the Malaysian and the British governments in 1994. However, technical assistance is an option that must be considered as the experience of the developed nations in developing their land markets and their technical expertise may prove invaluable to most lands, surveys, valuation and registration departments in developing countries. The following section reviews the existing funding of surveying, mapping and other modernisation efforts within Malaysia and in particular, Sabah.

4.11 The Funding of Federal and State linked agencies in Malaysia

As implied earlier, funding for the Sabah LIS project within the LS department came from the State Ministry of Finance and in some instances, from the virement of approved funds. In general however, there are not many avenues for organisation involved in managing spatial data sets, to fund LIS projects on their own because of the centralised system of governance in Malaysia. In order to understand the limitations as well as the options in terms of funding LIS projects in Sabah, it is necessary to firstly, review the procedures involved in allocation planning in Malaysia and secondly, to analyse the scenario in Sabah.

Allocation of funds by the Federal Government (FG) in Malaysia is a highly centralised process (IDS, 1993). The extent of the FG’s control over financial matters in all of the Malaysian states have been surmised in an earlier study by Holzhausen (1974, p.44):

"the Federal Government not only possesses all the powers necessary to carry out an effective development policy but it can also control directly or indirectly, the limited independent development activities of the states."

Another indicative comment has been stated by Cleary and Eaton (p.169, 1992) on development in the Malaysian states of Borneo, i.e. Sabah and Sarawak:

"While state revenues are swollen by tax and export duties on the production of oil and timber, the national, rather than the regional economy, is the chief beneficiary"
Development funds are allocated by the Federal Government to the various states in Malaysia, whose amount and purposes are closely tied with the aims and objectives of the Federal Government. As with most countries, three time frames for development planning exist in Malaysia, i.e. long term, medium term and short term.

Long term plans extend 10 or more years. Since 1970, two long term plans have been formulated. Initially there was the First Outline Perspective Plan (OPP1), otherwise known as the New Economic Policy (NEP), introduced in 1971 and expired in 1990. The dual aims of OPP1 included wealth distribution and restructuring society; this was inspired by the racial riots of 13 May 1969 in Peninsular Malaysia (Government of Malaysia, 1991). The NEP policy was extended into the present Second Outline Perspective Plan - OPP2 (Government of Malaysia, 1991) covering the period of 1991-2000, based on a policy called the New Development Policy (NDP). This in more ways than one was essentially an extension of the NEP, judging from the NDP's aims; "... build upon the achievements during the OPP1 to accelerate the process of eradicating poverty and restructuring society so as to correct social and economic imbalances" (Government of Malaysia, 1991, p.3).

Medium term plans involve the formulation of five yearly development plans (DP) and programmes. Since 1971 under OPP1, four development plans have been implemented, i.e. from the Second Malaysia Plan (1971-1975) to the Fifth Malaysia Plan. Currently Malaysia's medium term planning falls under the Seventh Malaysia Plan (7MP) covering the period 1996-2000. Under this plan, funds are allocated yearly by the FG to the respective states. Short term plans involve yearly state level budget planning and financial allocation procedures. This is the highest form of financial control in which the Sabah state and presumably others, exercises a fair amount of autonomy.

All the states within Malaysia conform to the policy guidelines drafted at the national level in the long and medium term development plans (DP). Figure 4.8 shows the general process flow of national development planning in Malaysia. It starts with the circular issued by the Chief Secretary to all secretary generals of federal departments, chairpersons or directors-general of statutory bodies and state secretaries with copies to other federal ministers, chief ministers and directors of the State Economic Planning Divisions. This
circular is dispatched usually 16 months before the end of the current five-year plan (IDS, 1993).

At the state level, the state secretary advises the State Economic Planning Division (SEPD) to prepare and issue a circular together with copies from the National Chief Secretary, to all state ministries, departments and statutory bodies urging them to prepare and submit their development proposals, in compliance with the policy guidelines. Reminder notes are also sent to federal departments and statutory bodies operating at the state level for submission of their development proposals to the SEPD. However, the IDS (1993, p.38) study states that:

"A number of federal departments and statutory bodies have not complied with this requirement. With this non-compliance the SEPD is not able to prepare an integral development plan and it is difficult to obtain an aggregate picture for the state as a whole."

The SEPD vets the proposals and holds discussions with the respective departments and agencies to justify and clarify ambiguous issues. In addition, the State Finance Ministry is consulted to determine the future availability of resources, if they are approved. The compiled version of the State Development Plan (SDP) is submitted to the State Development Planning Committee (SDPC), which vets these for "bureaucratic and political considerations", before submitting them to the State Cabinet for endorsement and debates in the state legislative assembly. The final phase of the process at the state level involves submission of the final draft to the central agencies (see Figure 4.8). Although in actual fact the process from the SEPD circular issuance to the final draft submission takes approximately five to six months, state ministries, departments and statutory bodies begin their preparation of development proposals well before they receive the circular from the SEPD, because "policy guidelines seldom or do not change in very significant way" (IDS, 1993, p.38).
FIGURE 4.8: Process of National Development Planning (Adapted from IDS, 1992)

CHAIRMAN OF NDPC
NATIONAL CHIEF SECRETARY
Issues Circular to:
- Secretary Generals - Federal Ministries
- Director Generals - Federal Departments
- Chairman, Director Generals - Statutory Bodies
- State Secretaries

on format of plan submissions

ECONOMIC PLANNING DIVISION (EPD)
Issues circulars to relevant Exec. Agencies

EXECUTIVE AGENCY
Prepares project proposals

RESPECTIVE FEDERAL MINISTRIES
- vets and compiles all development proposals within portfolio

CENTRAL AGENCIES
- Federal Economic Planning Units (10)
- ICU (3)
- SDP
- Public Works Dept. (JKR) HQ (3)
- Public Service Dept. (PSD) (3)
- Treasury (3)

forms IAPG, compiles ND proposal

INTER-AGENCY PLANNING GROUP (IAPG) comprising officials from:
- FEPU, BNM, ICU and Statistics Dept.
- vets and reviews all reports

TECHNICAL WORKING GROUP (TWG)
- scrutinises reports in specific/technical matters

ECONOMIC PLANNING DIVISION
- Ensures all programmes & projects consistent with national & state aspirations
- Prioritises all sectoral projects
- Be informed or consulted for federal-funded & executed projects
- Compiles State DP proposal

Consultation

EXECUTIVE AGENCY

STATE BUDGET EXAM. COMM.
- Projects revenue and expenditure
- Manpower

STATE DEV. PLANNING (SDP)
- Vets & approves SDP proposal for bureaucratic & political consideration

STATE CABINET
- Adopts SDP proposal

STATE LEGISLATIVE ASSEMBLY
- Debates, approves and endorses

ECON. PLANNING DIV.
- Finalises SDP proposal

NATIONAL DEV. PLANNING COMM. (NDPC)
- Reviews proposal for bureaucratic consideration

NATIONAL PLANNING COUNCIL
- Reviews proposal for political implication

FEDERAL CABINET
- Approves proposal

PARLIAMENT
- Debates and approves NDP

FIVE YEAR NATIONAL DEVELOPMENT PLAN

Consultation

Submission

KEYS
- National Level
- State Level
Although very much a top-down implementation, there are some inputs from the individual States in the formulation of DPs under the five yearly Malaysia Plans. However, from the State's perspectives, some problems with the arrangement that were noted by the IDS study include (IDS, 1993, p.9):

- Policy objectives at the state level may differ, or at times conflict with, national aspirations because Sabah's social, economic and political structures are significantly different from those of Peninsular Malaysia. For example, the NEP was formulated without the State's formal consultation and does not consider the fact that Sabah's ethnic composition is very diverse and different from Peninsular. As stated by the IDS study (IDS, 1993, p.9), "In this respect, national policies are, by implication and in many aspects of practicality, not suitable in Sabah's context".

- The need to balance the state's specific needs while at the same time abiding by national policy guidelines with differences in priorities is not easy to resolve. Project proposals that do not conform to national policies are likely to be rejected by the NDPC.

Hence, funding for development projects in Sabah must obtain clearance from the State Finance Ministry who in turn, may require approval from the Federal government. The next section discusses the budget planning at the state level.

4.12 Development Allocation and Budget Planning at the State Level

Most projects approved by the NDPC under the five-year Malaysia Plan (MP) are usually implemented within the stated period although projects that extend beyond five years will be carried forward to the next DP. The project implementation depends on the availability of resources at the State Ministry of Finance for the year, which also determines what projects are to be implemented. Figure 4.9 below depicts the steps involved in the preparation of the state's annual development budget.

Similar to the situation at the national level, the process begins with a circular issued by the Ministry of Finance to all ministries, departments and statutory bodies for their development proposals to the SEPD. These are mainly for allocating recurrent or supply
expenses, as well as to consider other development requests. The SEPD then recommends a paper to the State cabinet for further economical or political deliberations, which are subsequently returned to the SEPD for compilation and allocation of funds, if successful. The process is shown in Figure 4.10. The Chief Minister however, has the power to approve funds for development requests.

**FIGURE 4.9: Process of Annual Development Budget Preparation (Adapted from IDS, 1992)**

A further method for funding projects internal to a particular department or agency is by virement from departmental allocation or votes for certain projects, i.e. approved for a particular purpose, and diverted to support a different departmental objective. Such approaches however will be to the detriment of the original intended programme and are usually obtained from fixed supply votes, i.e. operational expenses, whose needs may not be as pressing or can be delayed.

The funding processes for the LS department and other government agencies in the state follow the procedures outlined above. However, some observations must be mentioned on the intake of qualified staff into the civil service within the context of Sabah because it
has implications in any efforts to modernise the present land information management procedures.

**FIGURE 4.10 Request for an Additional fund for existing or new projects for the Current Year (Adapted from IDS 1993).**

Although the state is responsible for the salaries and emoluments of staff in the State departments and agencies, the control over the recruitment of qualified staff in LIS or other professionals into the civil service rests with the Federal Public Services Department (PSD). This arrangement concerning the creation of civil posts, terms and conditions and schemes of service, was bestowed on the Federal Government by the IGC (Inter-Governmental Committee) as part of the discussions prior to the formation of Malaysia in 1963. It has created problems for the State’s capacity to meet the administrative
requirement and demands of the State because often it is difficult and lengthy for the State to obtain approvals for the expansion of the State Civil Service. As stated by Kitingan and Williams (1989, p.186), “the State Government has no right whatsoever to create pensionable posts.” Any request for the recruitment of new staff must be reported to the Federal PSD and the Federal Treasury, for consideration. Kitingan and Williams (1989) further observed that:

“The relevant Federal officers often make their decisions without ever going to the State to assess how genuine are the requests for new posts and upgrading of existing ones. The normal stand taken by the Public Services Department and the Federal Treasury is to say “no” to all the requests made; this will then be followed by a ‘bargaining’ session during which the Federal authorities will try to reduce the requests by half; after a lot of haggling they might agree to give one or two out of say four new posts requested. The fact that this ‘estimate meetings’ as they are known, are usually held in Kuala Lumpur, is another disadvantage. Apart from being expensive (cost of airfares, travel allowance and hotel accommodation, etc.) the Sabah representatives at these meetings may not have the necessary information at hand when requested because they may not have brought the relevant files with them ... What is so unpalatable for the State Officers is the fact that the salaries of State officers are paid by the State Government and not by the Federal Government”

The comment above proves the centralised nature of governance in Malaysia and for Sabah in particular, it indicates the degree of control exercised by the Federal Government on the state’s financial capacity and its ability to directly recruit graduates to the civil service. It has also been described as a “thorny issue in State Federal relationship” because Borneonisation³, which was supposed to have been implemented since the formation of Malaysia in 1963, has not been fulfilled (Fung, 1984; Kitingan and Williams, 1989). As stated by Kitingan and Williams (1989, p. 190) for example, 85% of the 64 Federal agencies were headed by West Malaysians and out of 46,780 civil servants in various Federal departments in Sabah, 26,606 were Federal staff of which 23,000 were West Malaysian officers.

³ Borneonisation -To allay the local population’s fears of administration by cadres from Peninsular Malaysia before the formation of Malaysia in 1963, a policy of Borneonisation of the civil service was promised to ensure that state functions and offices were largely staffed by citizens of the state. These, and other safeguards are documented in what has since been known as the 20 POINTS (See e.g. Kitingan and Ongkili, 1989).
4.13 Analysis of LIS funding options in Sabah

Generally, the present LIS funding sources in Sabah can broadly be categorised into three, i.e.

- Federal Government, via its inclusion into the 5 year National Development Plans (Malaysia Plan)
- Request from the State’s Finance Ministry
- Virements

The centralised nature of the funding system in Sabah and Malaysia implies that any state department or government linked agency intending to invest in a LIS must plan the investment well ahead and anticipate the major costs and in particular, those that are intangibles, before submitting funding proposals. This is a difficult task because as mentioned earlier, intangible costs are not easy to assess. Another limitation in the current government funding structure in Sabah and Malaysia is that the system does not allow for innovations and possibilities for funding LIS programmes from revenue generation. For example, the IDS (1992, p.14) study states that the “The Ministry of Finance has too much overriding power” and that under the present funding system, there is “too much red-tape, too many requirements to fulfil, and no room for the individual ministry to manoeuvre”.

At present, computer acquisitions by government departments in the state require approvals from the State Data Processing Steering Committee; once permission is granted, funds are subsequently requested from the State Finance Ministry who will include them in the department’s budget proposal for the following year. What appears to be an issue however, is the ability of the state to expand its staffing capability to manage any major LIS implementation programs, e.g. in terms of fulfilling the system requirements for realising the full potential of the technology, as well as in recruiting qualified staff into the civil service. While the former may be addressed to a certain extent by seeking external professional advice or hiring international consultants, the latter is more problematic essentially because control for the intake of qualified staff into the civil state departments rests with the Federal Government; the process is time consuming and
as implied by Kitingan (1989), has certain problems. Whether the FG will be willing to finally delegate this responsibility which rightfully should rest with state officers and decision-makers however, is a point for politicians to continuously pursue in their dealings with the centre. The consequences will be far reaching because other departments are similarly affected.

Funding from existing core activities, i.e. introducing charging for the department’s activities, however appears as a viable alternative. It can be expected that initially, the idea that public and private users of land information may have to pay for informational products and services that were hitherto provided freely or at minimal costs, may not be a popular one. The ‘public good’ attitude towards land related data is still dominant within all the user and provider agencies of land information in Sabah. When requests are made by other government departments for topographical maps or comments on land availability from the LS department for example, these are provided only at the cost of reproduction, e.g. photocopying. However, such schemes do not take into account the true costs of data collection and maintenance. If this attitude were allowed to continue, then it may be hard or difficult to generate revenue to internally fund modernisation programs of the present LIS and related activities in the future.

This may mean adopting a new approach in the provision of certain products or services, i.e. becoming commercial. Some changes to current arrangements in the provision of spatial data, e.g. changes to the law, cost recovery schemes, fixing realistic charges, as discussed earlier, that reflect the true cost of land information, may therefore be necessary. In Sabah in particular, the success or otherwise of any such changes may depend on the strength of the personalities involved and how the arguments or proposals are presented to the decision makers.

4.14 Conclusions

This chapter has explored in some detail, the major costing issues associated with a LIS implementation program. Costs of LIS are often underestimated and while some are not immediately recognisable, some of the cost elements are unquantifiable; these mainly were
of a socio-political nature that relates to human-organisational relationship and institutional structures.

The foregoing discussion also provides an example of how the main cost components of a LIS can be categorised. Each cost element however will differ for individual organisations and the essential point is that there are many variables that affect the final cost of a LIS. If there is a need for a complete re-mapping of a region or country, then all of the cost elements mentioned may be applicable. It is however more likely for data conversion to be initiated from existing spatial data sets. In such instances, the cost elements may largely involve the acquisition of the system and the digital conversion of existing data sets. The field study provided ample evidence that data related costs where available, are usually sporadic, not easy to access, and in most cases, mixed or merged with various other reports, document and papers. Hence, past or earlier data collection and equipment costs involved in e.g. photogrammetry and land surveying, can be treated as sunk costs, unless they are specifically required for the LIS project.

It has also been necessary to review how major investments for a major project such as a LIS are typically obtained in Sabah and in Malaysia, in general. Potential problems from the state's perspective have been identified, with the main issues being those related to funding and that of recruiting qualified officers into the state civil service. The next chapter discusses the benefits associated with LIS, how these are normally quantified and constructs a justification model for determining an optimum LIS investment level, which is specific for the case study.
Chapter Five
LIS Benefits in Developing Countries and an Investment Model

5.1 Introduction

This chapter analyses the benefits of a modern LIS. In addition, common methods for comparing the costs and benefits and a discussion on the possible LIS implementation risks will also be discussed. It will initially identify means of quantifying the benefits in general and later focus on the main methodologies and arguments used to assess an optimum LIS investment level for the case study, which of necessity, will be relevant to the conditions in Sabah. A conceptual justification model for an investment in modernising an existing LIS will be developed based upon an analysis of existing inefficiencies and ineffectiveness in the state’s land information management (LIM) procedures.

5.2 Classification of LIS Benefits

As implied in earlier chapters, it is essential to realise that LIS benefits to each user may vary in magnitude because they depend on the extent and type of use to which the data are put. The uses of LIS are as broad as the situation in which LIS can be used. At the risk of over simplification, a LIS organises and exploits spatial data that are digital or digitised and stored in records of data bases. The uses of digitised data can range from being mechanical in nature, to other more complex applications, such as aiding in decision making or other complex forms of spatial analysis, resulting from the integration of various sources of attribute and graphical data. Integration of land information thus promotes an environment of more informed, quicker and hence, more effective decision making (Dale and McLaughlin, 1988). However, quantifying LIS benefits is far from being a simple process.

The core element of a LIS is the provision of spatial or land related data. As with LIS costs, it is essential to identify and classify the various forms of benefit that can accrue with improved land information management processes. Although other benefit
classifications exist, e.g. tangible or intangible, for the purposes of this thesis, benefits will be classified into three main categories:

- Efficiency benefits
- Effectiveness benefits
- Impact on the land markets

Efficiency benefits of a LIS are those commonly referred to as tangible benefits and can be measured as time savings or avoided costs, where equal levels of quality or numbers of services or products are produced but at reduced unit costs. Effectiveness benefits occur when a LIS increases the output quality or increases the output range. Such benefits are usually unique to the environment in which LIS is used, although it should be stated that some effectiveness benefits may be intangible, i.e. it is difficult to assess the monetary consequences resulting from a change in one of the production functions (Gillespie, 1992). Such benefit concepts result from added 'value' to information as discussed in chapter three.

The third form of benefit, i.e. impact to the land markets, refers to the wider beneficial knock-on effects or consequences that can be expected as a result of increased efficiencies or effectiveness in the management of land related records. This includes, for example, improved mechanisms for land transaction processes or conveyancing, the impact of more secure land tenure, land and property rights, all of which contribute to the higher possibility for wealth creation. Figure 5.1 shows a generalised statement of the various forms of benefit under the above classification as well as their indicators, and measures of assessment.
### FIGURE 5.1: A General Classification of LIS Benefits in Developing Countries

<table>
<thead>
<tr>
<th>Narrative Summary</th>
<th>Indicators</th>
<th>Means of Assessment</th>
</tr>
</thead>
</table>
| **(1) Efficiency (tangible)**<br>Cost Savings | • Savings in map production and updating<br>• Minimisation of duplication<br>• Cost savings in labour to do the same task.<br>• Saving in storage space<br>• Improved customer service and faster approval times | Higher productivity and lesser unit cost of production<br>As above<br>Lower rental on office space<br>Growth in demand or improved customer service | Production cost input figures on existing product or service output including staffing cost<br>""<br>Figures on existing rental for office space and maintenance
| Avoided Costs | • Savings in staff. | Lower future staff intake | Figures on yearly staff intake for particular tasks. |
| **(2) Effectiveness (intangible)**<br>Processing facilities or ability for analysis not possible before. | • Improved information processing facilities or ability for analysis not possible before.<br>• Improved accuracy of information<br>• Better planning possible<br>• Better quality decisions<br>• Improvement of access and dissemination of information (multiple access of same information)<br>• Modelling possibilities<br>• More efficient use of human resources<br>• Improved revenue generation in sales of information<br>• Development of new areas of activity<br>• Improved land and geographic data storage and distribution<br>• Improved overall targeting of resources<br>• Improved project scheduling and co-ordination<br>• Improved utilisation, pricing, maintenance and disposal of fixed capital assets. | More informed/effective decisions | Figures, facts or statements on the impact of decisions. These are mainly concerned with the ‘value’ of information whose assessment requires qualitative input from user interviews, regarding the impact of e.g. quicker access to information, better decision making. |
| **(3) Impact to the land markets**<br> | • Possible faster rate of land titling, leading to creation of more secure tenure, higher transaction of properties, etc.<br>• Stimulation of land markets, e.g. higher credit demand and supply with formal recognition of rights<br>• Higher likelihood to invest on | Number of land titles produced<br>Expected increase in land transactions<br>Higher requests of formal loans | Approximate land value of each particular title<br>Increase in e.g. land transaction stamp duty, taxes, etc.<br>Increase in long term productivity |
As indicated above, a wide range of indicators and their assessment can be developed. Within the context of this research however, the benefits assessment will emphasise the efficiencies and the impacts on the land market. One of the main reasons for the difficulty in assessing effectiveness benefits or the impact of information value from the users' perspectives is the lack of a universally acceptable unit of land information. Hence, the quantification of LIS benefits will have to be assessed depending on their particular or unique uses. For example, the following techniques for assessing the impact of information were quoted by Haravu and Rajan (1995) in a paper presented at a workshop on 'Measuring the Impact of Information on Development':

- Performance measures relating inputs to outputs.
- Effectiveness measures relating output to usage.
- Cost-effectiveness measures relating inputs to usage.
- Cost-benefit measures relating inputs to outcomes.
- Impact measures relating usage to outcomes.

From the above, it can be deduced that the key to measuring and quantifying LIS benefits is identifying what has changed as a result of the LIS implementation, i.e. its direct impact and its quantification. For quantifying the benefits of land and geographic data infrastructure, two methods merit discussion; the traditional form of benefits measurement in a Cost Benefit Analysis (LGMB, 1989, 1991) and Cost Effectiveness Analysis (Price Waterhouse, 1995). The former is a widely used technique and its main advantage lies in its extensive coverage of factors that contribute to the overall impact of any new project or undertaking. This technique however depends heavily on the availability of detailed supporting statistical input information. As indicated in previous chapters, this may be problematical in practice because access to costs on surveying and mapping are affected by issues related to confidentiality, or that records may not detail cost items to a sufficient level for analysis. In cases where these are not attainable, cost effectiveness approaches may be used for justifying the investment, which in many instances, requires an assessment of the 'information value' as perceived by the user. Generally, it requires 'structured conversations' or interviews with the users and a statistical analysis of the results.
In most government agencies in developing countries, the majority of land information users and suppliers can generally be considered to be the same as their daily operations are funded by the state, i.e. land information is treated as a public good. To a large extent therefore, this assumption will be adopted because governments still play large participatory roles in the economic development of a typical developing country. The following will expand on how LIS benefits can be modelled, assessed and applied in a national LIS justification process. The evaluation procedures are viewed mainly from the perspectives of the provider of the products and services of land information, i.e. the benefits as viewed from the State’s perspective.

5.3 Measurement of Efficiency Benefits.

The assessment of LIS efficiency benefits essentially compares the costs of manual outputs against their equivalent computerised products and services. Within the mapping environment for example, efficiency benefits are those that result in cost savings and costs avoided. In the former, it occurs when existing tasks can be accomplished less expensively by reducing certain unit input costs. For example, cost savings from automating the mapping process may include time savings for carrying out functions such as the collection, checking, processing, display and distribution of land related data; reduction in future staff intake; reduced need of space requirements for data storage; gaining faster access to information and reducing duplication of efforts.

Cost avoidance is similar to the above but the main difference is that while no costs have been removed from the automation process, it assumes that computer usage can reduce or prevent future costs from being incurred. Cost avoidance occurs for instance when the number of steps, transactions or response time involved in delivering a product or service from the provider to the user is reduced. This quicker access to data can be enjoyed by both parties, e.g. time savings in travel, or lower transaction costs. To some extent it is obvious that some forms of benefit may be categorised as an efficiency or effectiveness gain depending on how these are viewed. The advantage of classifying LIS benefits in terms of cost avoidance is that it offers a sharper definition of the means of assessment and additionally, provides some order into what essentially is quite a difficult process.
For quantification purposes, it may be necessary to classify among others, the input and output factors. Within the context of surveying and mapping for example, input cost factors may consist of all the costs incurred in providing a particular service, e.g. data collection and its subsequent maintenance, whereas the output may involve the provision of a map or in the form of land information services, such as advice on the status of land. In the production of a map for example, the following input data may be necessary:

- specification of the outputs, user needs or informational products (e.g. maps or plans at particular scales, land records, etc.)
- approximate time and costs required to produce those products or services manually, i.e. considering salaries, number of personnel involved in the process, materials required, etc.

Based on these principles, a general relationship for assessing LIS efficiency benefits has been developed by Gillespie (1992) who argued that because personnel costs are variable, the time savings as a direct result of having digitised data can be calculated as a tangible benefit:

- Without LIS: Produce X at cost $a where $a = f (no. of people involved, salary, time)
- With LIS: Produce X at cost $b where $b = f (cost of computer systems and data conversion)

X above can be any type of land related service or product, e.g. maps, plans, records, coordinates or any specific land information.

From the relationships above, it is therefore clear that past and existing records such as the time required to access a map or other forms of land information leading to the production of informational outputs or services, are necessary for comparison purposes. All the input cost factors for these services and products must be computed and compared against their alternative, i.e. computerised but equivalent LIS outputs, for an assessment of the benefits. As mentioned earlier however, in practice, cost related information may be
difficult to obtain due to matters of confidentiality, or that such unit cost records may not be available. During the data collection phase of this research, the other major problems encountered included:

- the difficulty of identifying the number and extent of influence of other input factors contributing to the project in which spatial data are but one component.
- the monetary value of land information cannot be gauged accurately, due to its variation in value as perceived by the prospective users and among data supplying agencies.
- the direct contribution of land information in a decision or a project is difficult to quantify.

An example for assessing the efficiency benefits within a land information environment is shown in Figure 5.2. It portrays how current manual tasks of accessing land information can be modelled, classified, quantified and more importantly, it demonstrates how the anticipated cost savings with computer and digital data usage can be estimated. The model developed here was based on an approach by Chesher and Laybutt (1991) for quantifying LIS benefits in an Australian local authority. An important element in this methodology involves the quantification of a unit cost, which in this case is the rate per hour.

As mentioned earlier, a key requirement in the approach in Figure 5.2 is the availability of data relating to the costs of existing methods and procedures. It can be seen that although the figures used in the example are assumed, the approach can be used to portray the periodic benefit estimates. For this research, the approach adopted to assess efficiency benefits makes some specific assumptions; these however will be addressed in Chapter Seven.
FIGURE 5.2: LIS Efficiency Benefits

<table>
<thead>
<tr>
<th>Function</th>
<th>Time Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office checks of land availability, i.e.</td>
<td>1 hour</td>
</tr>
<tr>
<td>reference to maps, plans, records, encumbrances, etc.</td>
<td></td>
</tr>
<tr>
<td>Response to Titles or Property Search</td>
<td>1 hour</td>
</tr>
<tr>
<td>Checking of Title Conditions</td>
<td>1.5 hours</td>
</tr>
</tbody>
</table>

Monthly Cost Savings

<table>
<thead>
<tr>
<th>FUNCTIONS OF LS DEPT.</th>
<th>TIME SAVINGS (HOUR)</th>
<th>MONTHLY UNITS</th>
<th>MONTHLY TIME SAVINGS</th>
<th>RATE PER HOUR</th>
<th>MONTHLY COSTS SAVED (MALAYSIAN RINGGIT - MR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Checks of land availability</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>Response to Titles or Property Search</td>
<td>1</td>
<td>30</td>
<td>30</td>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>Checking of Title Conditions</td>
<td>1.5</td>
<td>30</td>
<td>45</td>
<td>4</td>
<td>180</td>
</tr>
</tbody>
</table>

Assumptions:
1. There are approximately 30 office checks, titles or property searches per month.
2. The average wage is assumed to be MR4.00 / hour.

The benefit model in Figure 5.2 performs well when a high level of accurate cost related data is available. This may not always be the case and hence, a more simplified model of classification and assessment may be necessary for assessing the benefits of LIS at the organisational or inter-departmental level. In such instances, it will be useful to generalise the tasks that can be grouped under common headings, which is shown in Figure 5.3 below.

The advantage of the model above is obvious; it is more practical at the national level involving many departments whose data on, e.g. staffing costs and other finance matters may not be easy to access. The precision of any benefits model will therefore depend upon the accuracies of underlying or supporting data used to estimate the unit costs and how 'true' are the assumptions adopted; more assumptions essentially mean more inaccuracies for the benefit assessment model.
FIGURE 5.3: A Generalised LIS Efficiency Benefit model

<table>
<thead>
<tr>
<th>Number of Staff</th>
<th>Expertise level (1-manager, 2-technical, 3-clerical)</th>
<th>Mean Salary per month (26 working Days)</th>
<th>Days saved (with LIS, from hr./day)</th>
<th>Freq. (of days occurring per month)</th>
<th>Total salary saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Response to initial query for land available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Prepare completed report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Monitor completed report</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other functions.....</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total benefit (Cost Savings) with digitised data and LIS $______

5.4 Measurement of Effectiveness Benefits

As opposed to efficiency benefits which are concerned with product and service assessment at the internal or supplier level, effectiveness benefits extend beyond them, i.e. to the users. This approach usually requires an assessment of benefits whose ‘unit measures’ or indicator levels are not easy to quantify, e.g. service to the public, product quality, job enhancement, strategic contributions, etc. It requires from the users, an assessment of how better or enhanced LIS informational outputs or products improve their decision making. Although these approaches will not be quantified in this research due to the limitations stated earlier, it may be useful to discuss the main issues involved and review approaches developed to quantify this form of benefit.

However, some qualification of the limitations must be mentioned. The first concerns alternatives where Strassman (1985, p. 130) for example, opined that one of the main difficulties associated with measuring effectiveness benefits relates to the availability of alternatives:

“As long as customers have no alternatives, it is possible to compute only the efficiency of suppliers, not their effectiveness. A government agency, whose actions are regulated by law, and whose budget is a share of tax revenues, can improve only its efficiency.”
An environment where a single supplier and many users exist is thus an example where efficiency benefit techniques offer more practicality and advantages. As further observed by Strassman (1985, p.117), "Effectiveness is a social concept: it applies to groups. Efficiency is an individualistic concept: it applies to isolated acts".

Within the context of this research, the observation above applies because there are seldom other alternatives to mapping and surveying services and products in most developing countries, which are usually controlled by the government or have connections with the military; in most cases, issues of land related data accessibility and availability still have higher significance than the economic opportunities offered by a more flexible approach to data. In the Thailand land titling project for example, the scheme had to be modified to suit military requirements during the photogrammetric data capture stages (Dale, 1991).

Effectiveness benefits as mentioned earlier, occur when the use of LIS produces different outputs from those delivered by manual methods, i.e. it improves the version of an existing product, or increases the output options or product range. The benefits will be realised when this results in a better informed decision making and planning environment with consequential improvements to the business processes and end products, as well as the attainment of other management goals. Gillespie (1992) states that the benefits are measured by determining the incremental value of the improved or new LIS output and provides the following mapping process as illustrating an LIS effectiveness benefit:

- Without LIS: Produce X at cost $a
- With LIS: Produce X+ (improved version of X) at cost $b where the effectiveness benefit is equal to the incremental value of X+ over X

Gillespie (1992) also claimed that it is possible for a single LIS application to benefit from both efficiency and effectiveness benefits:

- Without LIS: Produce X at cost $a; Produce Y at cost $a2
- With LIS: Produce (X + Y) at cost $c, where the efficiency benefit for X is (c-a), and effectiveness benefit for Y is (c-(a+a2))
In quantifying these benefits, Gillespie (1992) proposed a three step strategy in its identification:

- determine how the LIS output is different, e.g. newer products, higher quality of existing versions, more productive, more timely, more ways of presentation, etc.
- determine what effect each of the changes in the LIS output has on the users, e.g. lower unit costs, improved decision making or rate of project success.
- determine the value of each effect to the users, by interviewing them for their willingness to pay

In effect therefore, information values must be elicited from the user where an expression of the benefits in terms of tangible monetary values is required. Remenyi et al (1993) and Dickinson and Calkins (1988) proposed a similar method for quantifying the non-quantifiable benefits of improved decision making. Their principles for quantification involve a similar routine as those above, i.e. an initial estimation of the effects of better decision making, and including these into the total benefit contribution of the land information system. In this respect, a formula was forwarded by Dickinson and Calkins (1988):

\[
\text{Benefits} = \% \text{ of LIS contribution} \times \text{decision-making contribution (e.g. } \% \text{ in terms of Return on Investment)} \times \text{value of result.}
\]

It is obvious that the above equation assumes that the results of improved decision making with a LIS can be assigned an economic value, e.g. a 1 per cent increase in the rate of return, resulting from its use or output. As explained earlier however, there are significant data acquisition problems associated with such techniques because the value of each information product or service is unique and is normally judged on its own merit. Some effectiveness benefits can be related to efficiencies, e.g. an increase in the final information product or service can be due to an isolated and measurable improvement, and hence are more easily computable by the methods outlined earlier. In general however, most are not directly or readily measurable in monetary terms and in most instances, the order of magnitude or estimate of the effects of intangible benefits are estimated.

Another significant issue arises when the users or providers of land information are not aware of the value of their products and services that they provide and thus, may have
difficulties in expressing opinions on the benefits of digital data and computers. During the data collection phase for this research, the author was not able to obtain much information from the land information managers because of their inability to attach realistic monetary estimates or other relative values to their informational outputs. These benefits which require subjective user inputs will therefore be termed as mainly intangibles and will not be fully quantified within the context of this research but where appropriate, will be indicated.

5.5 The Cadastre and LIS Benefits Within a Land Markets Context

The efficiency and effectiveness benefits above form the common arguments of any LIS implementation, whether at the single or multiple user and provider agencies at the national level. The justification process for a national LIS in developing countries however should also consider the benefits related to the land markets, particularly its potential contribution to existing cadastral systems. Cadastral systems, as implied in chapter two, refer to the vast array of legal, technical, administrative and institutional mechanisms that are available to support *inter alia*, effective land markets, increased agricultural productivity, sustainable economic development, environmental management, political stability and social justice (Williamson, 1995).

Since the importance of cadastral systems in developing countries has been discussed in chapter two, only a brief review will be given here. It was argued for example that LIS benefits can accrue in the urban and rural areas. In the case of the former, a responsive cadastral system is essential because it supports the land markets by allowing land to be transacted, e.g. bought, sold, mortgaged or leased efficiently, effectively, quickly and at low cost. In addition, it can also aid in the management of cities due to its ability to identify land at the parcel level from which other forms of spatial records can be added and integrated. The immediate access to land information required in e.g. urban planning, development control, management of cities, etc. offers many efficiency and effectiveness benefits.

For rural areas, the main contribution of an effective cadastral system is its function in the enforcement of property or land rights in the form of land titles. Secure land titles are
essential because of their role in promoting, e.g. higher investment by farmers in agriculture, for more effective tillage, as a form of security for credit, support for land resource management and supporting sustainable development. These are mainly attributable to the concept of individual property rights because as opposed to a communal form of land tenure, it pre-supposes that responsibility and control for land use can be ascertained.

Maintenance of the land register and their associated cadastral maps or plans can also benefit from modernisation. For example, the benefits of computer assisted techniques in the management of land registers under the Torrens system of land registration was observed by Whalan (1982, p.80):

"Use of modern techniques will mean less bulky records, simple replacement of superseded certificates and the easier introduction of sophisticated management and administrative techniques. For instance, the present registration chain or process could be greatly simplified. Even the introduction of loose registers can help, but, with the introduction of computer technology, registration, or rejection, will take place immediately and will eliminate the registration chain."

The assessment of the benefits above can be carried out either by the efficiency or effectiveness techniques mentioned above. Of special relevance in this research will be the estimation of the increased land values resulting from land titling; this however will be developed in the next chapter.

5.6 Justifying Information Systems Investments - A Review.

There are many criteria used in the economic analysis for any intended Information System (IS). In most mapping and surveying organisations concerned with the collection, management and use of the cadastre and other spatially related data, a cost benefits analysis (CBA) is one of the most used techniques in investment decisions (Dale and McLaughlin, 1988; Dickinson & Calkins, 1988; Tomlinson Associates, 1993a). There are however other evaluation criteria used in combination with a CBA. In a UK study on IT investments reported by Willcocks and Lester (1994) for example, the following were used by 50 organisations in combination with a CBA:
• competitive advantage
• service to public
• quality of product
• job enhancement
• improved management information
• user requirements
• time scale
• legal requirements
• strategic importance
• organisation requirement and necessity

Of more significance in the study by Willcocks and Lester (1994) involving the various organisations above however is the wide and accepted usage of CBA in any initial IS analysis. A CBA involves a comparison of the cost of any investment against its anticipated benefits. These are usually discounted to an appropriate time or a base year, against which all future costs and benefits are based. The assessment of investment benefits in a CBA can be categorised into the following techniques which will be further discussed below:

• Benefit cost ratio
• Return on Investment (ROI) or pay back period
• Net Present Value (NPV)
• Economic Internal Rate Return (EIRR)

5.6.1 Benefit Cost Ratios

A benefit cost (B/C) ratio is the most common indicator for justifying the business case for an investment in a LIS, although its use will depend on the individual organisation. B/C ratios provide direct comparison between the benefits and the cost of a project and use these relationships to decide whether a particular project is a favourable investment. In addition the cost benefits analysis (CBA) also presents a structured approach for assessing alternative strategies because it allows different initiatives to be compared. The end result of a CBA is a benefit cost ratio derived by dividing the sum of the present value
of all the benefits by the discounted sum of all costs, in which investment options with higher than unity benefit cost ratios are deemed acceptable.

Some deficiencies of benefit cost ratios however deserve mentioning. The approach for example gives incorrect and misleading ranking when the sizes of the project vary. As observed by Kohli (1993, p.103) in discussing the use of B/C ratio in the economic analysis of investment projects, “Smaller projects with a higher benefit cost ratio are favoured over larger projects which may have a lower B/C ratio but have higher net present values and, therefore, are more beneficial to the economy.” A further limitation is that the ratio may not be unique because it varies with the way the costs and benefits are defined. Hence Kohli (1993, p.104) noted, “Since there is no standard procedure of defining costs and benefits, the use of B/C ratio could lead to incorrect comparison and wrong decisions.” However, its main shortcoming is probably the failure of the technique to account for the monetary value of the intangible benefits which limits its use in the computing environment (Hares and Royle, 1994). In this respect, Dickinson and Calkins (1988) suggested that a separate documentation of the intangibles, i.e. not accounted, should be included in any CBA for a land or geographical information system.

Discounting of the costs and benefits to a base year is usually applied for the purpose of estimating future values of money to the present, i.e. the present worth of investment earned or spent in future years. A general equation for calculating the present value (PV) of a benefit (B) or cost (C) in T years’ time is:

\[ PV(B) = \frac{B_T}{(1 + r)^T} \]

where, \( r \) is the rate at which the future benefits are discounted, i.e. the discount rate (Pearce, 1993, p.54)

As stated by Kohli (1993), the process of discounting is simply compounded interest rates worked backward and observed the following points:

- *The net present value of any sum is lower than its future nominal value*
- *The longer it takes to realise a certain nominal value, the lower its present value*
- *The lower the discount rate, the higher the present value, and vice versa.*
The impact of discount rates is therefore greater on benefits because costs are incurred in the earlier phases of a project, while benefits are usually realisable in later years. Hence, following the third observation above, a project would be more viable if the discount rate is lower, while a project would be less viable if the discount rate is higher.

5.6.2 Return on Investment (ROI) or Pay-back Period

The Return on Investment (ROI) or pay back period can also be used to assess the feasibility of an investment in a LIS. It sets out to measure the length of time, e.g. number of years, it would take for the net benefit (positive cash flow) to return the investment, i.e. the time required for the net benefit to be fully recovered from the anticipated benefits. As savings continue, it is inevitable that the capital be recouped although this will depend to some extent, on the amount of time involved; the shorter the pay back period, the more desirable the investment becomes. As with the cost benefit ratio above, all computed values need to be discounted although it is also difficult to specify an 'acceptable pay back period' or target, i.e. the length of time acceptable to recoup an investment. In the case of LIS projects and depending on the amount of data conversion required, the pay back usually involves several years.

The pay-back method thus has the conceptual appeal of informing decision makers how long it takes for a project to pay off and recover its initial investment. As stated by Zerbe and Dively (1994), it can also be a fairly accurate representation of true results in situations where benefits are constant or increase over a long period of time.

5.6.3 Net Present Value

Hares and Royle (1994, p.102) state that a net present value (NPV) is:

"simply the net sum of all the discounted cash flows over the life of the investment... this positive NPV is not just that the costs are exceeded by the benefits in an absolute sense but that the benefits exceed the costs even taking into account inflation and all the anticipated risks that can adversely affect the project during its life"
Thus, if the NPV is positive, i.e. larger than zero, projects are usually accepted. The present value of all flows of net benefits \((B_0-C_0), (B_1-C_1), \ldots (B_n-C_n)\) can be expressed algebraically as (Kohli, 1993, p.98):

\[
\text{NPV} = \frac{(B_0-C_0)}{(1+r)^0} + \frac{(B_1-C_1)}{(1+r)^1} + \ldots + \frac{(B_n-C_n)}{(1+r)^n}
\]

\[
= \sum_{t=0}^{n} \frac{(B_t-C_t)}{(1+r)^t} \quad \text{where} \quad r = \text{discount rate}, \ t = \text{time, e.g. year 1, year 2,\ldots,} \ n = \text{project lifespan}
\]

The NPV can be calculated either by estimating separately the present value of costs and benefits and then arriving at the net figure by deducting costs from benefits, or more simply by deducting the costs from the benefits in each year and then deriving the NPV of benefits minus costs. In the illustrative Table 5.1 below, the latter approach is used where the NPV of an investment of MR1200 million has an estimated NPV of MR3,845 million, over 10 years.

**TABLE 5.1: Example of Net Present Value (Adapted from Kohli, 1993, p.99)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Benefits (B)</th>
<th>Costs (C)</th>
<th>B-C</th>
<th>Discount Factor at 12 Per Cent</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-</td>
<td>9.000</td>
<td>-9.000</td>
<td>1.000</td>
<td>-9.000</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>2.000</td>
<td>-2.000</td>
<td>0.893</td>
<td>-1.786</td>
</tr>
<tr>
<td>2</td>
<td>2.000</td>
<td>1.000</td>
<td>+1.000</td>
<td>0.797</td>
<td>0.797</td>
</tr>
<tr>
<td>3</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.712</td>
<td>2.848</td>
</tr>
<tr>
<td>4</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.636</td>
<td>2.544</td>
</tr>
<tr>
<td>5</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.567</td>
<td>2.270</td>
</tr>
<tr>
<td>6</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.507</td>
<td>2.027</td>
</tr>
<tr>
<td>7</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.452</td>
<td>1.809</td>
</tr>
<tr>
<td>8</td>
<td>4.000</td>
<td>-</td>
<td>4.000</td>
<td>0.404</td>
<td>1.616</td>
</tr>
<tr>
<td>9</td>
<td>2.000</td>
<td>-</td>
<td>2.000</td>
<td>0.361</td>
<td>0.722</td>
</tr>
</tbody>
</table>

Net Present Value (NPV) Total 0 to 9 3.845

It should however be stated here that the main concern here is the use of the technology to justify an investment in a LIS. In evaluating options for an investment, Kohli (1993, p.100) however opined that the NPV is effective only when three conditions are present:

- First, there must be a large number of fully appraised projects whose total cost exceeds by a significant margin the available budget; otherwise, less desirable projects might be taken up in place of better ones which are still being appraised.
• Second, the investment budget for the government or the concerned ministry must be fairly firm; otherwise, the ranking of projects can change.

• Third, and most important, the opportunity cost of capital should be known. This is because the choice and ranking of projects in terms of their NPV can be affected by any change in the discount rate. For example, with a high discount rate, projects which yield high benefits in the earlier years would be desirable whilst for a low discount rate, projects with high benefits in later years appear preferable.

5.6.4 Economic Internal Rate of Return

The NPV method and Economic Internal Rate of Return (EIRR) are closely related. The advantage of the EIRR is that it can be calculated based on project data alone, and a decision on project viability can be made without precisely knowing the opportunity cost of capital, i.e. the discount rate. As stated by Kohli (1993, p.101):

"The NPV method, through the use of the discount rate, can estimate the present value of all benefits and costs. The difference between benefits and costs represents the NPV. In the EIRR calculation the procedure is reversed: The NPV is fixed at zero and, through a process of trial and error, the discount rate which will make equal the present value in the flows of costs and benefits of the life of the project is determined".

The EIRR of the project is obtained by the solution of the interest rate (I) often by iteration, using the following modified version of the earlier NPV equation above:

\[ NPV = \sum_{t=0}^{n} \frac{(B_t-C_t)}{(1+i)^t} \]

Hence, the EIRR method is the discount rate that, if used to discount a project's costs and benefits, will just make the project's net present value equal to zero. It utilises present value concepts but seeks to avoid the arbitrary choice of an interest rate in evaluating an investment proposal. The computed interest rate is in effect, taken to be the EIRR and can be used for a simple cash flows scenario, i.e. for single projects when initial negative cash flows are followed by a series of non-negative cash flows. Zerbe and Dively (1994, p.201) however noted that two major problems occur when the cash flows become complicated. The first is that the calculations become more complex and time-consuming, although this
is not a significant problem with the availability of computers. The second and more
fundamental problem arises if negative cash flows occur after positive cash flows; the
EIRR approach may produce multiple solutions because the polynomial used to calculate
the EIRR now has more than one sign change. As noted by Zerbe and Dively (1994,
p.201), “Each sign change has the potential for creating an additional positive root of the
polynomial, and hence an additional value for the IRR”.

Kohli (1993) meanwhile observed that the EIRR is more commonly used by international
lending institutions which are often requested by borrowing countries to finance specific
projects while the NPV criterion is valuable in making a selection of projects to fit
available resources.

5.7 General Observations of the Evaluation Methods

It is generally acceptable that the viability of a project is determined by comparing the
stream of net benefits and costs over the useful life of the project. It is clear from the
discussions above however that options for comparing the costs against the benefits of
any investment, including an information system, are only means to an end. No particular
method has been adopted as an international standard for evaluating the main concern of
this thesis, i.e. how to determine the investment level for a national land information
system.

Another point is that most of the methods above seldom consider the assessment of value
discussed in chapter three, to the investment process. The concept of value, which is an
extension of the traditional ‘limited view of economic benefits’ (Parker et al, 1989, p.22)
to an investment, has however increasingly gained acceptance as an essential component
of the justification process in information systems investment. This is usually applied in
the business environment and considers e.g. the impact on competitive advantage,
management information, competitive response, and strategic IS architecture. It is clear
that these involve a deeper level of analysis and in most cases, require user inputs in the
form of values attached to the informational products or services. Such approaches tend
to be assessed in a ‘bottom-up’ approach where IS projects are evaluated against ‘all
organisational, departmental, individual management and end user objectives' (Willcocks and Lester (1994)).

The purpose of the investment also plays an important role in the justification process of an investment in IT, because it defines the possible approaches to its evaluation and performance measurement. A useful classification for different types of investment was proposed by Remenyi et al (1993, p.83) which is reproduced in Table 5.2 below.

**TABLE 5.2: Investment Purposes, Types and Evaluation Techniques (Adapted from Remenyi et al, 1993).**

<table>
<thead>
<tr>
<th>INVESTMENT PURPOSE</th>
<th>INVESTMENT TYPE</th>
<th>EVALUATE/MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Survival</td>
<td>Mandatory</td>
<td>Continue/Discontinue business</td>
</tr>
<tr>
<td>Improving Efficiency</td>
<td>Vital</td>
<td>Cost Benefit</td>
</tr>
<tr>
<td>Improving Effectiveness</td>
<td>Critical</td>
<td>Business Analysis</td>
</tr>
<tr>
<td>Competitive Leap</td>
<td>Strategic</td>
<td>Strategic Analysis</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Architecture</td>
<td>Very Broad Terms</td>
</tr>
</tbody>
</table>

Hence, there are thus many needs that may justify investments in a LIS. In general however, it has to be conceded that the final arbiter in most investment analysis in which LIS is no exception, is that the costs are minimised and the benefits maximised.

**5. 8 Risks in LIS implementation**

Another important concept often associated with any investment is the risk involved in the process. The Collins dictionary (1995) defines risk as 'the possibility of incurring misfortune or loss' while the Concise Oxford Dictionary (1996) has a similar definition, i.e. 'a chance or possibility of danger, loss, injury or other abuse consequences'. A risk is therefore an unwanted eventuality. The terms risk and uncertainty have often been used in which the former is used to mean instances where the probabilities of a bad outcome are known, whereas in the latter, they are unknown. For the present context, both will be treated to be synonymous. While there is significant literature devoted to the management and assessment of risks, in which some are mathematical (Zerbe and Dively, 1994), only a brief review of the core concepts will be discussed in the following.

Risk is 'a cost on a project' according to Hares and Royle (1994, p.100) and lowers the value of an investment. Within the specific context of this thesis, risk refers to internal or
external factors that can affect the realisation of benefits in a LIS investment, either before or during its implementation. Hence, many of the intangible costs covered earlier in chapter four can be considered as risks. Other common risks associated with a LIS include technical risk and organisational or institutional risk. Technical risks refer to those uncertainties associated with the tangible aspects of the LIS technology, e.g. data compatibility, hardware, software and availability of trained LIS personnel. LIS risks that are technical in nature however are easier to manage, i.e. whose solutions can usually be provided by those with the technical expertise or competence (Dale, 1990).

On the other hand, organisational and institutional risks are more difficult to manage because they include issues such as the failure to develop, promote, and support an environment for a LIS to function. This may be due to the lack of mechanisms for data sharing including standards, administrative and legal frameworks, or other arrangements. These forms of risk may also be 'people oriented' such as the resistance of staff to e.g. the adoption of new working practices and responsibilities, or the non-cooperative attitude of staff from individual departments/sections affected by the computerisation, etc. due to the e.g. increased responsibility, fear of the technology, or even fear of losing power or authority.

In managing these unwanted possibilities and minimising their impact, risk analysis methodologies have been developed to create an awareness among decision makers of the most significant risks associated with their investment. Birch and McEvoy (1996) state that risk analysis (in the case of an IS) must answer the following questions:

- how much is it appropriate to spend on counter measures?
- where should this spending be directed?

Because of the fact that LIS investment involves people, systems and processes, it is difficult to anticipate all the possible risks and uncertainties that can occur throughout the life of a LIS implementation process. Each of the major LIS components i.e. data, hardware, software and people, will have their own unique set of problems and over the life-time of the LIS implementation, may affect the estimated incurred costs and anticipated benefits. Their net effect may result in estimates being over or under estimated
and incur consequential delays in various aspects of the project. One possible method of modelling risk has been proposed by Huxhold and Levinsohn (1995) who stated that:

"A popular approach to dealing with these uncertainties is to undertake a pilot project to test concepts and implementation issues. Pilot projects create working environments in which costs, technology, staff, and organisational impact can all be controlled... where failure (i.e. something not working as predicted) can be tolerated".

Generally however, the risks associated with any LIS implementation program can only realistically be managed on a project by project basis; as with the concepts of information value, the nature, extent and level of uncertainty will largely depend on the individual environment. Most approaches to minimising risks however include the development of strategies along the following lines:

- Identification and ranking in order of seriousness
- Analysis
- Response

Risk identification essentially involves drawing up a check list of all the possibilities that may affect the LIS investment, i.e. that prevent it from proceeding according to plan. It also appears prudent to identify, classify and rank the possible risks according to e.g. the different components of the LIS (data, hardware system, people and institutional) or according to the different stages of the development phases. In a literature review by Crosswell (1989) on the obstacles in GIS implementation, some interesting observations were noted which are summarised in Table 5.3.

An analysis of the individual risk component includes an assessment of their likely impact on e.g. costs, benefits, performance, etc. as well as an estimate of what countermeasures can be adopted, and their costs. Depending on the impact of risks, it may be necessary e.g. to modify the project objectives, to find alternative methods, technologies or means of managing the project. In essence, analysing the identified risks is a phase in which attempts are made to relate these to their sources and assessing their likely impact on the organisation.
TABLE 5.3: Obstacles in GIS Implementation (Adapted from Crosswell, 1989)

<table>
<thead>
<tr>
<th>Category</th>
<th>Obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apathy/Fear of Change</td>
<td>Apathy or fear of change, Too conservative/lack of innovation, Previous failure in information system development</td>
</tr>
<tr>
<td>Funding Availability or Justification</td>
<td>Benefits not well-quantified, Insufficient funding</td>
</tr>
<tr>
<td>Planning/Management support</td>
<td>Lack of management commitment, Inadequate high-level support or mandate, Lack of understanding by management, Lack of or inadequate implementation plan</td>
</tr>
<tr>
<td>Organizational Coordination and Conflicts</td>
<td>Inadequate coordination/communication among participants, Conflicts with main data processing organizations, Internal power struggles</td>
</tr>
<tr>
<td>Training/Understanding of Technology</td>
<td>Insensitivity to cultural/cognitive issues, Poor system documentation, Lack of trained staff or recruitment problems, Lack of understanding of technology</td>
</tr>
<tr>
<td>Data Communications and Networking</td>
<td>Data communication and networking problems, Hardware operation/communication problems</td>
</tr>
<tr>
<td>Data Structure and Source Materials</td>
<td>Problems in managing large databases, Problems in database design/data conversion, Database maintenance issues not addressed, Problems in quality or format of source data</td>
</tr>
<tr>
<td>Data and Software Standards/Data Integration</td>
<td>Data integration or inconsistency problems, No accepted standards for procedure or data</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Contract or performance problems with service vendors, Internal hardware/software procurement policies too rigid</td>
</tr>
</tbody>
</table>

Responses to the risks identified are strategy measures or plans for dealing with each potential risk. They provide a means by which potential problems or obstacles to progress can be avoided rather than being left to be dealt with at a later stage or when and if they occur. Lockyer and Gordon, (1996) summarise the response to risks as:

- Modify the project objectives
- Use alternative technologies or methods
- Use alternative ways of managing the project
- Increase managerial strength
- Reduce interdependency
- Increase resources
- Avoid obstacles by increasing flexibility
Although there are means of assessing and estimating the consequences of risks, these are beyond the context of this research. Risk management and assessment in LIS implementation have not received much attention in terms of their quantification in the literature essentially because of the variability of the factors of input, output and the possible environment.

5.9 A Conceptual National LIS Investment model.

Most of the approaches confront the LIS investment problem by classifying and elaborating upon the costs and benefits issues and assume that the existing conditions for implementing a system can be ignored. While the approaches reviewed above are among the commonly used options for assessing and presenting the results that can be anticipated, they seldom emphasise the existing information needs or deficiencies within a particular environment. More significantly, they overlook the issue of internal processes, i.e. the present efficiencies and effectiveness of an organisation, or whether the infrastructure capability exists for absorbing the impact of IT into existing working practices (the appropriateness of modern technology and methods) to the achievement of stated objectives.

In the present context, the main concern will be the monetary implications of inefficiencies and ineffectiveness in the management of land related information to the major internal users and the land markets. This thesis argues that if these 'losses' can quantified, it provides a useful indicator for determining how much should be invested in improving existing, albeit deficient, land information systems.

In this case study of Sabah, the benefits measurement of a modern cadastre based LIS will be linked to the improved 'outputs' and the 'improved processes' within the land information management environment. Some of the benefits include e.g. the increased efficiency in the recording and access to land related data, higher productivity of cadastral maps, the ability to generate newer or different varieties of maps within a shorter time period, higher response rates to queries relating for example to land transfers, subdivision or land development approvals, and other data management related tasks. Improved processes refer to e.g. the increased output rates of land titles within a shorter time
framework and hence, increase the possibilities for more land or property transactions. Moreover, improved information availability and accessibility may result in more effective or quicker decisions to be made since data are the essence of most decision making. Additionally, lengthy delays to the implementation of major development projects such as road construction also incur significant opportunity costs. An opportunity cost as defined by Lockyer and Gordon (1996, p.22) is “that which is sacrificed by choosing or failing to adopt a different course of action to that which is currently planned to be taken.”

The observation by Feder (1987) in Thailand that “the market value of titled land was shown to be significantly higher than that of untitled land of equal quality” merits attention. If, for example, the issuance of land titles with a LIS can be increased by 10 titles per month, and each has an average area of approximately 15 acres, then it is possible to estimate the ‘created wealth’ or the generated land value within that particular region or locality with the following analogy:

(i) estimate the difference in value between titled and untitled land in a particular locality; ideally, these should be determined by the appropriate authorities, e.g. government or professional valuers
(ii) and multiplying the estimated difference in value by the number of increased title outputs.

These computed land values are in essence, the minimum opportunity costs that may be forgone as a result of delaying land titles issuance. The key argument here is that land or property cannot be ‘formally traded’ in the economy unless and until property rights are defined in the form of land titles. The importance of efficient and effective cadastral systems for the poor in the developing world has been mentioned in influential publications such as the World Bank Development Reports (World Bank, 1989; UNCHS, 1996). As observed by Williamson (1995), one of the principal reasons for the resurgence of interest in land tenure, land titling, cadastral and land administration, and land management issues has been the increasing recognition that land tenure was a major constraint in projects undertaken by organisations, such as the World Bank.

For developing countries intending to invest in a national LIS that aspires to share data across all related agencies and ministries, it is essential that any investment be based on
the needs of the users at the local level and that they serve their specific needs and demands. The underpinning approach proposed is that a case for investing in a LIS can be made by analysing any inefficiencies and ineffectiveness within the existing land information management scenario. The investment level should be such that over time, it minimises any gap between the demand and supply of land informational products and services, or other consequential shortfalls resulting from existing non-optimal procedures or methodologies in the management of land related data.

Assuming that the present cadastre and land information management procedures have shortfalls in the provision of certain land information that results in e.g. the delay of certain end products or outputs such as land titles, replies to queries, etc., then it is desirable in the first instance, to monetarily quantify these ineffectiveness and inefficiencies. Figure 5.4 below attempts to depict this situation.

If the costs of existing infrastructures in land information management can be represented by a continuous curve $C_E$ and $B_E$ as the benefits curve, it can be seen that for all scenarios that are not optimal, i.e. where the costs and consequences are higher than the investment, there exists an inefficiency and ineffectiveness gap. This may be due to the duplication of efforts in information management at the various strategic, managerial and operational phases, or the consequences of delays or failure in coping with the market demand for the deliverables.

**FIGURE 5.4: Gap between existing benefits and costs due to Ineffectiveness and Inefficiencies in land information management (LIM) procedures.**
If on the other hand improvements in LIM are desired, then an immediate issue that must be addressed by governments in developing countries is determining the minimum or appropriate amount of investment. In assessing this expense, one criterion that should be taken into account as implied earlier, is the monetary value of the benefits foregone as a result of existing inefficiencies and ineffectiveness. Although other factors may be involved, e.g. the ability of the state to fund such initiatives, initiate changes, etc. any investment should be targeted towards meeting the needs of the present and eventual end users of the system. The implications of such a perspective necessitate an analysis of the following issues:

- Assessing the 'health' of the existing cadastre, i.e. identifying and estimating the variables contributing to existing shortfalls in land information management (LIM) procedures, and assessing the consequences of these ineffectiveness and inefficiencies, e.g. valuing the opportunity costs of non-marketable properties due to delayed land titles, delayed projects, expenses in time and effort in locating information, etc.

- Establishing linkages between the above variables and their sources. This may involve an examination of all current working methods, information flows, standard operating procedures, bureaucratic arrangements, etc. for their inefficiencies and ineffectiveness.

- Once the problem sources have been identified, their linkages determined and their internal and external consequences assessed, then it will be necessary to define requirements and possible modifications to existing processes in order to minimise them. This could imply reductions in bureaucratic steps, probable alteration to laws or standard operating procedures (SOP), requirements for effective information delivery, identifying levels of data access required against those that are currently available, etc. It will also be necessary to include costs and requirements for systems, data conversion, training of staff, etc. as discussed earlier in chapter four.

- Assessing the full benefits. The benefits include e.g. cost savings, avoided costs, impact on land markets such as the creation of more 'marketable or valuable' properties, reduced land related project delays with up to date and proper data; more effective
decision making in the areas of planning, municipal management, etc.; higher land revenue collection by reducing backlog in land revenues; better management of land related records, etc. These can be assessed by calculating the efficiency and effectiveness benefits, as well as indicating where possible, the intangible gains.

Essentially therefore, an optimum LIS investment level can be estimated not only by calculating the anticipated benefits from improving the way that land information is currently managed but also, by quantifying the consequences of existing ineffectiveness and inefficiencies. The following summarises the major procedural steps involved in estimating an optimum investment level:

• Quantify existing costs (C_e) and consequences of present inefficiencies and ineffectiveness (C_n) of current LIM procedures to the economy.

• Assess existing benefits (B_e) and evaluate the cost benefit ratio, i.e. \((C_e + C_n) : B_e\), which should be less than unity. In this research, the existing benefits will be assessed from the value of titled land, current income from land information revenues (e.g. land quit rents, licences, land premiums, etc.) and from services charged for the provision of quantifiable land informational products and services. However, some may escape quantification due to their nature of being public goods or the lack of supporting data.

• Estimate the possible cost range of the proposed system (C_LIS) at the desired levels, e.g. whether a single or multiple agency is proposed. In practice, the integration of information will depend on the willingness of the state to modify existing procedures in LIM (e.g. data and cost sharing) and the state’s ability to invest in a LIS. These however should be based on user needs, as mentioned earlier in chapter four.

• Estimate efficiency and effectiveness benefits at the proposed level (B_p).

• The optimum investment level will be achieved when the ‘inefficiency and ineffectiveness gap’ costs (C_n) are minimal, i.e. when the ratio of all costs \((C_e + C_n + C_{LIS})\) to the total benefits \((B_e + B_p)\) is equal to or less than unity.

However, for LIS benefits to be maximised, it is essential that any investment strategy takes into account the considerable albeit hidden, intangible costs, e.g. costs involved in initiative for reforms or ‘LIS institution building’ including e.g. the formation of specific committees to manage various managerial, technical, training, continuous evaluation
studies and other issues and challenges that will consequently emerge with the implementation of any change or reform. Within the area studied for this research, the investment can be considered to be optimal, if the present inefficiencies and ineffectiveness gap can be minimised, i.e. that there are no undue delays in the delivery of land informational products and services. This can be achievable under the following conditions:

\[(C_E + C_N) \leq (B_E + B_{\text{LIS}})\]

where

- \(C_E\) = Costs of existing LIM
- \(C_N\) = Costs of inefficiencies and ineffectiveness
- \(B_E\) = Benefits of existing LIM procedures (without LIS)
- \(B_{\text{LIS}}\) = Benefits with LIS or improved LIM procedures

Figure 5.5 below depicts a possible cost and benefit scenario before and after investments are made for a LIS. The shape of the benefit curve (B) can change depending on the LIS investment amount which in this case is assumed to begin at point a and time \(t_i\). The area represented by \(abcd\) represents the amount of investment on a modern LIS as well as in maintaining present activities. It can be expected that at the initial stages of the project, the overall costs of managing all land information management activities will increase while the benefits decrease. The gap between costs and benefits may also be widened because existing activities may be affected by e.g. the reallocation of staffs, training, etc. that will affect their informational outputs.

It is clear that from time \(t_i\) onwards, the benefits curve dips while the costs rise. Once the benefits begin to accrue and outweigh the total cost at point d, then the break-even phase has been surpassed by which time, the annual benefits should continually outweigh the costs; this is shown at point d in Figure 5.5. The step-like benefits curve below will be due to the varying stages of ‘critical mass’ (Nordic Kvantif, 1988) which is mainly influenced by the digital data conversion and its effective usage and diffusion.
However, it may not always be possible or necessary in practice to quantify all the benefits of existing land informational services or products provided by government. This may be due to the 'public good' nature of land information. Moreover, and particularly in developing countries, government agencies seldom measure the public performance of state agencies in terms of their benefit to society quantitatively.

Hence, the implication of the foregoing conceptual model to governments in developing countries is that before investments are made to upgrade present systems of LIM, some factors must be considered, e.g. the costs of maintaining present procedures, the financial consequences of prevailing ineffectiveness and inefficiencies, the anticipated benefits of these improvements, and particularly, the requirements for achieving the anticipated benefits. Any investment however should be driven by the need to minimise any gap in present demands and supply of land information, i.e. the inefficiencies and ineffectiveness gap. This amount however will depend on the individual countries, i.e. their capability, willingness, and whether the need to invest in a LIS infrastructure arises.
5.10 Conclusions

This chapter has examined the benefits of a LIS and some of the common methods of assessing them. It has also reviewed some common methodologies for comparing the costs and benefits, as well as an overview for assessing the viability of LIS in developing countries. Some aspects of risk management were also included, albeit with emphasis on the potential uncertainties involved in LIS implementation.

A central theme in this chapter is the proposition that while the means of assessing the costs, benefits or their comparison are important aspects in the LIS justification process, these are somewhat lacking because in general, most techniques are not based upon the informational demands of the users at the local level. In addition, these evaluation procedures do not consider the interaction or processes of the varying cadastral systems.

An investment methodology based upon minimising existing inefficiencies and ineffectiveness was proposed as a viable means for estimating the level of investment in a national LIS. While it is appreciated that the benefits of overcoming these shortcomings will be subjective to the user environment, this approach may be useful because it helps to focus the investment on real user needs and more significantly, considers the opportunity costs that may be implied as a result of existing shortfalls. The next chapter builds on this argument and applies it to the LIM scenario in the case study, i.e Sabah, Malaysia.
Chapter Six
Analysis of Existing Inefficiencies and Ineffectiveness In Sabah

6.1 Introduction

This chapter is an extension of the previous discussion, i.e. it applies the main ideas outlined earlier. An overview of the general process of land development procedures will also be covered as are the main tasks, procedures and problems in the existing land information system in Sabah, particularly from the perspective of the Sabah Lands and Surveys department (LS department). Its main emphasis however will be an estimation of the value of existing shortfalls in current land information management procedures in the area studied, i.e. Sabah.

6.2 Administration of Land in Sabah

The history of land management and administration in Sabah has been covered elsewhere, e.g. Cleary (1992), Jayasuriya (1989) and IDS (1991), and will not be repeated here. Briefly, the evolvement of laws and procedures governing land use and control in Sabah was affected by history (pre-1800s), the colonialism by the British (1881-1963), and more latterly, particularly in matters related to state revenue, by the formation of Malaysia in 1963. Under the Malaysia agreement, land was a state matter, which implied that for Sabah (and Sarawak), all matters regarding the management, regulation and cadastral surveys of land was under the purview of the state government. On the other hand, border surveys, triangulation, small-scale mapping and other matters of national interest, fall under the Federal Survey and Mapping Department.

The Sabah Land Ordinance Chapter (Cap) 68 provides the framework for land policy in Sabah. It is a Torrens based system of land registration whose evolvement in 1849 from the island of Labuan (now Federal Territory) off the East coast of Sabah may have a historic significance, as noted by Ibrahim and Sihombing (1989, p.1):
"In 1849 the Ordinance to provide for the Registration of Titles to Land (Labuan) was enacted. In 1858 the Real Property Act (South Australia) introduced what became known as the Torrens system of title to land by registration. In 1854 the Merchant Shipping Act (UK) had been passed. From the late 1850s Hubbe, a German lawyer, had assisted Torrens in the compilation of the provisions of what became the Real Property Act. Hubbe was an expert on the Hanseatic system of title to interests in land by registration. All these threads were pertinent to the Torrens system. Questions have remained long unanswered. Was it really Hubbe's system based on the Hanseatic Codes? Did Torrens copy it from the Labuan legislation? Was it based on the Merchant Shipping legislation? Whatever the answers, we continue to call it the 'Torrens' System."

The present context however will concentrate on the Lands and Surveys (LS) department, which has the responsibility of managing and administering all land related matters in the state, including its distribution, collection of land taxes, provision of land related information (e.g. land use maps, cadastral plans, topographic maps, etc.), and other functions normally associated with the cadastre. Hence, the department has a large responsibility in aiding all land related development as well as supporting modern land market system.

6.2.1 Land Information Products and Services provided of the LS Department

As the leading authority in all matters related to land and as an instrument of past and present state governments in implementing and executing their land policies and other socio-economic development and objectives, one of the main concern of the LS department at present continues to be the distribution of land to the land-less natives and supporting the land market infrastructure.

This policy was originally instituted for raising revenues from land taxes during the days of the British North Borneo Chartered Company and the British Colonial era (Tregonning, 1958) but gained momentum in the mid 1970s. The focus has since shifted to that of aiding natives with uneconomic land holdings, and the alienation of land for agriculture and more latterly, industrial based development purposes (LS department, 1994). Settlement is used here to mean state aided commodification of rights in land or property rights via the issuance of land titles to allow land to be transacted legally, regulated within the land markets economy as well as a means to reduce poverty via the
promotion of land ownership. From the State’s perspectives, land titles also provide the means for collecting state revenue by the imposition of taxes.

Based on the historical roles of the department as well as the continuation of government policies in alienating, regulating and controlling the use of land in Sabah, it therefore follows that core functions of the department support the infrastructure in achieving these aims. More specifically, its main responsibilities include inter alia, the alienation of state land, implementation of smallholder schemes, cadastral surveys of applications for land, subdivision, re-surveys, maintenance of control surveys, land registration, land valuation, land development monitoring or enforcement, international boundary surveys, mapping and aerial photography, as well as the maintenance and issuance of prospecting permits or licences of mining and quarry leases. There are many sections within the LS department but for simplification purposes, these can be divided into eight main categories as shown in Table 6.1 below.

Most of the functions mentioned above occur at the LS department headquarters in the state capital at Kota Kinabalu. In practice, all land registers, apart from the registration of native titles, field and temporary occupational licenses are kept at the Central Land Office in Kota Kinabalu, the State capital. The registers here are under the charge of the Registrar, while the native, field and temporary occupational leases are under the charge of the Assistant Collectors of Land Revenue. However, of equal importance are the supporting roles of the land offices at the various districts which are the initial point for all applications of land related development (e.g. change of use or tenure) in the state. Figure 6.1 outlines the main functions of the department at the district level and classifies the outputs in terms of products and services, as well as the informational elements required in performing their daily tasks and responsibilities.
### TABLE 6.1: Main Sections and Functions of the Sabah LS department.

<table>
<thead>
<tr>
<th>SECTION</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Administration</td>
<td>Personnel matters, finance, administration and security</td>
</tr>
<tr>
<td>Land Administration Section</td>
<td>Ensuring the optimum use of State land assets, implementation of government policies and land titles conversion, draft Titles preparation, updating of land related data to the Land Data Bank maintained by the State Computing Services Department, overseeing, aiding and inspecting other district land offices, recovery of land rent arrears, maintenance of revenue collection and processing all dockets of land enquiries from title holders</td>
</tr>
<tr>
<td>ACLR</td>
<td>Largely related to land administration but at the district level. (Table 6.2 refers)</td>
</tr>
<tr>
<td>Land Registration Section</td>
<td>Managing registration and maintenance of land ownership records, titles and/or transactions in land, guarding security of tenure and documents transaction.</td>
</tr>
<tr>
<td>Valuation Section</td>
<td>Assessment of land premium or rents, providing the executive framework for land acquisition, rent reviews, land or building management, rating works, and valuation services to state or federal agencies</td>
</tr>
<tr>
<td>Land Development and Planning Section</td>
<td>Implementation of pre-planned smallholder schemes, providing advice on other large land schemes, maintenance of town planning records, maintenance and compilation of monthly and yearly statistics of the LS department throughout Sabah</td>
</tr>
<tr>
<td>Land Enforcement Unit</td>
<td>Ensuring the compliance of land owners on terms and conditions of titles, and for initiating appropriate actions on defaulters</td>
</tr>
<tr>
<td>Training School</td>
<td>Training of new staffs in cadastral map and plan checking, drafting, cadastral surveys, photogrammetry, engineering surveys, and the preparation of departmental exams</td>
</tr>
</tbody>
</table>

However, the administration of land matters in Sabah is somewhat unique because of the varying organisational arrangement and background of the officers involved. In seven of the 23 districts in Sabah, officers of the LS department, i.e. with land surveying degrees, are employed as sectional heads in administering land matters. Generally they can be classified into two categories; both are designated District Surveyors (DS) but one assumes the specific role of managing cadastral surveys of approved LAs, while the other assumes the wider and varying roles of the Assistant Collectors of Land Revenue (ACLR), set out in Table 6.2 below.

In the other district Land Offices, responsibilities for managing land related matters are managed by administrators from the state’s Chief Minister’s Department. In these offices, the functions of the ACLR are assumed by the District Officers (DO) or their immediate
assistants (ADO). As opposed to the DS who are under the employment of the Director of the LS department, DOs and ADOs fall under the State’s administrative pool of staffs who are not technically experienced in the technical aspects of managing land related information. This has created debate among the state’s policy makers as to the appropriateness of this inherited arrangement of delegating land related tasks to officers of varying background (Kitingan, 1981; Riman, 1992; IDS, 1992)

TABLE 6.2: Table showing the main Functions, Outputs and Land Informational requirements of the District Lands Offices (Source: Various Lands & Surveys Department Loose Notes)

<table>
<thead>
<tr>
<th>Functions</th>
<th>Output Products (P) and Services (S)</th>
<th>Land Informational Requirement prior to providing output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roles of the District Surveyor as ACLR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administering and Enforcing Land Ordinance Cap. 68 and other ordinances and government policies</td>
<td>All below</td>
<td>All below</td>
</tr>
<tr>
<td>Registration and Processing of Land Application (LA)</td>
<td>Receipts</td>
<td>Register of all LAs</td>
</tr>
<tr>
<td>Implementation of smallholders and pre-planned schemes</td>
<td>Land Titles</td>
<td>Status on land availability and applicants’ qualification and suitability to develop land</td>
</tr>
<tr>
<td>Subdivision of land in rural areas</td>
<td>Issuance of new land titles</td>
<td>As above but only for areas outside the planning scheme, i.e. rural areas. If within planning scheme, requires approval by local authority. Acceptance of old titles, issue to a private surveyor nominated by lessee.</td>
</tr>
<tr>
<td>Registration of all new Native Titles (NT), Field Registers (FR) and Land Dealings</td>
<td>As above and necessary amendments</td>
<td>Preparation of draft titles authorised by LS director and payment of e.g. charges, signature and attestation.</td>
</tr>
<tr>
<td>Land Enforcement of stipulated development in land.</td>
<td>Action on extension of lease, land use or notice of demand</td>
<td>Information on existing condition of titles, e.g. charges, sub-leases, etc. depending on individual enquiry.</td>
</tr>
<tr>
<td>Processing and holding land enquiries</td>
<td>Decisions in form of rulings, e.g. succession, Native Customary Rights (NCR), rights of way.</td>
<td>All spatially related data (e.g. shares) and information recorded regarding individual cases.</td>
</tr>
</tbody>
</table>
breach of title conditions, granting and lifting of caveats, title rectification, title replacements, boundary disputes, notices of demand/sales, subdivisions, etc.

<table>
<thead>
<tr>
<th>Service Description</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Revenue collection and issuance of notices of demand</td>
<td>Receipts and notices</td>
</tr>
<tr>
<td>Services of notices</td>
<td>Notice to affected parties, advertisement costs.</td>
</tr>
<tr>
<td>Supervising land office staffs and disciplinary actions</td>
<td>Ensuring that balance of daily revenue collection closes</td>
</tr>
<tr>
<td>Land Acquisition</td>
<td>Resumption or gazetting of land on behalf of Government.</td>
</tr>
<tr>
<td>Processing Applications for subsidiary Titles.</td>
<td>Strata Titles</td>
</tr>
</tbody>
</table>

Status of quit rent payments on land, mining permits, licenses (minerals and birds nests), fees or renewals of TOL, prior evidences of dealings in land. Records of affected land, order by Governor and publication in Official State Gazette. Management Corporations input on building conditions, boundaries, occupation certificates, land rents, etc.

From Tables 6.1 and 6.2 above, it is clear that the ACLR and DS require complete and up to date land information records as a necessity in dealing with or processing all land related development applications. Cadastre based data are essential in almost all of their work procedures without which actions cannot be taken or development programs may be halted. It is also noteworthy that apart from the approvals of land applications below 15 acres, the final outputs, i.e. in the form of land titles, are not produced at the local level. Most of the essential printing work including draft titles preparation, printing, etc. is carried out at the LS department headquarters.

However, while the emphasis above is on the role of spatially related data, the scenario defines only the major tasks that are handled by the DS and ACLR; it does not depict for example, the specific individual tasks involved in the processes and mechanisms involved in land application or the titling process. This is discussed in the next section.

### 6.3 Current Process of Applying Land in Sabah

According to an IDS study (1991, p.68), the state’s “land alienation policy is very liberal and allows piecemeal application from any individual or company, anywhere anytime”.

Hence, any adult whether Malaysian or foreigner with local connections is eligible to apply for available state land. The LS department plays a central and pivotal role not only in registering these applications but also, in vetting each individual application and approving agriculture related land development applications that are less than 50 acres. Within this context, the roles of the department can be summarised into the following:

- Recordation, checking and processing of all applications for State Land.
- Amendment of terms to existing titles
- Collection of land revenue
- Land enquiries
- Quasi-judicial roles in the settlement of disputes
- Provision of cadastral and topographic maps and spatially related information.

Government related agencies and statutory bodies in Sabah can acquire land by orders from the State Governor, as provided for principally in the Land Acquisition Ordinance (Cap. 69), as well as the reservation of land for 'any public purpose or for a residential reserve' (Land Ordinance, Cap. 68, Section 28). To the public, i.e. individuals or companies, the land application process begins at the district concerned where all LAs must be submitted to the ACLR who registers and allocates a registration number upon the payment of a nominal registration fee. The procedure is shown in Figure 6.1 which is based on loose materials from the LS department.
FIGURE 6.1: Procedure of Land Applications for all Purposes (Source: Lands and Surveys Department, 1995)

Applicant L.A.
LSF. 1001

Non-agricultural
If unavailable

Agriculture
If not available

District Surveyor

ACLRL

Pre-planned
Areas (up to
15 acres)

Land Utilisation
Working Comm. (LUWC)

(Fix terms
for Non-
agricultural
Use, else
standard)

Senior Valuer

For agriculture under 50 acres

For all LAs:
- Non-agricultural use
- Area over 50 acres
for timber extraction.

Offer

Secretary of
Natural Resources

Chief
Minister

Applicant

LS Director

ACLRL

Offer

Applicant

Potential Delay
For agricultural purpose applications, the Land Utilisation Working Committee (LUWC) is the highest authority at the district or local level. The committee, which comprises government departments, uses the data holdings for processing all applications for land development. For native applications below 15 acres, the District Surveyor or ACLR has the authority to approve requests for titles. However other applications by individuals, groups or companies for land that exceed 15 acres are recommended by the LUWC to the Director of the LS department, who can approve requests for land below 50 acres in area; applications beyond this limit require the approval of the Secretary of Natural Resources, which is under the Chief Minister’s Department. On attaining approval, the land applied for must be surveyed and for large area applications, i.e. more than 15 acres, private surveyors are usually employed by the applicants themselves or contracted out to Licensed Private Surveyors (LLS). The final products, i.e. land titles, are only issued after preparation in the head office of the department, and are subsequently distributed from the districts concerned.

As the flow diagram in Figure 6.1 shows, there are many bureaucratic hurdles involved in the process of land applications or requests for land development. This however is somewhat generalised and does not show the details of administrative procedures because in practice, many land informational data or requirements are checked, verified and involve varying sections within the LS department. In addition, the requirement for comments from other state or federal departments who are custodians of specific spatial data sets (e.g. soil types, zoning areas, road alignments, etc.) also contribute to the process involved in approving land applications.

The fact that more than one department is involved implies that these departments must physically examine and comment on individual applications pertaining to the land concerned before decisions can be made. Hence, exchange of the relevant files among the departments involved is therefore necessary at this early stage. Although the average waiting period for a land title at present is approximately one and a half to two years, applications where boundary disputes exist may be delayed longer. From the author’s working experience as well as from observations and discussions with senior officers of the department, some land applications dated in the late sixties and seventies are still awaiting approval. Such delays are at a cost not only to the economy but also, to the individual land owners who need to maintain some evidence of occupation and other
forms of land use in the occupied land in order to preserve their native customary rights (NCR).

Once approvals are granted, the next sequence involves the demarcation or cadastral surveys of land. The process leading to the preparation and registration of titles is shown in Figure 6.2 below, albeit generally because it is similar to the previous diagram. It does not show the individual operational tasks involved in the preparation of land titles such as how they are finally prepared, drafted and formalised. However, the main emphasis is the number of steps involved from the initiation of development requests (Figure 6.1), through to the cadastral surveying processes leading to the final land titles.

Until the mid-eighties, most cadastral surveys of native LAs were carried out by the LS department. Pressure on the government to expedite land distribution, formalisation and the consequent increased workload to the LS department have necessitated the privatisation of surveys to the Private Licensed Land Surveyors (LLS). Because of this increased role of LLS in title surveys and their effects to the workload of the department, a brief review of their mode of operation merits discussion.

**6.3.1 Licensed Land Surveyors (LLS) in Sabah**

The Surveyors Ordinance was enacted in 1960 to provide for the registration, licensing and control of the land surveying profession in Sabah and was enforced the following year. A Surveyor Board was formed for this purpose with the Director of the Lands and Surveys Department as the Chairman. Under this ruling, all cadastral surveys undertaken by LLS in Sabah must obtain approvals from the LS department in the form of Registered Survey Papers (RSP), as well as the “express sanction” of the District Surveyors (DS) for the areas in which the surveys will be carried out (Sabah Board of Surveyors, 1989).
FIGURE 6.2: Cadastral Surveys procedure for Approved Applications (Lands and Surveys, 1995).

---

1 Land Data Bank, which is a database containing records of parcel details and mainly used for monitoring land quit rents and other revenues. Data are updated on disks and sent to the State’s Computing Service Dept.
For title surveys, client fees, collected by the LLS, must be deposited with the Board who retain five per cent for administrative purposes. The current payment arrangements are that up to 60 per cent of the fees may be claimed on completion of the field work and another 25 per cent upon deposition of survey plans and field books to the Lands Office concerned. The balance of 15 per cent is paid “either within a period of twelve months from the date of such deposit or after the survey plan has been approved by the Director of Lands and Surveys” (Sabah Board of Surveyors, 1989, p. 30). As observed by the present Secretary of the Board (Gangadharan, 1996) however, it is more common for LLS to claim 85 per cent of the fees, i.e. upon the deposition of cadastral survey outputs to the LS department. In 1995, there were 95 registered LLS in Sabah but only 24 were practising with 16 being locals.

In the privatisation of cadastral surveys, the LLS are responsible for executing the field work involved but the certification of their outputs, i.e. the checking of draft cadastral plots and field books rests with the LS department. Hence, the staff of the department are involved not only in verifying their own internal cadastral surveys but also, for the products of the LLS. This sequence is noteworthy because no payments of any sort are charged to the Private Surveyors for this service.

The role of the Sabah Surveyors Board is totally detached from the Sabah LS department and viewed in this perspective, the Board’s main function is as the guarantor to protect the interests of the land owner whereby survey fees are lodged with the Board which on approval of their surveys and plans, are reimbursed to the LLS.

6.3.2 Applications for Land Development

All suitable land for housing requires conversion in title status before any form of development can occur. This seemingly straightforward process however requires approval from one of the highest authority in the State, i.e. the Chief Minister’s Secretary of Natural Resources, as shown in Figure 6.3 below. The conversion of land titles in Sabah can broadly be categorised into the following (Lands and Surveys, 1995):
• Native titles (NT) into Country Leases (CL) for agriculture outside planning areas.
• NT into CL/Town Lease (TL) for non-agricultural purposes within planning areas.
• Agricultural land under CL into non-agricultural purposes
• Applications from a non-agricultural purpose to another
• CL to NT.

From the perspectives of the land owner and developer however, it is a lengthy, time consuming and expensive process. At the final stages of any housing development, the issuance of sub-divided and subsidiary titles which are equally as important as land titles
have also been voiced as a long process even though a time-frame of 18 months has been set by the LS department for the issuance of subdivided titles under normal circumstances (Sham, 1996).

Essentially therefore, all land owners of titled land intending to convert their land use must go through the process shown in Figure 6.3 above, which is quite bureaucratic, inflexible and normally takes at least two years or more, to attain approval. Various government agencies must be consulted in the planning process and each necessitates the physical transfer, examination and comments on the individual land applications, which is similar with the land application process.

The present procedures and mechanisms in land development evolved from the colonial days when there was probably greater need for control and monitoring of all land related development projects in order to ensure that authority was preserved at the centre of government. However, such procedures are outdated in current times where the emphasis has shifted to the promotion of a land market where the supply and demand side of the economy requires a certain degree of freedom and flexibility. In the case of land and the cadastre, this implies the existence of a cadastral system whereby rights in land could ideally be transacted, i.e. sold, leased, rented and transferred, effectively, simply and at low cost.

The present state of the existing mechanisms of the land system and processes in Sabah however falls short of this ideal and is probably more suited to the past, rather than responsive to meet the needs of the present and the future. From the perspective of the LS department, the need to provide a certain level of output, services and consistency in the management of land information is therefore compromised; the higher delivery of survey outputs from the LLS has only served to increase the gap between the expectation of the public or private sectors, and their demands. Consequently, the shortfall in the outputs of the LS department is now a somewhat accepted occurrence albeit viewed unfavourably by most quarters in the State.

However, the importance of delays cannot be under estimated because as observed by Nichols (1993), the length of time taken to effect or validate a land transaction directly influences the financing, investment and development of land. Some consequential effects
are the various work backlogs which usually mean delayed or frozen land development projects. The next section identifies the major consequences of the present process of the Sabah land system from the perspective of the LS department. In particular, it will focus on the delayed land titles and other related outputs of products and services expected of the department.

6.4 An Analysis of the Major Backlog Issues in the Land Titling Process in Sabah

To date, no studies have been carried out to analyse the effects, significance and consequences of existing inefficiencies and ineffectiveness of land information management procedures in Sabah, nor have the costs to the economy been quantified. This is observed in the following.

As implied earlier, history plays a large part in contributing to the present state of bureaucratic affairs in the management of land in Sabah. Although the land laws formulated by the British North Borneo Chartered Company (BNBCC) were fairly protective of the natives, the consequences of the rigidity or inflexibility of these mechanisms in the commodification of land in Sabah have been felt since their implementation in the late 1900s and early this century (Tregonning, 1958). They did not anticipate or were ill-equipped for example, in the provision of supporting institutional infrastructure and staff required to support the cadastral work and the land information management process necessary to support their revenue generation aims via the introduction of land titling. Laws that were instituted were also bureaucratic and more significantly, were not conducive to the evolvement of a land market that is responsive, flexible, effective and adaptable to meet the needs of the users. The most noteworthy legacy of the past however has to be the fact that most of these sets of ‘land laws and rules’ have survived the passage of time and are still in general, in force today albeit under a different economic, social and political environment.

Until the late 1930s for example, arrears in land Quit Rent collections averaged around 27% of the amount due while for land surveying work, the average waiting period for definitive (country) leases and Native Titles was approximately four years and two and a
half years respectively (1930s Annual Reports of the Land Offices obtained from the Sabah State Archives). By 1964, the LS department had rent rolls arrears amounting to 40.8% from the total revenue (close to 3.5 million dollars then) with expenditures at over 2 million for personal emoluments and annually recurrent charges.

At present, the department is a revenue making agency for the state government and between the period of 1988 to 1995, the average land revenue (mainly land taxes) collected yearly is approximately MR 74 million (Lands and Survey, 1994) with arrears however, still averaging at 40%. This income contributed to about 7-8% of the total state revenue for the same period.

The consequences of the highly centralised nature of the land development process, the inflexible but inherited system of operations and land laws regulating land usage, the government policy of distributing land and the demands of the modern land markets have consequently resulted in increased work pressure on the LS department to perform.

The following attempts to explore the major work backlogs, i.e. primarily the ineffectiveness, of land information management in Sabah. The statistics have been compiled from internal statistics records of the LS department and although these are confidential, their inclusion in this thesis is necessary in order to appreciate the magnitude of the consequences of existing land information management procedures.

### 6.4.1 Land Application Backlogs - ACLR Offices

Land Application (LA) backlogs in the state are the most well-known work backlogs within the Sabah LS department and can broadly be categorised into two, i.e. those that are handled by the Assistant Collectors of Land Revenue (ACLR) and the District Surveyor (DS). The former refers to the initial stages of LAs by applicants who have yet to obtain approval from the LS department. These usually have to pass through the various other departments as shown in Figure 6.1 for their comments on suitability, availability, etc. Based on past as well as the latest LS department (1996) statistics record, the LA backlogs are tabulated in Table 6.3 below.
From the headings highlighted in Table 6.3 above, it is clear that there are many forms of backlog from the office of the ACLR. However, the main concern in this thesis will be the backlogs in LA and title registration as these involve untitled land; the backlogs in land dealings, enquiry and demand notices involve land that are already titled with documented ownership. Their inclusion above is intended to represent the range of other tasks under the jurisdiction of the ACLR in the 23 districts throughout Sabah, as reviewed in Table 6.2 earlier.

The backlogs in land applications above refer to the applications for land that have not been approved, i.e. those that are uncertain in terms of suitability, checked for overlapping claims or land applications awaiting comments from other departments, etc. It can be seen that with 118,821 outstanding LAs up to the period 1995, there is a substantial amount of potential land awaiting approval and possible subsequent cadastral survey.

### TABLE 6.3: Sabah State wide Backlogs Reported by ACLR (Source: LS department Annual Statistic Reports)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Received</td>
<td>29,782</td>
<td>19,603</td>
<td>20,495</td>
<td>20,253</td>
</tr>
<tr>
<td>Processed/Submitted to HQ</td>
<td>11,839</td>
<td>8,454</td>
<td>11,274</td>
<td>10,063</td>
</tr>
<tr>
<td>Approved</td>
<td>2,342</td>
<td>1,041</td>
<td>1,080</td>
<td>1,301</td>
</tr>
<tr>
<td>Cancelled</td>
<td>7,968</td>
<td>10,124</td>
<td>8,268</td>
<td>5,541</td>
</tr>
<tr>
<td>Balance Outstanding</td>
<td>118,821</td>
<td>111,068</td>
<td>110,159</td>
<td>100,666</td>
</tr>
<tr>
<td>Registration of Title</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brought Forward</td>
<td>3,244</td>
<td>2,712</td>
<td>2,365</td>
<td>2,371</td>
</tr>
<tr>
<td>Received</td>
<td>3,025</td>
<td>4,207</td>
<td>3,121</td>
<td>2,659</td>
</tr>
<tr>
<td>Registered</td>
<td>2,463</td>
<td>2,957</td>
<td>2,322</td>
<td>1,893</td>
</tr>
<tr>
<td>Registered &amp; returned to Dir.*</td>
<td>619</td>
<td>735</td>
<td>500</td>
<td>664</td>
</tr>
<tr>
<td>Balance Outstanding</td>
<td>3,146</td>
<td>3,227</td>
<td>2,712</td>
<td>2,259</td>
</tr>
<tr>
<td>Reg. of Land Dealing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brought Forward</td>
<td>225</td>
<td>175</td>
<td>167</td>
<td>196</td>
</tr>
<tr>
<td>Received</td>
<td>12,952</td>
<td>11,000</td>
<td>11,219</td>
<td>10,503</td>
</tr>
<tr>
<td>Registered</td>
<td>12,993</td>
<td>11,005</td>
<td>11,260</td>
<td>10,627</td>
</tr>
<tr>
<td>Balance Outstanding</td>
<td>191</td>
<td>225</td>
<td>166</td>
<td>173</td>
</tr>
<tr>
<td>Land Enquiry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brought Forward</td>
<td>3,018</td>
<td>3,063</td>
<td>2,578</td>
<td>2,564</td>
</tr>
<tr>
<td>Received</td>
<td>1,759</td>
<td>1,979</td>
<td>2,642</td>
<td>2,162</td>
</tr>
<tr>
<td>Held/Cancelled</td>
<td>1,926</td>
<td>2,011</td>
<td>2,180</td>
<td>1,336</td>
</tr>
<tr>
<td>Balance Outstanding</td>
<td>2,841</td>
<td>3,018</td>
<td>3,039</td>
<td>2,603</td>
</tr>
<tr>
<td>Notice of Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brought Forward</td>
<td>867</td>
<td>949</td>
<td>3,067</td>
<td>3,445</td>
</tr>
<tr>
<td>No. Served</td>
<td>476</td>
<td>85</td>
<td>594</td>
<td>1,089</td>
</tr>
<tr>
<td>No Cancelled</td>
<td>55</td>
<td>82</td>
<td>1,253</td>
<td>2,408</td>
</tr>
<tr>
<td>Balance Outstanding</td>
<td>793</td>
<td>876</td>
<td>784</td>
<td>3,158</td>
</tr>
</tbody>
</table>

* Approved and returned to LS department Dir.
As mentioned earlier, all titles including draft native titles (NT) are prepared at the LS department HQ but are registered at the respective district land offices in which the land is located. The district land offices retain a copy of all NT in their ‘strong rooms’ after registration in the NT register of titles. One contributing reason for this backlog is the lack of an effective addressing system in the State. It was observed during the research attachment for example, that the department faced difficulties in contacting the applicants; in other instances, the time that has elapsed since the initial land application, cadastral surveying or the printing of draft titles has simply been too long and has outlived the lives of the applicant themselves. It is not uncommon in Sabah for a LA to be ‘handed down’ to the applicants’ offspring who continue to pursue their parents’ application for a particular piece of land.

Leases on the other hand, are registered after the relevant documents on terms and conditions have been approved and signed by both parties at the department’s headquarters. Delays where they arise can generally be attributed to disagreements on e.g. the terms set or conditions implied that may consequently require further negotiations.

### 6.4.2 Backlogs of Cadastral Surveys - DS Offices

Another significant backlog involves applications for land that have already attained consent from the LS department but are awaiting cadastral surveys and subsequent titling. Before expanding on this issue, it is useful to review the different categories of land titles in Sabah which include the following:

- **Native Titles (NT)** - A NT means the “entry in the District Register of Native Titles registering the title of a native to a surveyed or demarcated parcel of land. No non-native may become the registered owner of a Native Title” (Lands and Surveys Annual Report, 1959)
- **Country Leases (CL)** - A Country Lease refers to the lease of State Land usually for a fixed number of years (99 or 60 years) and used for the purpose of agriculture. In Sabah, these are mainly owned by non-natives, companies or developers.
• Temporary Occupational Leases (TOL) - These are usually meant for the extraction of timber.

• Field Registers (FR) - According to the 1959 LS department (State Archives, 1996) report, this refers to “the entry in the District Field Register registering the right of a native to a parcel of land which has either not been surveyed or has only been very imperfectly surveyed”. Upon the demarcation of his land described in the Field Register, its owner is required to exchange his Field Register for a Native Title.

• Provisional Lease (PL) - Provisional leases on registration are approved by the Director, either without survey of the alienated land concerned or on the basis of a rough and ready low grade demarcation.

Currently, there are three main forms of title registered by the LS department, i.e. NTs, CLs, and TOLs. The number of LAs awaiting surveys from the government cadastral surveyors and the LLS are shown in Table 6.4 below.

<table>
<thead>
<tr>
<th>TABLE 6.4: Backlogs of Cadastral Surveys in Sabah (Source: LS department Annual Statistic Reports)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LAs Received</strong></td>
</tr>
<tr>
<td>NT</td>
</tr>
<tr>
<td>CL</td>
</tr>
<tr>
<td>TOL</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Surveyed by LLS</strong></td>
</tr>
<tr>
<td>NT</td>
</tr>
<tr>
<td>CL</td>
</tr>
<tr>
<td>TOL</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>Surveyed by Department</strong></td>
</tr>
<tr>
<td>NT</td>
</tr>
<tr>
<td>CL</td>
</tr>
<tr>
<td>TOL</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td><strong>LAs Outstanding</strong></td>
</tr>
<tr>
<td>NT</td>
</tr>
<tr>
<td>CL</td>
</tr>
<tr>
<td>TOL</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

As mentioned earlier, the increased role of LLS in undertaking cadastral surveys is mainly due to the importance attached by the State government on land titling as part of its policy to address poverty among the local populace. From the above, it can be seen that if the average land applications approved for cadastral surveys is currently around 2,000 per
year with the output at around twice this figure, the possibility of reducing the cadastral survey backlogs which stood at 12,174 at the end of 1995 appears to be achievable in 6 years, assuming other things remain equal, e.g. the current approved LAs remain consistent or decrease in the future, or that the state can afford to contract out its cadastral surveying obligations. However, it should also be stated that there is potentially more cadastral survey work for the LS department, if the backlog of LA is considered.

Alternatively, if the state has the means to continually contract out surveys to the private sector, this particular backlog may be tackled in the short term. The LS department currently has about 80 survey teams specifically assigned for executing cadastral surveys in the State (Land Survey department statistic 1995). Their output however is constrained by the use of labour intensive techniques in executing cadastral survey work, in particular the ongoing use of chains for measuring distances, the high requirement of cadastral surveys, as well as the stringent checking performed on the cadastral data. The inhospitable and arduous environment of cadastral surveying in an equatorial or tropical environment as mentioned by MacDonald (1996) also slows down the operation.

There is no official estimate for the size of an average land parcel held under the various land titles in Sabah. Generally however, NT refer to lands that are under 15 acres in size while CLs which are usually leased for larger scale plantations such as for cocoa and palm oil normally exceed 50 acres. As mentioned earlier, this is the maximum size of land that can be approved by the Director of Lands and Surveys; others require the approval of the Chief Minister’s department. TOL are large areas (usually exceeding one hundred acres) and normally alienated to Registered Companies for the purpose of timber extraction.

### 6.4.3 Backlogs in Cadastral Plan Checking

All completed cadastral survey plots executed by both the government and private surveyors are checked against certain criteria as shown in Appendix C (Checklist). This aspect of the land titling process however also suffers from a work backlog in the State, as the following statistics in Table 6.5 illustrates. Government surveys are documented in
files called Survey Papers (SP) while surveys executed by LLS are filed in Private Survey Papers (RSP).

**TABLE 6.5: Backlog of Surveys and Plan Checking (Source: LS department Annual Statistic Reports)**

<table>
<thead>
<tr>
<th></th>
<th>1995</th>
<th></th>
<th>1994</th>
<th></th>
<th>1993</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Received SP’s</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>680</td>
<td>578</td>
<td>860</td>
<td>829</td>
<td>728</td>
<td>903</td>
</tr>
<tr>
<td>Plans</td>
<td>841</td>
<td>787</td>
<td>1,094</td>
<td>925</td>
<td>996</td>
<td>1,159</td>
</tr>
<tr>
<td>Parcel Lots</td>
<td>2,347</td>
<td>7,071</td>
<td>3,799</td>
<td>9,480</td>
<td>2,608</td>
<td>10,528</td>
</tr>
<tr>
<td>Area (Ha.)</td>
<td>577.86</td>
<td>2,693.98</td>
<td>1,234.61</td>
<td>17,382.89</td>
<td>1,968.43</td>
<td>46,497.23</td>
</tr>
<tr>
<td><strong>Checking Completed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>822</td>
<td>626</td>
<td>938</td>
<td>791</td>
<td>828</td>
<td>1,014</td>
</tr>
<tr>
<td>Plans</td>
<td>981</td>
<td>807</td>
<td>1,148</td>
<td>1,018</td>
<td>1,198</td>
<td>1,419</td>
</tr>
<tr>
<td>Parcel Lots</td>
<td>2,515</td>
<td>7,293</td>
<td>3,262</td>
<td>9,229</td>
<td>3,992</td>
<td>9,563</td>
</tr>
<tr>
<td>Area (Ha)</td>
<td>8,685.68</td>
<td>49,177.81</td>
<td>12,019.62</td>
<td>78,684.97</td>
<td>9,664.69</td>
<td>180,868.17</td>
</tr>
<tr>
<td><strong>Under Query</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>512</td>
<td>422</td>
<td>423</td>
<td>120</td>
<td>394</td>
<td>143</td>
</tr>
<tr>
<td>Plans</td>
<td>638</td>
<td>560</td>
<td>523</td>
<td>208</td>
<td>471</td>
<td>236</td>
</tr>
<tr>
<td>Parcel Lots</td>
<td>3,105</td>
<td>3,561</td>
<td>1,444</td>
<td>3,814</td>
<td>1,128</td>
<td>1,639</td>
</tr>
<tr>
<td>Area (Ha)</td>
<td>14,650</td>
<td>1,359.45</td>
<td>212.46</td>
<td>759.91</td>
<td>56.35</td>
<td>26,053.77</td>
</tr>
<tr>
<td><strong>Approved</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>570</td>
<td>470</td>
<td>707</td>
<td>795</td>
<td>614</td>
<td>869</td>
</tr>
<tr>
<td>Plans</td>
<td>691</td>
<td>576</td>
<td>833</td>
<td>1,008</td>
<td>801</td>
<td>1,157</td>
</tr>
<tr>
<td>Parcel Lots</td>
<td>2,546</td>
<td>5,664</td>
<td>2,042</td>
<td>8,340</td>
<td>2,803</td>
<td>8,495</td>
</tr>
<tr>
<td>Area (Ha.)</td>
<td>5,925.43</td>
<td>39,694.34</td>
<td>6,286.17</td>
<td>70,419.27</td>
<td>27,244.25</td>
<td>89,032.58</td>
</tr>
<tr>
<td><strong>Outstanding</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>1,805</td>
<td>549</td>
<td>1,752</td>
<td>513</td>
<td>1,800</td>
<td>659</td>
</tr>
<tr>
<td>Plans</td>
<td>2,614</td>
<td>931</td>
<td>2,661</td>
<td>830</td>
<td>2,612</td>
<td>992</td>
</tr>
<tr>
<td>Parcel Lots</td>
<td>8,717</td>
<td>6,140</td>
<td>11,007</td>
<td>6,989</td>
<td>9,512</td>
<td>9,280</td>
</tr>
<tr>
<td>Area (Ha.)</td>
<td>761.65</td>
<td>832.08</td>
<td>5,196.32</td>
<td>10,641.665</td>
<td>4,150.92</td>
<td>9,448.32</td>
</tr>
</tbody>
</table>

Note:
SP - Survey Papers (Government Survey File)
RSP - Private Survey Papers (Licensed Private Surveyor File)

From the above, it can be seen that the amount of cadastral plan checking backlog in Sabah is fairly substantial. While the drawing office section in the LS department appears capable of processing more than 10,000 parcel lots annually, it has accumulated backlogs amounting to approximately one and a half to two times higher. Hence, unless there is for example a drastic decrease in land applications or development requests, or that a whole year is spent tackling the current outstanding amount while freezing all land applications, it is unlikely that the plan checking backlogs can be tackled in the future under the present procedures.
The final stage of the land formalisation process involves the preparation of draft land titles at the LS department’s headquarters. The backlogs are shown in Table 6.6 below:

TABLE 6.6: The Backlogs of Draft Title Preparation (Source: LS department Annual Statistic Reports)

<table>
<thead>
<tr>
<th>Year</th>
<th>Title Type</th>
<th>Draft Titles Received</th>
<th>Completed Lots</th>
<th>Outstanding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>FR</td>
<td>41</td>
<td>67</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>NT</td>
<td>4,495</td>
<td>3,947</td>
<td>4,060</td>
</tr>
<tr>
<td></td>
<td>PL</td>
<td>68</td>
<td>128</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>CL</td>
<td>3428</td>
<td>4,116</td>
<td>857</td>
</tr>
<tr>
<td></td>
<td>TL</td>
<td>592</td>
<td>592</td>
<td>86</td>
</tr>
<tr>
<td>1994</td>
<td>FR</td>
<td>61</td>
<td>101</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>NT</td>
<td>4,116</td>
<td>5,590</td>
<td>3,152</td>
</tr>
<tr>
<td></td>
<td>PL</td>
<td>7</td>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>CL</td>
<td>7,156</td>
<td>3,059</td>
<td>1,486</td>
</tr>
<tr>
<td></td>
<td>TL</td>
<td>1,447</td>
<td>648</td>
<td>91</td>
</tr>
<tr>
<td>1993</td>
<td>FR</td>
<td>113</td>
<td>145</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>NT</td>
<td>3,435</td>
<td>5,444</td>
<td>4,484</td>
</tr>
<tr>
<td></td>
<td>PL</td>
<td>4</td>
<td>81</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>CL</td>
<td>2,071</td>
<td>4,880</td>
<td>1,907</td>
</tr>
<tr>
<td></td>
<td>TL</td>
<td>100</td>
<td>352</td>
<td>157</td>
</tr>
</tbody>
</table>

The backlog in draft title preparation above shows the amount of draft titles awaiting authorisation before these are registered in the land register; the list against which each title and lease is checked is provided in Appendix D. As can be seen, the backlog in titles preparation as of the end of 1995 amounts to almost 5,000 titles with the majority (around 80%) being Native Titles.

6.5 Estimate of Untitled Land in Sabah.

It is obvious from the foregoing that in Sabah at present, a significant amount of backlog exists at the various stages of the land titling process. These backlogs can be summarised into:

- The Land Applications (LA) Phase
- Cadastral Surveys
- Plan and Field Book Checking
- Draft Titles Preparation
The various statistics are summarised in Table 6.7 below. The main emphasis, as mentioned earlier, will be the LA backlogs and Registration of Titles although there are other forms of work backlog faced by the ACLR, e.g. backlogs involving titled land in land dealings registration, land enquiry and notices of demand.

**TABLE 6.7: Summary of Work Backlog**

<table>
<thead>
<tr>
<th>BACKLOG TYPE</th>
<th>QUANTITY</th>
<th>APPROX. AREA (HA)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Applications Backlog</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Outstanding LA</td>
<td>118,821</td>
<td>n.a.</td>
</tr>
<tr>
<td>2. Registration of Title</td>
<td>3,146</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Cadastral Surveys Backlog</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Native Titles (NT)</td>
<td>10,896</td>
<td>n.a.</td>
</tr>
<tr>
<td>2. Country Leases (CL)</td>
<td>1,110</td>
<td>n.a.</td>
</tr>
<tr>
<td>3. Town Leases (TL)</td>
<td>168</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Plan &amp; Field Book Checking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Government Surveys (SP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. Under Query</td>
<td>(85) 3,105 Lots</td>
<td>(14,650)</td>
</tr>
<tr>
<td>1.2. Outstanding</td>
<td>(277) 8,717 Lots</td>
<td>(761,649)</td>
</tr>
<tr>
<td>2. Private Licensed Surveyors (LLS)</td>
<td>(277) 3,561 Lots</td>
<td>(1,359,447)</td>
</tr>
<tr>
<td>2.1 Under Query</td>
<td>(277) 3,561 Lots</td>
<td>(1,359,447)</td>
</tr>
<tr>
<td>2.2. Outstanding</td>
<td>(1,388) 6,140 Lots</td>
<td>(832,078)</td>
</tr>
<tr>
<td><strong>Titles Preparation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Field Register (FR)</td>
<td>41</td>
<td>n.a.</td>
</tr>
<tr>
<td>2. Native Title (NT)</td>
<td>4,060</td>
<td>n.a.</td>
</tr>
<tr>
<td>3. Provisional Lease (PL)</td>
<td>8</td>
<td>n.a.</td>
</tr>
<tr>
<td>5. Town Lease (TL)</td>
<td>86</td>
<td>n.a.</td>
</tr>
</tbody>
</table>

n.a. - Not Available

Note: Bracketed figures indicate equivalent quantity and areas because no area statistics exist in other districts

Before LAs are approved, it is problematic to estimate how many applications will eventually be accepted because these may depend on the confirmation from other departments, agencies or related bodies who are custodians of specific types of land information. For example, some of the 118,000 backlogs may inevitably be rejected due to the area applied for being in a forest reserve, gazetted national park, or that the land concerned encroaches into a designated area held by government bodies; in some instances for land in the remoter areas, the land concerned may already be titled, without the knowledge of the applicants. While it is difficult to estimate how many LAs will ultimately be approved or rejected, officers interviewed during the field study opined that at the minimum, approximately 50 to 70 per cent acceptance of the total LA backlog was a realistic figure. Thus, for the purposes of analyses in this research, 70,000 plots will be assumed to be outstanding from the total LA backlog. In addition, the LAs that have been
accepted and are awaiting cadastral surveys stood at 12,174 at the end of 1995 and these are categorised into the three main titles, i.e. CL, NT and TOL in Table 6.7 above. In terms of area, the cadastral survey backlog is thought to be similar to the LAs above but no data pertaining to the number of land parcels and areas exist.

One obvious question that follows from the observations in the foregoing is that how much do these inefficiencies and ineffectiveness cost the state? If the general viewpoint that land is basic material wealth of a nation is taken into consideration, and that formalised property rights in land are a necessity before they can be legally transacted in the processes of wealth creation in a modern economy, then quantifying the shortcomings involved in the formalisation of property rights above is a good indicator of the opportunity costs of land. This is addressed in the following.

6.6 Costs of Land Titling Ineffectiveness in Sabah

In the ideal scenario, estimating the value of untitled land should be based on adequate supporting data that are accurate, complete, up-to-date and accessible. This however is seldom the case in most situations and was the reality faced during the data collection phases for this thesis. Recognising this shortcoming, the assessment of untitled land values for this research will be estimated from available statistic as well as from discussion with officers from the Land Valuation Branch of the LS department.

Most of the land application backlog is for agricultural land, although no exact data are available on whether the areas are developed or otherwise. While there are figures available on the amount paid by the state for land acquired in the various districts in Sabah as reported in the internal annual Lands and Surveys department statistic reports, these are mainly for prime land or urban areas in the state. Hence, these may not necessarily reflect the true value of agricultural or otherwise undeveloped land in the state.

However, in order to estimate the consequences of delayed land titles to the economy, it is necessary to estimate the value of such land. For the purposes of this research, the value of untitled land, i.e. those applied in the land applications, will be estimated from two main sources. These are the Property Market Report by Williams, Talhar and Wong
(1996), as well as using inputs from staff at the Valuation Section of the Lands and Surveys department. An assumption is however necessary, i.e. that the majority of the untitled land are agricultural land. It is held that any estimation should represent the minimal price of land available anywhere in the state, although it is appreciated such land may not necessarily be uninhabited. The main reason for this assumption is that most of the land application backlogs in the state, i.e. those that are still untitled, mainly consist of agricultural land in the rural areas. These are usually used by natives and smallholders for the plantation of value added crops or occupied under customary rights and hence, are evidently lesser in value than urban land areas.

Also, the premise that the estimated land value should be minimal had to be adopted in the absence of more accurate data, in particular, access to comprehensive, reliable and timely evidence of land transactions that are necessary to make informed predictions of land value. This approach was also deemed necessary to prevent the anticipated benefits of an improved LIS from being overestimated.

In the latest mid-year property market report in Sabah by Williams, Talhar and Wong (1996), the values of undeveloped agricultural land in two of the districts with the highest agricultural activities and land potential was indicated. This is portrayed in Table 6.8 below:

<table>
<thead>
<tr>
<th>District</th>
<th>Undeveloped Agricultural Land (MR per Ha)</th>
<th>Developed Agricultural Land (MR per Ha.)</th>
<th>Estimated Value/acre for Undeveloped Land (MR per Acre)</th>
<th>Estimated Value/acre for Developed Land (MR per Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keningau</td>
<td>1,500-3,000</td>
<td>10,000-15,000</td>
<td>607-1214</td>
<td>4047-6070</td>
</tr>
<tr>
<td>Lahad Datu</td>
<td>5,000-8,000</td>
<td>25,000 or higher</td>
<td>2023-3237</td>
<td>10,117 or higher</td>
</tr>
</tbody>
</table>

The range of value per acre of undeveloped agriculture land above varies from about MR600 to MR3200. However, according to interview with officers in the Valuation Section of the LS department, the probable lowest value for an acre of titled land anywhere in the state was MR3,000 (Unattributable source, 1996). Considering that the published value for an undeveloped acre of land has a minimal value of MR607 per acre,
while a titled land may be worth at the very minimum MR3000, it can be assumed that the value for an untitled acre of land should in general have a value somewhere between those two limits. Agricultural land in Sabah usually means the plantation of mature cocoa, oil palms and rubber (Williams, Talhar and Wong, 1996) and obviously, these will affect the value of any such land, in addition to their location, as well as other physical, legal and economic factors.

For the purposes of the present context, the value of untitled land throughout the state will be assumed to be MR 1,500 per acre. The market value of titled land will be taken to be MR4,000, being near the bottom of the range from MR3,000-10,000. This suggests that titling adds MR2,500 to the value of an acre of land. This approach however does not consider the value of land with existing timber assets as such land would be subject to Temporary Occupational Leases and moreover, such information is confidential. Salleh (1996) however opined that an acre of timbered land in Sabah was worth approximately MR10,000. As indicated in Table 6.8 above also, the value of developed agricultural land can also increase by a factor of five or higher if the land were already developed.

From personal interviews conducted during the research attachment, the main valuation method used by the valuation section of the LS department in Sabah is the comparative method, as reviewed by e.g. Dale and McLaughlin (1988) and Wyatt (1994). It is worth mentioning that no valuation work on untitled land has ever been done in the state because according to Chee (1996, Personal Communications) the need never arose.

Should the actual value for an acre of land be higher, then the arguments for modernising and speeding the processes involved in acquiring land will be greater. It is thus clear that the approximations above are appropriate only for this research in the absence of other detailed data sources on untitled land and do not consider other possible variables, e.g. cash crops, properties, etc. attached with the untitled land that should otherwise be taken into account in the estimation of its value.

Viewed from another perspective, the process of granting title to land above in effect represent some of the opportunity cost to the economy, i.e. the potential withheld non-transaction land values, due to the inability to trade land rights in the open land markets. Alternatively, the estimated value can also be viewed as the ‘hidden wealth’ or benefits
foregone due to the inefficiencies and ineffectiveness in the land titling process or their non-involvement in the land markets economy.

6.7 Implications of Inefficiencies and Ineffectiveness in the Management of Land Related Data

It would be difficult to accurately assess how the existing inefficiencies and ineffectiveness of land information management procedures affect the public and private sectors involved in the land markets. It is not easy for example, to categorically evaluate the costs and opportunity costs to the land owners or developers who are awaiting approval for their land titles and other land related development requests, unless all are individually asked of their intent on the future land use and their amount of investment. There are however real consequential costs that results from these shortfalls that includes *inter alia*:

- The implicit avenues for corruption or favouritism as land owners and developers approach certain government officers or authority figures for the speedier approval of their applications. In Sabah for example, it is quite normal for land application by natives to be 'endorsed or supported' by prominent individuals and politicians. Such approaches may in some instances speed up the process of acquiring the final output but this would invariably mean 'leap-frogging' earlier or genuine land applicants who may not enjoy similar support in their LA. The general rule of 'first come, first served' hence cannot be practised effectively.

- The statistics backlog of the LS department proves that one of the costs of ongoing backlogs or ineffectiveness can result in the loss of the department’s good image with the public and ability to cope with modern land markets demand. This was reflected recently where a local paper in Sabah reported that among the various state department and agencies, the LS department had the highest number of complaints from the public (Daily Express, 23 November 1996).

- More importantly, less wealth is created because land without titles or permission to alter its regulated land use cannot be transacted or transferred without undergoing the
lengthy and bureaucratic processes, i.e. efficiently and effectively. Such uncertainties as stated before, may result in frozen or stalled developments.

- The current system of providing, using, verifying and accepting spatial data sets in decision making in land information management in Sabah is in need of a major review, improvements and investments not only to the underlying processes but also, in the effective use of modern technology in the management of its spatial data needs.

At present, there is little public information available on the state of the land market and it is also relatively difficult to obtain data on property rights, the names of current property owners and land values in Sabah. One of the consequence as observed by Holstein (1992) is that part of the market operates by and large, secretly through private contracts, word of mouth and intermediaries. These contributes to higher transaction costs and possible loss of state revenue because the operations of the market escapes regulation and hence, are untaxed by the government. On the other hand however, land market information can be obtained by those who have the resources, the right contacts, knowledge, or are in the civil service.

6.8 Conclusions

This chapter has reviewed the general processes and procedures involved in the management of land, as well as the workflow of land development proposals in the state. The chief aims have been to examine the procedures involved in the formalisation of land rights, the steps required for a change in land use, as well as the cadastral survey work involved in the land titling process.

More significantly however, it has identified the extent of the state's inefficiencies and ineffectiveness in the management of its land related information. Four main areas have been identified, namely backlogs in the processing of land applications, cadastral surveys, the checking of cadastral plans and field books, as well as backlogs in the preparation of land titles. The most significant of these however are the land application backlogs, where it was postulated that at least 70,000 land parcels were awaiting to be titled.
The constraints imposed by the confidentiality of government valuation data as well as the inaccessibility of the precise methodology used by the LS department’s land valuation section has necessitated the need to develop an approach that utilises available internal government statistics within the LS department and published property market reports for assessing the impact that land titling has on the market value of land. Based on discussions with senior officers of the Valuation Section of the LS department and the available literature evidences, it was proposed that while untitled land may in general be worth around MR1,500 per acre throughout the state, land titling increases the market value of land by MR2,500. Overall a one-off benefit in excess of RM1 billion should be attainable. The next chapter builds on the methodology developed and assesses the monetary impact of these work backlog to the state’s economy, as well as the benefits that a LIS infrastructure may offer to the LS department.
Chapter Seven
LIS Benefits in Sabah and Financing Issues

7.1 Introduction

The previous chapter has provided some arguments and evidence for the need to modernise Sabah’s existing LIM procedures. The work backlog in various aspects of managing spatially related data within the Lands and Surveys department results in delayed land titles issuance with considerable consequences to the parties concerned and the land market. This chapter seeks to quantify the possible benefits that can be anticipated with the implementation of a LIS infrastructure. These will be generally classified into efficiencies, effectiveness and land market benefits. A general comment that applies throughout this chapter is the observation by Dale and McLaughlin (1988, p.211) that, “every minute of delay can cost money because investment and development are held back.”

7.2 Quantification of Possible Revenue Benefits of a Cadastre based LIS in Sabah

Before assessing the quantifiable LIS benefits, it is useful to understand the current land distribution in Sabah. The present status of land distribution in the state are shown in Table 7.1 below which summarises the appropriation of Sabah’s land, based on a Lands and Surveys Department 1994 briefing paper. In general, the land areas of Sabah are allocated into reserves, those managed by various government bodies and those owned by private land owners and developers.
TABLE 7.1: Sabah’s Land Distribution (Source: Lands and Surveys Department, 1994)

<table>
<thead>
<tr>
<th>Approximate Total Land Area of Sabah (excluding Federal Territory Labuan)</th>
<th>HECTARE</th>
<th>PERCENTAGE</th>
<th>TOTAL (HECTARE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,360,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STATE RESERVE AREA</th>
<th>HECTARE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest Reserves</td>
<td>3,253,228</td>
<td>44.2 %</td>
</tr>
<tr>
<td>Parks Reserves</td>
<td>265,794</td>
<td>3.6 %</td>
</tr>
<tr>
<td>Agriculture Reserves</td>
<td>19,226</td>
<td>0.3 %</td>
</tr>
<tr>
<td>Veterinary Reserves</td>
<td>7,795</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Fisheries/Aquaculture Reserves</td>
<td>52,657</td>
<td>0.7 %</td>
</tr>
<tr>
<td><strong>Total Area for Reserves</strong></td>
<td></td>
<td>48.9 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREA HELD BY PRIVATE OWNERS AND GOVERNMENT BODIES</th>
<th>HECTARE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Under Titles</td>
<td>1,323,167</td>
<td>18.0 %</td>
</tr>
<tr>
<td>Sabah Forest Industries</td>
<td>259,980</td>
<td>3.6 %</td>
</tr>
<tr>
<td>FELDA</td>
<td>128,682</td>
<td>1.7 %</td>
</tr>
<tr>
<td>SAFODA</td>
<td>99,336</td>
<td>1.3 %</td>
</tr>
<tr>
<td>KPD</td>
<td>6,687</td>
<td>0.1 %</td>
</tr>
<tr>
<td>SLDB</td>
<td>106,740</td>
<td>1.5 %</td>
</tr>
<tr>
<td>Rubber Fund Board</td>
<td>10,475</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Smallholders Schemes</td>
<td>111,666</td>
<td>1.5 %</td>
</tr>
<tr>
<td>Youth Scheme</td>
<td>4,581</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Sabah Soft Wood</td>
<td>60,703</td>
<td>0.8 %</td>
</tr>
<tr>
<td>Lembaga Padi &amp; Beras Negara (National Rice Board)</td>
<td>12,950</td>
<td>0.2 %</td>
</tr>
<tr>
<td><strong>Total Area</strong></td>
<td>2,124,967</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximate Total Area of State Land/ Under Application</th>
<th>HECTARE</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,636,333</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From Table 7.1 above, the amount of titled land in Sabah in 1994 is therefore slightly less than 20 per cent of the total area of the state, i.e. at 18 %.

As at March 1995 however, data from the LS department statistics report shows that the total titled area has increased to 18.5 %, as shown in Table 7.2 below:

<table>
<thead>
<tr>
<th>Types of Titles</th>
<th>Number</th>
<th>Total Area (Ha.)</th>
<th>Percentage</th>
<th>Avg. Size/Title (Ha. (Acres))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Titles (NT)</td>
<td>122,999</td>
<td>238,751.525</td>
<td>17.4</td>
<td>1.9 (4.8)</td>
</tr>
<tr>
<td>Field Registers (FR)</td>
<td>12,121</td>
<td>28,134.079</td>
<td>2.1</td>
<td>2.3 (5.7)</td>
</tr>
<tr>
<td>Country Leases (CL)</td>
<td>82,586</td>
<td>892,278.491</td>
<td>65.4</td>
<td>10.8 (26.7)</td>
</tr>
<tr>
<td>Provisional Lease (PL)</td>
<td>6,103</td>
<td>202,970.831</td>
<td>14.9</td>
<td>33.3 (82.3)</td>
</tr>
<tr>
<td>Town Leases (TL)</td>
<td>13,644</td>
<td>2,593,821</td>
<td>0.2</td>
<td>0.2 (0.5)</td>
</tr>
<tr>
<td>Total</td>
<td>237,453</td>
<td>1,364,728.747</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Total State Area</td>
<td></td>
<td>(7,360,000)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Figures in Italic are estimated

Based from the previous chapter which inter alia explored and analysed the major work backlogs within the LS department, the overall benefits can broadly be classified into:

- The impact of minimising the various work backlogs, i.e. in the production of land titles
- Possible increased revenue to the LS department and the State
- Estimated efficiency benefits with direct access to land information, cost savings or avoided costs.
- Other unquantifiable benefits specific to the LS department.

It was proposed in the preceding chapter that titling an acre of land in Sabah should increase its market value by MR2,500. With this value, it is possible to evaluate the amount of ‘created wealth’, i.e. in terms of land titles to the economy, if the average size of the land parcel backlogs were known.

For example, the land application (LA) backlog as opined in the previous chapter implies that there are at least 70,000 potential land titles to be produced. Although it is difficult to estimate the precise size of land applied under each LA, average parcel sizes can be estimated based on the titled land holdings depicted in Table 7.2 above. It can be seen, that on average, each approved LA should at least cover an area of 1.9 hectare or 4.8 acres. For the purpose of convenience in the following, an average of 4 acres per title will be assumed in all calculations involved in estimating the ‘increase in value’ or opportunity costs of Native Titles (NT) and Field Registers (FR), 25 acres for Country Leases (CL)
and 80 acres for Provisional Leases (PL). This is a conservative estimate but is deemed realistic for the purpose of this analysis, based on the statistics implied in Table 7.2 above.

In addition, there is also little likelihood of the applied land parcels being less than 4 acres because on average, the other forms of registered land titles apart from Town Leases (TL), have higher area coverage per parcel (Table 7.2). There is also less possibility of land near townships or urban areas being available, apart from the registration of land market activities such as their subdivisions, transfers or delegation of rights via Powers of Attorneys.

For evaluating untitled land, the following calculations can therefore be made on all backlogs that lead to the production of a land title:

\[
\text{(No. of Backlogs)} \times \text{(Avg. Size/parcel)} \times \text{(Increased Value/parcel)} = \text{Avg. Value of Titled Land}
\]

Based on these assumptions, the ‘costs’ of delay in the production of land titles by the LS department are computed and tabulated in Table 7.3 below. The ‘value’ of each particular backlog is estimated by multiplying the backlog amount with the average parcel size, and the anticipated increase in market price value, i.e. MR 2,500 per acre, assessed earlier in the previous chapter.

The implications, in terms of the impact of land values, if the various work backlogs were cleared, are presented in Table 7.3 below. It is clear from the figures computed that \textit{prima facie}, the cumulative potential value by granting titles to untitled land in the state adds to over MR 1.2 billion. This is fairly substantial and almost equivalent to the state’s average annual GDP. If the observation by Williams and Stanfield (1993) that tenure regularization tends to increase the capital values of properties by 50 to 100 percent is taken into account, then there is therefore a major argument for the state to invest in modernising and improving upon any inefficiencies and ineffectiveness contributing to the backlog.
TABLE 7.3: Valuation Estimate of Work Backlogs in Sabah.

<table>
<thead>
<tr>
<th>BACKLOG TYPE</th>
<th>QTTY</th>
<th>APPROX. AREA (HA)</th>
<th>AVG. PARCEL SIZE (ACRE)</th>
<th>INCREASED VALUE PER ACRE (MR)</th>
<th>POTENTIAL VALUE OF DELAYED TITLE (MR)</th>
<th>TOTAL ESTD AREA (ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA Backlog</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Outstanding LA</td>
<td>70,000</td>
<td>n.a.</td>
<td>4</td>
<td>2,500</td>
<td>700,000,000</td>
<td>280,000</td>
</tr>
<tr>
<td>2. Registration of Title</td>
<td>3,146</td>
<td>n.a.</td>
<td>4</td>
<td></td>
<td>31,460,000</td>
<td>12,584</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>731,460,000</td>
</tr>
<tr>
<td>Cadastral Surv.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backlog</td>
<td>10,896</td>
<td>n.a.</td>
<td>4</td>
<td>2,500</td>
<td>108,960,000</td>
<td>43,584</td>
</tr>
<tr>
<td>Native Titles (NT)</td>
<td>1,110</td>
<td>n.a.</td>
<td>25</td>
<td>&quot;</td>
<td>69,375,000</td>
<td>27,750</td>
</tr>
<tr>
<td>Country Leases (CL)</td>
<td>168</td>
<td>n.a.</td>
<td>0.5</td>
<td>&quot;</td>
<td>210,000</td>
<td>84</td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>178,545,000</td>
</tr>
<tr>
<td>Plan/Field Bk. Checking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Govt. Surveys (SP)</td>
<td>3,105 Lots</td>
<td>n.a.</td>
<td>4</td>
<td>2,500</td>
<td>31,050,000</td>
<td>12,420</td>
</tr>
<tr>
<td>1.1. Under Query</td>
<td>8,717 Lots</td>
<td>n.a.</td>
<td>&quot;</td>
<td>&quot;</td>
<td>87,170,000</td>
<td>34,868</td>
</tr>
<tr>
<td>1.2. Outstanding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Licensed Land Surveyors (LLS)</td>
<td>3,561 Lots</td>
<td>n.a.</td>
<td>4</td>
<td>2,500</td>
<td>35,610,000</td>
<td>14,244</td>
</tr>
<tr>
<td>2.1 Under Query</td>
<td>6,140 Lots</td>
<td>n.a.</td>
<td>&quot;</td>
<td>&quot;</td>
<td>61,400,000</td>
<td>24,560</td>
</tr>
<tr>
<td>2.2. Outstanding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>215,230,000</td>
</tr>
<tr>
<td>Titles Preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Field Register (FR)</td>
<td>41</td>
<td>n.a.</td>
<td>4</td>
<td>2,500</td>
<td>410,000</td>
<td>164</td>
</tr>
<tr>
<td>2. Native Title (NT)</td>
<td>4,060</td>
<td>n.a.</td>
<td>4</td>
<td>&quot;</td>
<td>40,600,000</td>
<td>16,240</td>
</tr>
<tr>
<td>3. Prov. Lease (PL)</td>
<td>8</td>
<td>n.a.</td>
<td>80</td>
<td>*10,000</td>
<td>6,400,000</td>
<td>640</td>
</tr>
<tr>
<td>4. Country Lease (CL)</td>
<td>857</td>
<td>n.a.</td>
<td>25</td>
<td>2,500</td>
<td>53,562,500</td>
<td>21,425</td>
</tr>
<tr>
<td>5. Town Lease (TL)</td>
<td>86</td>
<td>n.a.</td>
<td>0.5</td>
<td>2,500</td>
<td>107,500</td>
<td>43</td>
</tr>
<tr>
<td>Sub-Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>101,080,000</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,226,315,000</td>
</tr>
</tbody>
</table>

Note: **Figure estimated by Salleh (1996)**

Figures in Italic are calculated.
n.a. Not Available

Clearing the LA backlog offers the highest potential benefit and accounts for almost three-quarters of the total increase in land values. Although as stated earlier no specific records exist for the particular types and forms of LA e.g. applications for vacant land, tourism development purposes, etc., interviews with officers at the LS department’s Land Alienation section indicate that the majority of these LAs are requests for untitled land which are mainly for agriculture use, although there are some areas applied for the purpose of timber extraction. It was earlier mentioned in the previous chapter that some of these outstanding LAs may eventually be rejected and that 50 to 70 per cent was a realistic acceptance figure. If this were taken into account, the increase in land market value however still amounts to over MR700,000,000, which is almost 50 percent of the
state’s annual GDP. It should also be noted that this estimate does not include the value of land for timber extraction purposes nor for land held under Country Leases (CL), which have higher acreage and rateable values.

Hence, the amount of created wealth is probably higher in practice because the increase in land value by MR2,500 per acre is in most cases, likely to be higher, as opined earlier in the preceding chapter. The values of CLs are usually higher than land under native titles (NT) or field registers (FR) whereas the analysis above assumes that there is no difference. A NT has a restrictive nature, i.e. dealings of native land is prohibited with non-natives and also, because a CL title is held by the payment of higher premiums as opposed to a NT which has a fixed rate of quit rent. Although there may be other factors that affect the value of a CL, (e.g. its location, improvements on land, etc.) suffice to state that it has been government policy since the days of the British North Borneo Chartered Company that country leases were meant for non-natives who were required to pay higher land taxes because of the larger allowable land area and the commercial nature of land use. Land values are even more substantial for temporary occupational licenses but no precise data on the value and amount of timbered areas in the state were available to the author. Salleh’s (1996) estimate of MR10,000 per acre was therefore used in the estimation of provisional leases in Table 7.3 above.

The amount of backlog for registration of title shown in Table 7.3 depicts titled land that are either awaiting for collection from the land owners or their acceptance of the terms and conditions of title. For the other forms of backlog, namely cadastral surveys, plan or field book checking and titles preparation, the quantities are more conclusive compared with the land applications. These backlogs have already gone through the formal procedures of LA vetting, checking for land availability, the applicants’ suitability, etc. that require comments from the LS department and various other government departments and ministries; these are still awaiting issuance for titles.

The total area of the backlogs estimated in Table 7.3 above amounts to approximately 488,606 Acres or approximately, 197,736 Ha., equivalent to about 2.7 percent of the total state area and implying that even if all the backlogs were cleared, the state still has about 19.4% of its area available for application.
A large part of the benefits of expediting land titling estimated in Table 7.3 above accrues mainly to the end-users, e.g. individuals, developers or corporations, although how they benefit from utilising their land and achieving their objectives is beyond the scope of this research. From the government’s perspective, it is however possible to estimate the minimum revenue that can be expected if all the land applications and title backlogs were cleared. This is estimated in Table 7.4 below.

**TABLE 7.4: Estimate of Annual Lost Revenue due to Backlog**

<table>
<thead>
<tr>
<th>BACKLOG TYPE</th>
<th>QUANTITY</th>
<th>ESTIMATED AREA (ACRES)</th>
<th>TOTAL ESTM. RENT (MR) AT MR 0.50/ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Applications Backlog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Outstanding LA</td>
<td>70,000</td>
<td>*280,000</td>
<td>140,000</td>
</tr>
<tr>
<td>2. Registration of Title</td>
<td>3,146</td>
<td>12,584</td>
<td>6,292</td>
</tr>
<tr>
<td>Sub-total</td>
<td>250,226</td>
<td>126,292</td>
<td></td>
</tr>
<tr>
<td>Cadastral Surveys Backlog</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Native Titles (NT)</td>
<td>10,896</td>
<td>43,584</td>
<td>21,792</td>
</tr>
<tr>
<td>Country Leases (CL)</td>
<td>1,110</td>
<td>27,750</td>
<td>13,875</td>
</tr>
<tr>
<td>Town Leases (TL)</td>
<td>168</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>71,334</td>
<td>35,667</td>
<td></td>
</tr>
<tr>
<td>Plan &amp; Field Book Checking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Government Surveys (SP)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1. Under Query</td>
<td>3,105 Lots</td>
<td>12,420</td>
<td>6,210</td>
</tr>
<tr>
<td>1.2. Outstanding</td>
<td>8,717</td>
<td>34,868</td>
<td>17,434</td>
</tr>
<tr>
<td>2. Private Licensed Surveyors (LPS)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Under Query</td>
<td>3,561 Lots</td>
<td>14,244</td>
<td>7,122</td>
</tr>
<tr>
<td>2.2. Outstanding</td>
<td>6,140</td>
<td>24,560</td>
<td>12,280</td>
</tr>
<tr>
<td>Sub-total</td>
<td>86,092</td>
<td>43,046</td>
<td></td>
</tr>
<tr>
<td>Titles Preparation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Field Register (FR)</td>
<td>41</td>
<td>164</td>
<td>82</td>
</tr>
<tr>
<td>2. Native Title (NT)</td>
<td>4,060</td>
<td>16,240</td>
<td>8,120</td>
</tr>
<tr>
<td>3. Provisional Lease (PL)</td>
<td>8</td>
<td>n.a.</td>
<td></td>
</tr>
<tr>
<td>4. Country Lease (CL)</td>
<td>857</td>
<td>3,428</td>
<td>1714</td>
</tr>
<tr>
<td>5. Town Lease (TL)</td>
<td>86</td>
<td>N.A.</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>19,832</td>
<td>9,916</td>
<td></td>
</tr>
<tr>
<td>Estimated Revenue of titled land</td>
<td>404,174</td>
<td>MR 234,921</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
- All Figures in italics are estimated
- Assumes that 50 per cent of LA are rejected
- n.a. - Premium for Town Lands (TL) are made to Local Authorities

Because of data confidentiality on the other forms and magnitude of land taxes or premiums, license fees and their evaluation procedures, one overriding assumption in Table 7.4 above is that all backlogs of potential land titles are presumed to be held under Native Titles (NT) because it is the only form of land tax fixed at 50 cents per acre (Sabah Land Ordinance, Cap. 68, Section 71). This rate has been set since the introduction of the Sabah Land Ordinance in 1953 which surprisingly has never been reviewed and still
applies to this day. However, other forms of land titles such as a CL and TOL are taxed individually based on the “situation and quality of the land and the value of the timber thereon” (Sabah Land Ordinance, Cap. 68, Section 51), which are subject to circumstantial and periodic review.

From Table 7.4 the minimum benefits per annum to the LS department under the assumptions above amount to around MR 234,000, which is not as high as the impact of conferring land titles to the users. As will be implied later in Table 7.7 however, revenue from land quit rent collection alone has consistently accounted for more than 25 per cent or around MR18 million of the total departmental revenue (Lands and Surveys, 1994); the other land revenue sources being premium for land sale, license fees and collection of fees from the registration of dealings and leases.

Hence, there is therefore strong evidence to indicate that because the anticipated benefits above are based solely on a single form of land tax, i.e. NT land quit rents, the eventual annual benefits should at least be higher by a factor of three or four, if current land revenue statistics are considered. The assumption that all titles are NTs with a fixed land tax rate at MR 0.50 per acre attempts only to provide an estimate of the absolute minimum revenue that can be anticipated if there were no backlogs. It does not model all possible income sources to the LS department because other types of land titles have varying and higher land taxes.

7.3 Anticipated Efficiency Benefits.

The foregoing has estimated the effectiveness benefit to the state by estimating the value of granting titles to land and the possible revenues to the government. Another form of benefit that can accrue to the LS department is that termed as efficiency benefits that include time savings and avoided costs as a result of quicker access to land information. Before any efficiency benefits can be estimated however, it is essential to analyse the overall costs of managing the activities, as well as to examine its consequence on the land information products and services of the department.
### 7.3.1 Estimation of Present Land Information Costs and Value in Sabah

The cost of operating the LS department in Sabah is approximately MR27-32 million annually. There are a few approaches that can be used to classify the various land informational costs required to operate the department and in fulfilling their obligations. For example, costs can be classified according to their sections, their functions or in quantifying the costs or investment required to deliver a product or service to the end-user, although as experienced during the course of this research, it is much more difficult to obtain cost data from the various stake holders. Table 7.5 below shows the costs of managing land related information within the LS department in Sabah, compiled from existing and past state annual estimates of revenue and expenditure. These are classified according to three main components, i.e. personnel emoluments, recurrent expenses and Special Expenditures.

#### TABLE 7.5: Annual Costs of Managing the Sabah LS department from 1994-1996
(Source: Compiled from Sabah’s Annual Estimates of Revenue and Expenditures 1994-1996)

<table>
<thead>
<tr>
<th>Items</th>
<th>1996</th>
<th>1995</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Emoluments (No. of Staffs)</td>
<td>26,000,000</td>
<td>25,505,000</td>
<td>22,000,000</td>
</tr>
<tr>
<td>(2,363)</td>
<td>(2,325)</td>
<td>(2,316)</td>
<td></td>
</tr>
<tr>
<td>Average Salary/Staff</td>
<td>11,217/person</td>
<td>10,970/person</td>
<td>9499/person</td>
</tr>
<tr>
<td>Annually Recurrent Expenses</td>
<td>8,202,020</td>
<td>7,475,020</td>
<td>6,843,530</td>
</tr>
<tr>
<td>Special Expenditures</td>
<td>345,010</td>
<td>415,000</td>
<td>175,010</td>
</tr>
<tr>
<td>Total</td>
<td>34,547,030</td>
<td>33,395,020</td>
<td>29,734,540</td>
</tr>
<tr>
<td>GDP</td>
<td>1,821,806,438</td>
<td>1,432,678,821</td>
<td>2,088,560,665</td>
</tr>
<tr>
<td>Costs as % of GDP</td>
<td>1.8%</td>
<td>2.3%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

All amount in Malaysia Ringgit (MR)

From the table above, it can be estimated that based on data in recent years, the present costs of surveying, mapping and maintaining the cadastre in Sabah varies between 1.5 to 2.5 percent of the state’s GDP. Compared with reports of other developing countries in general, e.g. Bernhardsen (1992) and Brandenberger (1980), this figure is comparatively high because figures averaging between 0.1% to 0.5% of a state’s GDP were quoted. For example, Bernhardsen (1992 p.268) stated that:
"As of the early 1990s, the total geographic information sector accounted for approximately 0.5% of the GNP in most industrialised countries. For most African countries, the corresponding figure was 0.1% of far lower GNPs."

It appears however that although the cost of maintaining the department is fairly consistent, the state’s GDP varies to the extent that it can affect the annual magnitude of land information costs; the significant variation in the state’s yearly GDP will be explained in more detail later.

In practice of course, there are other government departments who manage spatial data sets for their own internal use e.g. in support of decision making related to their functions and objectives; taking this fact into account, the amount of annual investment in managing land information in Sabah should therefore be higher than the estimation above. However, none of the other state agencies or departments in Sabah are as involved in the management of spatial data sets either in scale or magnitude when compared with the Lands and Surveys department and historically, the department has always been the main land information authority and custodian in the state.

The estimation of personnel emoluments in Table 7.5 above includes salaries and payments to the employees’ social benefits, insurance, etc. From the total cost of salaries and the number of staff employed by the LS department above for the period 1994-1996, the annual salary per staff amounts to approximately MR 9,562; for the purpose of convenience, this will be rounded to MR9,500. Although this assessment is a generalised estimate because it does not take into account other factors e.g. the specific functional tasks carried out by each employee, their spheres of influence, authority, etc., it will however be used as a guide in assessing the benefits of a national LIS developed in the following because of two factors - firstly, the absence of more accurate data and, secondly, because it encompasses the other emoluments paid by the state to the employees of the LS department. The fact that these were calculated from actual government estimate lends weight to their usage specifically within the LS department and within the context of this research.

According to the 1995 LS department staff list, a total of 2083 staff were in employment with the department, namely:
Division I (Managerial) 53
Division II and III (Mid-management and Technical Staffs) 456
Division IV (Clerical and Labour line staffs) 1540
Staffs on leave from the LS department 34
Total 2083
Note: Division I - Graduate level
Division II & III - Diploma or Sixth Form level
Division IV - Secondary/Tertiary education level

There is however a discrepancy between the staff figures provided internally by the LS department, and that from the State Treasury's report on the State's Annual Estimates of Revenue and Expenditures. For example, according to the LS department 1995 staff list, 2083 staff were employed by the department, whereas the State Treasury gives a total of 2325 staff, for the same period. This difference may be due to the fact that the latter may take into account contract workers or those on daily pay basis, i.e. staff not permanently employed by the department, as well as accounting for staff on study leave or attached to other department. For the purposes of the following analysis however, the staff list provided by the LS department will be adopted.

It is clear that senior or qualified officers represent only a fraction of the total staff when compared with those employed under the mid-management and technical, or division four levels. The growth of division II and III staff has mainly been driven by the need to cope with the increased departmental workload and obligations over the years. The main reason for the high rate of labour staff is due to the fact that for every land surveyor employed and trained by the department, at least three or four extra staff are needed to complete a cadastral survey team. They are mainly employed for carrying out work such as clearing the lines of sight required for angular surveying observations and for measuring distances, where in the latter, the majority of cases in the Sabah LS department is still executed with chains.

In order to estimate the efficiency benefits that can be gained by the LS department with the existence of a LIS infrastructure, it is necessary also to classify the various outputs of the department. The 1995 departmental products and services are used for this purpose as well as forming the core data for assessing the efficiency benefits, which is summarised in Table 7.6 below.
### TABLE 7.6: Overview of LS Department Output (Source: LS department Statistics Report, 1996)

<table>
<thead>
<tr>
<th>Function/Task Type</th>
<th>Output for 1995</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Applications (LA)</strong></td>
<td></td>
</tr>
<tr>
<td>LA approved &amp; Survey Instructions Issued</td>
<td>4,541 (61,402.834 Ha.)</td>
</tr>
<tr>
<td><strong>Titles</strong></td>
<td></td>
</tr>
<tr>
<td>Diagram Preparation</td>
<td>8,703 (66,865.55 Ha.)</td>
</tr>
<tr>
<td>Registration of Leases</td>
<td>3,227 (51,693.651 Ha.)</td>
</tr>
<tr>
<td>Surrendered Titles</td>
<td>165 (1,787.428 Ha.)</td>
</tr>
<tr>
<td><strong>Land Matters (ACLR)</strong></td>
<td></td>
</tr>
<tr>
<td>Received &amp; Registered</td>
<td>29,782</td>
</tr>
<tr>
<td>Processed to Director</td>
<td>11,839</td>
</tr>
<tr>
<td>Registration of Land dealings</td>
<td>12,993</td>
</tr>
<tr>
<td>Land Inquiry</td>
<td>1,759</td>
</tr>
<tr>
<td>Notice of Demand</td>
<td>867</td>
</tr>
<tr>
<td><strong>Other Land Matters</strong></td>
<td></td>
</tr>
<tr>
<td>Registered dealings for leases</td>
<td>29,019</td>
</tr>
<tr>
<td>Conversion/Subdivision</td>
<td>56 (346.719 Ha.)</td>
</tr>
<tr>
<td>Vesting Order &amp; Compulsory Acquisition</td>
<td>26 (1,730.109 Ha.)</td>
</tr>
<tr>
<td>Reservation of Land</td>
<td>52 (251,381.803)</td>
</tr>
<tr>
<td>Revocation of Land</td>
<td>12 (240,810.335 Ha.)</td>
</tr>
<tr>
<td>Land Acquisition</td>
<td>847 (430.440 Ha.)</td>
</tr>
<tr>
<td>Land Enforcement</td>
<td>389 (36,833.45 Ha.)</td>
</tr>
<tr>
<td>Implementation of Smallholders</td>
<td>14,616 lots (82,902.405 Ha.)</td>
</tr>
<tr>
<td>Scheme for Agencies Preparation of Draft Titles</td>
<td>3,942 lots (22,278.821 Ha.)</td>
</tr>
<tr>
<td><strong>Survey Matters (D.S.)</strong></td>
<td></td>
</tr>
<tr>
<td>LAs received</td>
<td>2,276</td>
</tr>
<tr>
<td>Subdivisions</td>
<td>167 (5,524.899 Ha.)</td>
</tr>
<tr>
<td>Amalgamation</td>
<td>9 (1.163 Ha.)</td>
</tr>
<tr>
<td>Other Surveys</td>
<td>72 (623.254 Ha.)</td>
</tr>
<tr>
<td>SP Issued</td>
<td>1,007 (2,070 lots)</td>
</tr>
<tr>
<td>RSP Issued</td>
<td>493 (3,608 lots)</td>
</tr>
<tr>
<td>Plan Drawing</td>
<td>1,473 lots (5,662.642 Ha.)</td>
</tr>
<tr>
<td>Plan Checking (SP)</td>
<td>2,515 lots (8,685.681 Ha.)</td>
</tr>
<tr>
<td>Plan Checking (RSP)</td>
<td>7,293 lots (49,177.813 Ha.)</td>
</tr>
<tr>
<td>Titles Preparation</td>
<td>8624</td>
</tr>
<tr>
<td>DS Field Survey Report</td>
<td>4,737,513.831 m (11,040.687 Ha.)</td>
</tr>
<tr>
<td><strong>Survey Matters (Others)</strong></td>
<td></td>
</tr>
<tr>
<td>Task Force Plan Drawing</td>
<td>490 lots (31 plans)</td>
</tr>
<tr>
<td>Plan Checking</td>
<td>2,158</td>
</tr>
<tr>
<td>Survey Output</td>
<td>800 lots (2,382.941 Ha.)</td>
</tr>
<tr>
<td><strong>Control Survey</strong></td>
<td></td>
</tr>
<tr>
<td>Stations Occupied</td>
<td>871</td>
</tr>
<tr>
<td><strong>Function/Task Type</strong></td>
<td><strong>Output for 1995</strong></td>
</tr>
<tr>
<td>No. of HPCP</td>
<td>108</td>
</tr>
<tr>
<td>No. of new GPS station</td>
<td>79</td>
</tr>
<tr>
<td>No. of Trigs. Maintained</td>
<td>18</td>
</tr>
</tbody>
</table>
Privatisation of NT survey (1988-1994)  |  5,859 lots (18,863.827 Ha.)

**Photogrammetric Section**
- Aerial Triangulation  |  491 Overlaps (2,583 points)
- Detail Plotting/Digital Mapping  |  111 Overlaps (169.340 Sq. Km)
- Fair Drawing/GEOVEC  |  88 Std. Sheets (132.410 Sq. Km)

**Cadastral Digital Mapping System (CDMS)**
- Std. Digital Sheets Produced  |  199 (44,216 points)
- Attribute Files:
  - Updates  |  4,222 Files (532,077 Points)
  - Boundary Marks  |  523 Files (87,491 Points)
  - Text Compiled  |  1,612 Files (293,981 Points)
  - Text Key-in  |  364 Files (53,890 Points)

**Cadastral Processing System**
- No of Lots (Ha.)  |  1,059 Lots (3,021.703 Ha.)

**Map Revision and Photo Library**
- Photo Supplied  |  23,841 photos
- Map Revision  |  2 Photo-mosaic
- Map Store  |  16,267 maps in Store
- Aerial Survey  |  41 Aerial Films (1,154.63 Sq. Km)

**Photography Section**
- Offset Print  |  38,285
- Film Diapositive  |  576
- Contact Prints of Aerial Photo & Enlargement  |  26,454
- Photographic Reduction  |  2,540
- Aerial Films Processed  |  37
- Film negatives Printed  |  10
- Laminating Plan Forms  |  4,267
- Laminating LS department ID cards  |  2,185

It is obvious from Table 7.6 above that the department has a wide range of responsibilities in fulfilling its role as the main land information custodian in the state particularly in matters regarding the land market activity and its supporting infrastructure; the department is involved across the broad spectrum of managing land and its transactions, which extends to the creation and maintenance of information related to the individual parcel level. Other activities that are not included in the yearly departmental statistics are the services of the general administration section; their operations and outputs in terms of land information however are not as wide ranging compared with the above. The output of the LS department summarised in Table 7.6 above will be used to estimate the efficiency benefits with a LIS infrastructure because this represents the latest available
estimates of the department’s products and services and is also reflective of the department’s activities.

7.3.2 Assessment of Efficiency Benefits

In determining efficiency benefits that can be expected with the use of an improved and computerised LIS, emphasis has usually been placed upon assessing those that can deliver tangible results in the short term. In this respect cost savings and avoided costs are usually the most used techniques and in quantifying these benefits to the LS department, the following assumptions have been made:

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working year</td>
<td>1778 hours</td>
</tr>
<tr>
<td>Working day</td>
<td>7 hours</td>
</tr>
<tr>
<td>Working Year</td>
<td>254 days</td>
</tr>
<tr>
<td>Avg. Personal Salary</td>
<td>MR9,500 per annum</td>
</tr>
<tr>
<td>Hourly Rate (incl. overheads)</td>
<td>MR9,500/1778 x 3 = MR16 per hour</td>
</tr>
</tbody>
</table>

The assumptions above are based on an average of a 7 hour working day minus the 14 day public holidays in Malaysia and an average of 25 days paid leave per annum. The need to multiply the average hourly rate by three takes into account the average overhead costs incurred by the state on each employee, which according to Dale (1976a, p.102) include factors such as the purchase of equipment, materials, building maintenance, costs of training, etc. Another assumption concerns the use of the term LIS infrastructure; this is used to refer to a scenario where all the data sets required for fulfilling the department’s obligations are available on-line to the staff of the department, i.e. the internal users.

Access to information supports effective decision making; this is probably the most significant contribution that digital spatial data can offer in tackling the LS department’s work backlog problems discussed in the previous chapter. Lack of proper, precise and up to date information, and the absence of a centralised data bank that can be immediately accessed by officers in the various land offices in Sabah is one of the main sources contributing to the significant backlog problem in land application. Excluding other delaying factors such as the need for consent or approval, i.e. signature, from senior authorities for some types of LAs and political interference in an application, the uncertainty that arises due to the lack of land information according to interviews from
officers of the LS department, is a significant delaying element in decision making by the ACLR offices. If all the information required e.g. for commenting on an application is instantaneously available at the commenting stages, then it may be possible to reject or further process an application within a shorter time framework, and prevent backlogs from accumulating.

During the research attachment and data collection phases of this research, the following have been identified as potential efficiency benefits. These are particular to the LS department although it is anticipated that if an integrated LIS can be developed in the future where other government ministries or agencies can access the required spatial data sets, more efficiency benefits can be expected.

The 1991 ‘Land Matters’ study by the IDS estimated that the LS department is capable of processing 10,000 LA per annum which on average, still holds to this day (IDS, 1991). The process involved in approving or rejecting a LA at present involves *inter alia*, the inspection of existing cadastral sheets or locality plans on which area sketches of previous applications are plotted; in some instances, site inspections are also carried out. Problems involving time arise when accessing these records and ensuring their verifiability or currency. At the LS department HQ for example, cadastral sheets required for plotting or cross-checking purposes have at times, been reported missing which results in consequential delays to the tasks at hand. With a LIS infrastructure, immediate access to land related data even in the form of a screen display may result in a direct benefit to the LS department in the form of costs saved. Assuming that there are 10,000 transactions per annum and that a saving of two hours involved in accessing the required land information is possible with digitised data, then the following savings can be calculated:

\[
10,000 \times (MR16 \times 2) = MR320,000
\]

The titles section at the LS department’s headquarters has a minimal work backlog partly due to their early exposure and use of computers in the preparation of draft land titles and for the recordation of ownership and status details (Simpson, 1976). However, in other land matters classified in Table 7.6 above, e.g. the conversion of titles, vesting orders and compulsory acquisitions, revocation of land, etc. the availability of digital spatial data will aid in many aspects of the preliminary stages of any land application, as implied in the
various flow diagrams in the previous chapter. This is due to the fact that consulting existing land record details and other information contained in cadastral sheets and plans for various verification purposes is a necessity before any planned development from the status quo can take effect.

Hence, any digitised data sets that are easily accessible to departmental users provide real benefits in terms of cost savings. Under the heading of ‘Other Land Matters’ summarised in Table 7.6 above, the number of cases and lots, excluding registered dealings of leases, amounted to 1,382 cases covering an area of 244,123 Ha. and 18,558 lots for the implementation of smallholders schemes with an area over 105,181 Ha. Assuming then a minimal saving of one hour per transaction can be expected with a LIS infrastructure in place, then the efficiency savings can be estimated in both cases, i.e.

\[
1,382 \text{ cases} + 18,558 \text{ lots} = 19,940
\]

which should result in a savings of \(19,940 \times \text{MR16} = \text{MR319,040}\) per annum.

Similarly in matters related to surveys, substantial savings can be made if spatial data sets are available on-line. The informational requirements of the users may differ slightly from those above but broadly, these can be categorised as cadastral sheets, traverse volumes, i.e. the record of co-ordinated observation markers or boundaries of land parcels, and area zoning or planning schemes for urban areas. The functions of the District Survey (DS) offices as mentioned in the previous chapter, are technical in nature and their outputs are mainly concerned with the execution of cadastral surveys and the process of producing cadastral plans for subsequent drafting of individual parcel plots onto draft titles at the LS department HQ. This is in contrast to the duties of the Assistant Collector of Land Revenues (ACLR) which are more managerial and administrative in nature. Both the DS and the ACLR stand to benefit with the availability of digitised data. Instantaneous access to digitised land information will reduce the time taken by their staff in carrying out their daily tasks e.g. in plotting cadastral plans and for various other cross-checking or verification reasons.

In some parts of the land information management process within the LS department, computer usage has been intensified since 1989, as reviewed by Meinin (1996) on the state of the Sabah LIS. However, although a significant proportion of the state’s cadastral
sheets have been digitised (90% until mid-1996), these are not available on line; their functions have mainly been the production of hard copy products (Land and Surveys department, 1996). The traverse volumes mentioned earlier are one of the most used land information records not only by departmental staffs but also by the licensed land surveyors (LLS) who require data control data before commencing any survey; these however have not been digitised. Hence, in tasks or processes of land management such as the recording of survey files, papers, cadastral plan checking, plotting, titles preparation, etc., there is also a time element involved in accessing or searching for the required data records stored in some hard copy medium. If these can be digitised and are available on line, even an hour of time saved on all individual cadastral survey related tasks such as subdivision, amalgamation of titles and other related tasks can result in significant savings. Grouping the outputs under the heading of Survey Matters and the Task Force (See Table 7.6) whose main concern is the surveys of LA involving native customary rights (NCR) but excluding the issuance of SP/RSP, the following one hour benefits estimate can be assessed under a LIS infrastructure:

\[23,601 \times \text{MR16} = \text{MR377,616}\]

The Control Survey Section of the department is responsible for maintaining existing control points and the densification of GPS controls in the State. The main benefit of computerised on-line spatial data availability such as traverse volumes and plans are largely similar to those of the DS and Task Force above. Assuming that a saving of an hour is possible on each product or service output, then the following assessment can be anticipated:

\[1,078 \times \text{MR16} = \text{MR17,248}\]

Tasks undertaken by the Photogrammetric section will also enjoy similar potential benefit although computers have already been used to upgrade the existing analogue photogrammetric instruments in the LS department. According to Wan (1996), significant savings in plotting overlaps from aerial photographs have been achieved since the use of computers in plotting and have increased outputs by more than 50%. Assuming that a saving of half an hour is possible on all outputs with the on-line availability of associated
information for each task, then the 690 individual tasks in 1995 can result in a saving of MR5,520.

The Cadastral Digital Mapping System (CDMS) involves the conversion of digital cadastral sheets which are subsequently stored on magnetic tapes or disks. In the data conversion process, spaghetti data form the core data sets, i.e. there is no connectivity of points, areas or polygons; only cadastral boundary parcels are captured and no integration with parcel records such as ownership or value exists. The text placement of bearings, distances, station numbers and the coordinates of major controls however also form part of the tasks involved. No direct anticipated benefits can be identified from this section's output as the data conversion forms a part of the building up process of the LIS infrastructure.

The Cadastral Processing Section (CPS) at the HQ is responsible for plotting cadastral plans for the West Coast (North and South Divisions), which covers eight districts. Similar to the tasks executed at the district lands or surveys offices of the LS department, the on-line accessibility of cadastral plans and coordinates should, at the minimum, reduce the time involved in searching for a particular piece of land information. Although individual cases apply in the amount of detail required for processing a particular SP or RSP, a savings of one hour on each of the plotted lots will result in a saving of 1059 x MR19 = MR16,944.

Another common form of LIS benefit involves the reduction of space required for storing hitherto paper based records such as maps and cadastral sheets; these tasks are grouped under the Map Revision, photo library and photography section. With the use of digitised data over time, their ability to replace existing records will result in decreased space requirements for the storage and maintenance of these records. Consequently, any space rental specifically paid for storing these records should decrease in the future or may otherwise be used for other purposes, as stated by the LGMB (1991) study. However, no data regarding the rental paid by the LS department were available to the author and hence, no realistic estimate of this benefit can be presented here.

There is thus quite a substantial amount of potential saving that can be enjoyed by the department if on-line accessibility to land records were available, particularly those related
to cadastral surveys and plan checking. In addition to verifying the mathematical integrity, cadastral plan checking is usually designed to \textit{inter alia}, ensure security of title, integrity of the survey system, and maintaining the reliability of the cadastral record. To a certain extent, the computerisation program within the LS department to date has been designed to tackle the manual and mechanically inclined tasks of the cadastral process such as the mathematical checking of traverses, recordation and plotting of cadastral survey outputs.

\textbf{7.3.3 Overview of Efficiency Benefits}

The foregoing efficiency benefit assessment of the LS department's output for 1995 is summarised below:

- Processing land applications  \hspace{1cm} 10,000 \times 19 \times 2 = \text{MR320,000}
- Handling of other land matters\hspace{1cm} (i.e. land transactions)\hspace{1cm} 19,940 \times 19 \times 1 = \text{MR319,040}
- Cadastral survey matters \hspace{1cm} 23,601 \times 19 \times 1 = \text{MR377,616}
- Control survey section \hspace{1cm} 1078 \times 19 \times 1 = \text{MR17,248}
- Photogrammetric section \hspace{1cm} 690 \times 19 \times 0.5 = \text{MR5,520}
- Cadastral Processing system \hspace{1cm} 1059 \times 19 \times 1 = \text{MR16,944}

\begin{center}
\begin{tabular}{l c}
\hline
\textbf{Total} & \text{MR1,056,368} \\
\hline
\end{tabular}
\end{center}

Based on the analysis above of a typical LS department annual output, the efficiency savings with a LIS infrastructure amounts to an annual saving of MR1,056,368, or approximately MR1.1 million per annum. These benefits can be achieved by improvements in accessing, searching and displaying the land records and are conditional upon the following assumptions and requirements:

- That the related cadastral maps, plans or standard sheets have been digitised and are available on line, if necessary, at the basic land parcel or property unit level to the users whose data requirements need to have been determined in advance.
- Other associated land records and information pertaining to the basic land parcel unit are similarly connected and available on-line to all internal users, e.g. commenting sections of the ACLR offices, survey parties and drawing offices of the LS department; it may be necessary to link data sets with other departments.
• Equally crucial is the level of computer usage competency of the end users who must be confident in utilising and accessing the digitised spatial data sets; as implied in earlier chapters, this may prove to be the most significant hurdle before any realisation of the benefits is possible. It implies awareness, education and training.

Hence, investment in the LIS computing infrastructure encompassing e.g. data conversion and training, plays essential roles in fulfilling the anticipated benefits above. Thus, many savings are achievable only after a minimum threshold of data conversion and usage, i.e. critical mass, has been attained. A modern LIS should thus improve departmental communications within and among the various Land Offices, provide timely information on land status details, promote increased productivity in cadastral plan checking and plotting, in addition to delivering efficiency benefits which should reduce costs in the long term.

7.4 Intangible LIS benefits to the LS Department

Intangible LIS benefits are not quantified in this research as this is fraught with difficulty and may merit a separate study on its own; the focus so far has been on minimising the inefficiencies and ineffectiveness to the LS department and the State, in general. Much has been stated on intangible benefits but as concluded earlier, their quantification is subject to the land information environment in which they are used and analysed. LIS improvements on the management of land information in terms of quality, flexibility, responsiveness, improved customer service or relationship and functional integration of tasks, to mention a few, are difficult to assess in clear monetary terms using traditional financial based evaluation techniques. In addition, these usually occur over a period of time.

One of the most significant intangible benefits that a modernised cadastre based LIS can offer to the LS department in Sabah will probably be the increased public confidence in the department's role in delivering its products and services. In recent years, the LS department has not received favourable reviews from the public mainly due to the huge work backlog, namely land titles and replies to land applications. Lately, for example, the department was reported as having the highest number of public complaints in the state
and implied as one of the most inefficient state agencies in Sabah (Daily Express, 16 August, 1996). These complaints were mainly for delays in carrying out its functions, relating to land titling and land applications.

In another report, the present Chief Minister (CM) of Sabah Mr. Yong Teck Lee in commenting on undeveloped land in the district of Kudat in Sabah, highlighted the need for a new approach to deal with villagers who had worked on government land prior to getting approval for their land titles (Daily Express, 9 December 1996, Headlines). It was reported that “this showed proper attention was seriously lacking among the government agencies that failed to develop the land with the villagers doing it faster”. Significantly, the CM attributed this to lengthy delays in getting approval from the Lands and Surveys Department and that the villagers had applied for titles to the land which they wished to develop but were frustrated by the ‘tardy application’ process. As observed by the CM (Daily Express, 9 December 1996, Headlines):

"It may take one year or even 25 years in some cases to get the land titles. Once they have submitted their applications, the particular land can't be developed until it is approved... Sometimes, before the applications are approved, they (villagers) will go ahead with it."

Such a comment from the highest authority in the state on the performance of the LS department is thought provoking; it requires a re-thinking in present processes and begs for options to improve existing products and services supplied by the department. However, even if assuming that improvement can be identified with a LIS infrastructure such that it prevents similar remarks from being made and which is clearly a form of benefit, it would be extremely difficult to assess how much this will be worth in clear monetary terms.

It would however be unfair to solely blame the LS department for the various work backlogs, which has tarnished its image in the eyes of the public. The department as mentioned in the previous chapter, has basically inherited a system of land information management from the earlier British colonialists whose rules, laws and standard operating procedures and protocols, although well intended in that they were designed to create a formal land market, are ill equipped to meet the modern land markets economic scenario. The consequences are the various inefficiencies and ineffectiveness mentioned earlier.
Another difficult benefit to assess is the impact of reducing the backlogs to the activities of the land market, such as the increased number of land transactions. Land tenure regularisation should establish a new and supposedly more secure decision making environment for the holder of land in order to encourage more investments and more productive use of land. Meanwhile, from the state’s perspective, the efficient, effective and improved procedures of managing land information will promote the creation of a conducive and responsive atmosphere for the land market, e.g. higher public confidence in the system, increased revenue for government from more land transactions, etc. Quantifying and assessing all the possible economic impact of any improvement to the management and accessibility of land information remains a largely subjective end-user matter, although generalisations based on market-type survey data may be used to assess the consequences; this however is beyond the scope of this research.

7.5 Overview of Sabah’s Economy

The foregoing has assessed the potential efficiency and effectiveness benefits of a LIS and identified some conditions, particularly related with data, that must be met if the state and LS department in particular, are to enjoy the maximum gains from any investment in building up a LIS infrastructure. However, based on observations and interviews during the research attachment in Sabah as well as an awareness of past State and Federal government relations, it is postulated that matters regarding funding and political support are of crucial importance to achieving any LIS vision in the state, essentially because it requires support from both sides. Although the state of Sabah has vast natural resources, there are significant limitations in its ability to control its funds primarily because of the decision to join in the formation of Malaysia in the early sixties which was formalised on 16 September 1963 (Kitingan and Ongkili, 1989). The following will analyse the economic scenario in Sabah particularly in matters of State-Federal finance in order to examine the options of how and where potential funding for a LIS can be obtained.

Sabah’s revenue sources are limited by Articles 109, 110 and 112c of the Federal Constitution (IDS, 1991; Pang and Vun, 1994). It is difficult to calculate the precise wealth of Sabah in the absence of official government data but this will nevertheless be
attempted in the following because of its relevance to this research. Of particular interest here are the expenses incurred by the state in managing its land related information as part of the responsibility in its daily administration, regulating and as a means for generating state revenues from the land markets. Table 7.7 below summarises Sabah’s total earnings and expenses from 1994-1996, compiled from the state’s official yearly estimates of revenue and expenditure.

**Table 7.7: Sabah’s Revenue and Expenditure Estimates for 1994 to 1996 (Source: Compiled from Sabah’s Annual Estimates of Revenue and Expenditures 1994-1996)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REVENUE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Revenue</td>
<td>1,986,435,385</td>
<td>1,242,759,211</td>
<td>1,594,291,973</td>
</tr>
<tr>
<td>Federal Grants, Contr. and Reimbursements</td>
<td>60,920,600</td>
<td>72,143,500</td>
<td>74,380,500</td>
</tr>
<tr>
<td>Development Fund Receipts (Exclude Contribution from supply budget)</td>
<td>41,204,680</td>
<td>60,430,207</td>
<td>133,833,285</td>
</tr>
<tr>
<td>Contribution from Surplus of Development fund</td>
<td></td>
<td>57,345,903</td>
<td>19,300,680</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>2,088,560,665</td>
<td>1,432,678,821</td>
<td>1,821,806,438</td>
</tr>
<tr>
<td><strong>SUPPLY EXPENDITURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Recurrent Expenditure</td>
<td>583,111,770</td>
<td>597,209,520</td>
<td>672,265,210</td>
</tr>
<tr>
<td>b) Special Expenditure</td>
<td>738,705,820</td>
<td>210,151,590</td>
<td>198,766,150</td>
</tr>
<tr>
<td>c) Contribution To Statutory fund (Excl. Contribution to Development fund)</td>
<td>4,000,010</td>
<td>10,000,030</td>
<td>75,000,020</td>
</tr>
<tr>
<td><strong>DEVELOPMENT EXPENDITURE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Federal Reimbursement grants</td>
<td>14,664,630</td>
<td>19,774,630</td>
<td>23,341,870</td>
</tr>
<tr>
<td>b) Federal Loans</td>
<td>13,320,050</td>
<td>15,147,050</td>
<td>85,000,000</td>
</tr>
<tr>
<td>c) State Funds (1) Dev. Exp. Financed by Contribution from Supply Budget</td>
<td>708,464,557</td>
<td>475,000,000</td>
<td>633,180,000</td>
</tr>
<tr>
<td>(2) Dev. Exp. Financed by Surplus of Development Fund</td>
<td>57,345,893</td>
<td>9,300,680</td>
<td></td>
</tr>
<tr>
<td>d) Contingencies reserve</td>
<td>10</td>
<td>760,822,550</td>
<td></td>
</tr>
<tr>
<td>e) Dev. Exp. To be Financed by other sources</td>
<td>25,508,527</td>
<td>25,491,415</td>
<td></td>
</tr>
<tr>
<td>Total Expenditure</td>
<td>2,062,266,847</td>
<td>1,410,137,250</td>
<td>1,732,345,345</td>
</tr>
</tbody>
</table>

Table 7.8 however portrays a more detailed view of the state’s income sources particularly the major forms of revenue. It is clear that Sabah’s GDP fluctuates but averages between MR 1.5 to 2.0 billion per annum over the past few years. Although there are altogether more than 120 revenue sources for Sabah, the annual earning is largely dependent on 10 major sources that contributed an average of 79.9 per cent to the
total state revenue between 1980 and 1993 (Pang and Vun, 1994), i.e. 8 percent of the revenue sources contributed to 80 per cent of the total revenue. These major revenue earners are:

- Royalty and fees on forest produce
- Export royalty on timber products
- Premium on round logs
- Import duty on petroleum
- Excise duty on petroleum
- Land rent
- Premium from land sale
- Petroleum royalty
- Interest from cash balances
- State road grant (discontinued in 1993)
<table>
<thead>
<tr>
<th>Year</th>
<th>Royalty and Fees and Forest Produce</th>
<th>Export Royalty on Timber Products*</th>
<th>Premium on Round Logs**</th>
<th>Revenue from Timber</th>
<th>Import Duty on Petroleum</th>
<th>Excise Duty on Petroleum</th>
<th>Petroleum Royalty</th>
<th>Revenue from Petroleum</th>
<th>Land Rent</th>
<th>Premium from Land Sale</th>
<th>Revenue from Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>1,036.8*</td>
<td>0.1</td>
<td>1,036.9</td>
<td>19.4</td>
<td>17.1</td>
<td>91.6</td>
<td>128.0</td>
<td>5.1</td>
<td>18.3</td>
<td>23.3</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>731.0</td>
<td>0.3</td>
<td>731.3</td>
<td>19.5</td>
<td>17.2</td>
<td>81.1</td>
<td>117.8</td>
<td>6.2</td>
<td>20.2</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>968.0</td>
<td>4.2</td>
<td>972.3</td>
<td>15.8</td>
<td>25.9</td>
<td>87.7</td>
<td>129.4</td>
<td>6.6</td>
<td>30.1</td>
<td>36.7</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>768.8</td>
<td>16.6</td>
<td>786.6</td>
<td>18.5</td>
<td>34.3</td>
<td>118.8</td>
<td>171.6</td>
<td>8.5</td>
<td>30.5</td>
<td>39.0</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>665.8</td>
<td>15.0</td>
<td>686.0</td>
<td>10.7</td>
<td>44.7</td>
<td>104.6</td>
<td>160.0</td>
<td>8.6</td>
<td>71.3</td>
<td>79.8</td>
<td></td>
</tr>
<tr>
<td>1985</td>
<td>465.0</td>
<td>16.2</td>
<td>486.1</td>
<td>9.5</td>
<td>51.9</td>
<td>104.3</td>
<td>165.7</td>
<td>8.8</td>
<td>147.8</td>
<td>156.6</td>
<td></td>
</tr>
<tr>
<td>1986</td>
<td>523.7</td>
<td>14.2</td>
<td>541.0</td>
<td>13.5</td>
<td>93.5</td>
<td>81.0</td>
<td>187.9</td>
<td>8.6</td>
<td>17.5</td>
<td>26.0</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>962.2</td>
<td>15.3</td>
<td>990.6</td>
<td>10.8</td>
<td>82.5</td>
<td>61.3</td>
<td>154.6</td>
<td>10.7</td>
<td>23.6</td>
<td>34.4</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>1,037.6</td>
<td>18.2</td>
<td>1,073.8</td>
<td>13.9</td>
<td>101.9</td>
<td>77.1</td>
<td>192.9</td>
<td>13.4</td>
<td>31.8</td>
<td>45.2</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>856.5</td>
<td>27.5</td>
<td>905.3</td>
<td>19.6</td>
<td>92.1</td>
<td>83.5</td>
<td>195.1</td>
<td>13.1</td>
<td>88.3</td>
<td>101.4</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>749.0</td>
<td>40.7</td>
<td>897.7</td>
<td>22.0</td>
<td>81.1</td>
<td>115.4</td>
<td>218.5</td>
<td>15.1</td>
<td>35.5</td>
<td>50.5</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>578.3</td>
<td>88.7</td>
<td>690.6</td>
<td>31.1</td>
<td>121.3</td>
<td>154.8</td>
<td>307.2</td>
<td>18.4</td>
<td>40.1</td>
<td>58.5</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>641.5</td>
<td>166.7</td>
<td>845.5</td>
<td>67.1</td>
<td>127.9</td>
<td>111.5</td>
<td>306.6</td>
<td>18.9</td>
<td>44.0</td>
<td>62.9</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>372.1</td>
<td>283.5</td>
<td>686.0</td>
<td>97.0</td>
<td>119.8</td>
<td>107.6</td>
<td>324.4</td>
<td>21.3</td>
<td>50.2</td>
<td>71.5</td>
<td></td>
</tr>
<tr>
<td>1994***</td>
<td>304.0</td>
<td>330.0</td>
<td>669.0</td>
<td>95.0</td>
<td>120.0</td>
<td>80.0</td>
<td>295.0</td>
<td>34.0</td>
<td>40.0</td>
<td>74.0</td>
<td></td>
</tr>
</tbody>
</table>

*(Millions)

Note:

* Known as “Sawn Timber Export Cess” prior to 1993

** Known as “Timber Premium Extraction Charges (Other than Settlement Scheme)” prior to 1993

*** Estimate
CONTINUATION OF TABLE 7.8: Major Components of State Revenue (Adapted from Pang and Vun, 1994)

<table>
<thead>
<tr>
<th>Year</th>
<th>Interest on Cash Balances</th>
<th>State Road Grant</th>
<th>Sub-Total Major Revenue</th>
<th>% to Total Major Revenue</th>
<th>Other Revenue</th>
<th>Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>97.7</td>
<td>19.5</td>
<td>1,305.6</td>
<td>84.9%</td>
<td>237.9</td>
<td>1,538.3</td>
</tr>
<tr>
<td>1981</td>
<td>94.9</td>
<td>15.8</td>
<td>986.2</td>
<td>81.8%</td>
<td>226.4</td>
<td>1,206.1</td>
</tr>
<tr>
<td>1982</td>
<td>104.4</td>
<td>47.4</td>
<td>1,290.3</td>
<td>87.1%</td>
<td>202.4</td>
<td>1,481.7</td>
</tr>
<tr>
<td>1983</td>
<td>54.6</td>
<td>23.7</td>
<td>1,075.6</td>
<td>81.8%</td>
<td>266.4</td>
<td>1,315.6</td>
</tr>
<tr>
<td>1984</td>
<td>77.9</td>
<td>59.6</td>
<td>1,063.4</td>
<td>79.6%</td>
<td>301.5</td>
<td>1,336.2</td>
</tr>
<tr>
<td>1985</td>
<td>60.7</td>
<td>48.8</td>
<td>917.9</td>
<td>79.4%</td>
<td>268.5</td>
<td>1,156.4</td>
</tr>
<tr>
<td>1986</td>
<td>40.0</td>
<td>126.7</td>
<td>921.7</td>
<td>83.8%</td>
<td>203.6</td>
<td>1,099.5</td>
</tr>
<tr>
<td>1987</td>
<td>27.0</td>
<td>37.9</td>
<td>1,244.6</td>
<td>88.2%</td>
<td>206.0</td>
<td>1,411.5</td>
</tr>
<tr>
<td>1988</td>
<td>49.9</td>
<td>56.6</td>
<td>1,418.3</td>
<td>69.6%</td>
<td>669.2</td>
<td>2,037.9</td>
</tr>
<tr>
<td>1989</td>
<td>79.7</td>
<td>57.5</td>
<td>1,338.9</td>
<td>76.8%</td>
<td>467.0</td>
<td>1,744.0</td>
</tr>
<tr>
<td>1990</td>
<td>95.3</td>
<td>63.8</td>
<td>1,235.8</td>
<td>76.3%</td>
<td>384.1</td>
<td>1,619.9</td>
</tr>
<tr>
<td>1991</td>
<td>94.2</td>
<td>99.2</td>
<td>1,249.6</td>
<td>84.4%</td>
<td>230.3</td>
<td>1,480.0</td>
</tr>
<tr>
<td>1992</td>
<td>83.1</td>
<td>98.9</td>
<td>1,396.9</td>
<td>69.7%</td>
<td>607.8</td>
<td>2,004.7</td>
</tr>
<tr>
<td>1993</td>
<td>57.1</td>
<td>14.5</td>
<td>1,153.4</td>
<td>86.6%</td>
<td>178.9</td>
<td>1,332.3</td>
</tr>
<tr>
<td>1994**</td>
<td>70.0</td>
<td>1,108.0</td>
<td></td>
<td>54.1%</td>
<td>939.4</td>
<td>2,047.4</td>
</tr>
</tbody>
</table>

The state’s dependency on a few core sources is best exemplified by the fact that timber related resources accounted for 53.3 per cent of the revenue for the period 1980-1993 while the other components, i.e. premium on round logs, import and excise duties on petroleum, land rent and premium, petroleum royalty, state road grant, and interest on cash balances and short term benefits, together contributed only 26.7 per cent over the same period (Pang and Vun, 1994). The previous government’s decision on 11 May 1993 to ban the export of round logs and concentrate on the downstream processing of timber in order to preserve the state’s forest resources had a marked impact on the state’s income. According to a recent report in Sabah (Daily Express, 23 November 1996), this cost the state between MR1.2 and MR1.5 billion in potential timber revenue. However, this policy has since been revoked by the present National Coalition Front Government with effect from 1st November last year, stating that the aims of the previous government to promote the downstream processing industry and to manage the forest on a sustainable basis to maximise social, economic and environmental benefits, were not achieved.

As opposed to other state revenue sources however, the contribution from land witnessed a consistent increase over the years. In 1980 for example, the MR23.3 million revenue increased to an estimated MR74 million in 1994; the surge in revenue in 1985 and 1989 can be attributed to the sale/lease of prime land by the state government. According to the
latest state budget debate, the anticipated income from land is expected to be MR75 million to MR80 million but "may reach MR90.36 million following the Government's decision to implement the public auction drive on prime urban land" (Daily Express, 19 November, 1996).

However, Sabah's true revenue is difficult to ascertain because of the fact that a large proportion of the state's income is directly collected and controlled by the Treasury Ministry of the Federal Government. An informative study on this matter has been carried out by Sabah's Institute of Development Studies that resulted in a report entitled 'Federal State Finance' (IDS, 1989), which essentially argued for more equitable revenue sharing arrangement between Sabah and the Federal Government (FG).

One of the main arguments of the paper was that while there was a noticeable outflow of rightful state revenues to the FG, i.e. from income taxes (company and individuals), custom duties (on excise, export and import), sales and service tax, stamp duty and other forms of taxes (additional taxes and postal services), federal development funds to Sabah were inadequate in addressing the state's development, social and economic needs. The state has therefore had to rely on its own limited income sources for funding development programs.

The IDS study also proposed that the state's 5% share from petroleum should be increased considering the fact that the state was lacking nationally in many spheres of socio-economic development. At the time of the study in 1989, these included poverty (33.1% for Sabah as opposed to 31.9% for Sarawak and 18.4% in the Peninsula), education (40% of Sabahans were illiterate and more than 70% of teachers under qualified at primary school level), medical (Sabah has the lowest doctor population ratio in Malaysia with 1:7000 compared with 1:3517 at the national level) and basic infrastructure facilities such as roads, electricity and water supply which were then and still are to a large extent, underdeveloped (IDS 1989). As succinctly stated by the IDS (1989) study, "Those lacking are mainly Federal responsibility but many a time the State Government has to supplement due to insufficient allocation by the former".

Similar with the recruitment of division one civil officers, i.e. graduates, into the civil service mentioned earlier in Chapter Four, federal government approvals to requests for
development funds by the state also always fall short of the state’s real demands and needs. The study stated for example, that in terms of percentage share over the past four five-year Malaysia Plans, federal contributions into the state’s operating revenue have dwindled from 45% to around 6% as shown in Table 7.9. As mentioned by the report, “this means that the State Government shouldered more than 80% of its annual operating procedures”.

**TABLE 7.9: Comparison of Federal and State contributions to the Malaysia Plans (Adapted from IDS, 1991)**

<table>
<thead>
<tr>
<th>Year</th>
<th>State Fund</th>
<th>%</th>
<th>Federal Fund</th>
<th>%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971-1975</td>
<td>1,097,192,943</td>
<td>82</td>
<td>201,008,837</td>
<td>18</td>
<td>1,298,201,780</td>
</tr>
<tr>
<td>1975-1980</td>
<td>4,729,367,228</td>
<td>93.7</td>
<td>296,494,564</td>
<td>6.3</td>
<td>5,025,861,792</td>
</tr>
<tr>
<td>1980-1985</td>
<td>6,075,253,036</td>
<td>93.1</td>
<td>420,847,115</td>
<td>6.9</td>
<td>6,496,100,151</td>
</tr>
</tbody>
</table>

It should be stated however that the IDS study has been banned from the public because of its obvious sensitivity. However, a realistic overall picture of the state’s revenue is necessary for this research because a national LIS requires major investment and it is important to assess all the possibilities and identify the constraints. In order to appreciate the magnitude of the FG’s economic impact to the state, the following are major classification of Federal contribution to the State government:

1. Supply/Operating Grants that include:
   - Capitation grants which are paid to each Malaysian state based on the population size. For Sabah, this averaged MR5 million between 1964-1987,
   - State Road grants, which are meant for the maintenance of roads in the state. However, the IDS study opined that the present rate was far short of the actual costs; the Federal rate which was last reviewed in 1984 provides MR 11,853 per mile for each standard road and MR 8,530 for sub-standard. State authorities on the other hand calculated that this ranged from MR 3,418 to MR 27,859 per mile (average MR15, 638) but can reach MR42,963 per mile per annum. The yearly average for the similar period was approximately MR19.5 million with the payment in 1987 reaching MR 37,935,218. As argued by the study, there is a strong case for a larger grant because road taxes and licenses have been taken over by the Federal Government.
• Special Grant, which was designed so that Sabah, Sarawak and other states always had sufficient operating fund. Although initially agreed since Malaysia’s Formation to be at 40% from the net Federal revenue from Sabah, this was eventually fixed at MR 26.7 million per year since 1974.

• Revenue Growth Grant, which was established under the Revenue Growth Grants Act (1977) and later repealed by the Revenue Growth Grants (Amendment) 1980; whereby every state government received the grant when the Federal revenue increases by 10 per cent but not more than 100 million in a particular year. Sabah’s annual revenue under this grant averaged at around MR 4 million since its inception. Half of the grant is allocated based on the per capita GDP where states having lower than the national average GDP per capita were qualified. Sabah however does not qualify for this grant because the entire production of crude petroleum from Sabah’s territory is included in its GDP. As argued by the IDS study (1991), this is “unfair” since Sabah actually gets only 5% of the total sale of petroleum.

(2) Development Grants.
This comes in various forms and on average since 1980 to 1987, the state obtains between MR 20-25 million per year. There are three forms of development grants:

• Federal Reimbursable Grant (FRG), which was used in the State Development Budget since 1978 and denotes the scenario where the federal government reimburses 50% of the State Government expenditure on any development project that falls under the Concurrent List

• Growth Revenue Grant. Not to be mistaken with the Federal Revenue Growth Grant above, this is apportioned among the states whose per capita GDP is below the national average and utilised for development projects determined by the National Federal Council.

• Grants for the development of the economy, infrastructure and well-being of the people, whereby MR100 million was allocated by the Federal Government after a National Finance Council meeting in 1983, to be shared among the states. Between 1983-1985, Sabah annually received MR6.2 million and MR6.4 million in 1986, which decreased to MR 5.46 million in 1987. As stated by the IDS study however, there is no
clear formula/method used to derive the amount, as is the method of determining the level of development of the economy, infrastructure and well being of the people.

(3) Direct Federal Grants (DFG)

DFG are remitted directly to the State departments carrying out duties on behalf of the Federal government that include *inter alia* research, surveying (usually national control survey), extension services and other development projects such as trunk roads and rural water supplies. These are commonly known as allocations under the Five Year Malaysia Plans (MP) explained earlier in Chapter Four where the FG's contributions are summarised in Table 7.9 above. The amount of grant according to the IDS (1991, p.39) study "is arbitrarily determined by the Federal Government which is normally less than the amount requested by the State Governments."

It is therefore clear that if one were to base the amount of revenue channelled to the FG and assess these against the amount that are diverted back to the state for development purposes, the Federal Government's contribution to the state does not appear to be equitable considering that Sabah is still lacking in many areas of socio-economic development. Between the period of 1985 to 1992 for example, it was reported that the FG has allocated MR872.5 million to Sabah but has collected revenue from Sabah amounting to MR6,306.53 million (Daily Express, 24 November 1992). Hence, over this period, the direct FG grants to the state, on average, do not appear to exceed MR150 million per annum, while the FG has instead continuously collected MR900 million annually.

### 7.6 Consequences of State-Federal Relations to the funding of LIS in Sabah

The heart of the issue is one of finance for the LIS infrastructure and the ability of the LS department to e.g. expand its services particularly in recruiting qualified graduates to meet the ever-growing needs of development and in the context of this research, the land markets. These issues are analysed in the following.
The centralised nature of governance in Malaysia means that for 'surplus' states like Sabah with vast natural resources, they have limited access to enjoy their wealth because the major income sources have over the years since the formation of the Federation, been 'federalised'. The means for financial manoeuvre available to the state are therefore severely limited as requests to the Federal Government for allocations is a time consuming process and more significantly, is not a user driven approach; important decision making is not based on the views of those at the local (state) level but rather, of those at the top who usually have little understanding of the true scenario, apart from basing their decision from simplified statistical reports or trying to ensure that the funding requests do not exceed a certain budgetary amount. While it is appreciated that there is a need for some form of centralised planning for control, co-ordination, national integration and the requirement for overall monitoring of progress, it appears that the benefits of centralisation particularly in the case of Sabah above, can in fact slow down development.

The consequences within the state are far reaching. From Table 7.5 for example, the annual expenses of the LS department, i.e. personal emoluments, recurrent expenditures and special expenditures over the past three years have averaged at around 75%, 24% and 1% respectively. The amount of special expenditure is of particular importance in this case because this represents funding for new activities or the acquisition of additional equipment. There are thus limited options available within the LS department to internally finance and undertake major LIS infrastructures on their own as the bulk of the departmental expenses go towards staff salaries and other annually recurrent operational expenses. The funding options available to the LS department include the following:

- In the absence of expenditure funds, it may therefore be necessary to resort to the virement of existing funds originally designed for other purposes.
- The LS department may adopt strategies of 'commodifying spatial data' sets, i.e. charging or leasing for the usage of data owned by the department in order to raise the necessary funding for LIS and cost-recovery approaches.
- The LS department may request for additional funding via the proper channels to the State and Federal governments as mentioned earlier in chapter four. In such instances, added emphasis on the benefits and their quantification should be highlighted because in the past, these have not been emphasised enough.
• By increasing current levels of fees or land taxes. However, unless the quality and service of the end-results are felt by the users, e.g. the outputs deliverable within a short time span, these can provoke controversy.

In addition, the issues on State-Federal finance has also highlighted the scarcity of funds available to the state Treasury essentially because much of the state’s financial revenue does not accrue to the state but to the federal government. From the state’s perspectives, about 40% of the annual expenditure can be considered ‘fixed’, i.e. including payments for personal emoluments and recurrent expenses, as shown in Table 7.10 below.

**TABLE 7.10: The Major Components of Sabah’s Expenditure (Adapted from Pang and Vun, 1994)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Personal Emoluments</th>
<th>Recurrent Expenditure</th>
<th>Special Expenditure</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>111.9 (8.1%)</td>
<td>476.0 (34.4%)</td>
<td>795 (57.5%)</td>
<td>1,383.5</td>
</tr>
<tr>
<td>1981</td>
<td>133.3 (7.7%)</td>
<td>421.4 (24.2%)</td>
<td>1,183.5 (68.1%)</td>
<td>1,738.2</td>
</tr>
<tr>
<td>1982</td>
<td>139.9 (10.4%)</td>
<td>319.4 (23.8%)</td>
<td>881.2 (65.7%)</td>
<td>1,340.5</td>
</tr>
<tr>
<td>1983</td>
<td>142.9 (8.7%)</td>
<td>382.4 (23.2%)</td>
<td>1,120.3 (68.1%)</td>
<td>1,645.7</td>
</tr>
<tr>
<td>1984</td>
<td>140.4 (9.8%)</td>
<td>340.2 (23.7%)</td>
<td>956.6 (66.6%)</td>
<td>1,437.2</td>
</tr>
<tr>
<td>1985</td>
<td>137.2 (13.2%)</td>
<td>386.0 (37.2%)</td>
<td>514.0 (49.6%)</td>
<td>1,037.2</td>
</tr>
<tr>
<td>1986</td>
<td>150.4 (14.8%)</td>
<td>393.2 (38.6%)</td>
<td>474.4 (46.6%)</td>
<td>1,018.0</td>
</tr>
<tr>
<td>1987</td>
<td>158.0 (14.9%)</td>
<td>376.9 (35.5%)</td>
<td>526.4 (49.6%)</td>
<td>1,061.7</td>
</tr>
<tr>
<td>1988</td>
<td>161.4 (9.4%)</td>
<td>381.0 (22.2%)</td>
<td>1,173.0 (68.4%)</td>
<td>1,715.4</td>
</tr>
<tr>
<td>1989</td>
<td>173.0 (9.9%)</td>
<td>582.3 (33.5%)</td>
<td>985.4 (56.6%)</td>
<td>1,740.7</td>
</tr>
<tr>
<td>1990</td>
<td>182.6 (9.1%)</td>
<td>545.8 (27.3%)</td>
<td>1,269.8 (63.5%)</td>
<td>1,998.2</td>
</tr>
<tr>
<td>1991</td>
<td>198.0 (10.7%)</td>
<td>376.8 (20.4%)</td>
<td>1,273.6 (68.9%)</td>
<td>1,848.4</td>
</tr>
<tr>
<td>1992</td>
<td>228.6 (11.7%)</td>
<td>470.9 (24.0%)</td>
<td>1,260.8 (64.3%)</td>
<td>1,960.3</td>
</tr>
<tr>
<td>1993</td>
<td>258.2 (15.5%)</td>
<td>451.1 (27.0%)</td>
<td>960.7 (57.5%)</td>
<td>1,670.0</td>
</tr>
<tr>
<td>1994*</td>
<td>274.5 (13.5%)</td>
<td>308.6 (15.2%)</td>
<td>1,452.7 (71.4%)</td>
<td>2,035.8</td>
</tr>
</tbody>
</table>

Average 1980-1993: 11.5% 28.2% 60.8%

Note: * Estimate
Figures in brackets are percentages for the particular year.

Under these constraints, it is arguable that there may be other pressing socio-economic demands of the state requiring urgent funding, e.g. the provision of basic infrastructure facilities for the populace, rather than approving funds for IT acquisition alone; available funds may be better used for other purposes to serve the needs of the poor and needy. It is also problematic for the state to seek external aid or loans from other aid agencies such as the UN or AusAID as external affairs fall under the jurisdiction of the Federal Government. If past observations from senior State government officials and intellectuals are taken into consideration, e.g. Fung (1984), Kitingan, (1989) and Ongkili, (1989), then
funding to tackle the backlog problems will not be easy for Sabah and will at best, be gradual; these costs will be discussed in the next chapter.

7.7 Conclusions

This chapter has assessed the value of the state’s ineffectiveness in its land information management procedures, as well as the efficiency benefits that a modern LIS infrastructure may provide. Most of the effectiveness benefits, i.e. land titling, of a modern LIS to Sabah may not directly flow to the department; a large extent of these will accrue to the applicants themselves and the land markets in general. The most significant will be due to the wealth created by formalising land tenure and securing property rights, i.e. increasing the land market value. These benefits may not be immediate but an assessment of the increase in land market value as a result of titling implies that their potential may exceed MR1.2 billion.

The total efficiency benefits within the LS department assuming that all land records were digitised and accessible on-line is approximately MR1.1 million per annum. These savings were computed by analysing the annual typical land informational outputs provided of the LS department, i.e. for the year 1995. Within the LS department, the anticipated revenue should result in a minimum of MR235,000 per annum assuming that all untitled lands, i.e. backlogs, are titled. These however are conservative estimates because the amount is likely to be three or four times higher in practice as the revenue from the leases has been downplayed for the reasons stated earlier.

Hence, the tangible benefits of a LIS infrastructure to the LS department should amount to at least MR1.3 million per annum. Other state agencies or departments involved in the use of land information records who require access to the LS department’s data sets should also benefit in the long run, although their assessment was not carried out in this thesis; most queries pertaining to land records by other state departments and agencies are ad-hoc and usually unrecorded.

This chapter has also discussed the financial standing of the state, in particular its revenue sources and expenditures, and the contributions and influence of the Federal Government
to the State's economy. There appears to be a significant outflow of Sabah’s revenue to the Federal Government, compared with the amount that was channelled back to the state. The ratio is approximately six to one during the 1985 to 1992 period. The main reason for including this finding is to substantiate the need for more equitable State-Federal financing arrangements, in order to *inter alia*, fund a major LIS modernisation program for tackling the significant work backlogs within the LS department. While the benefits are substantial, the investment costs are nonetheless high, as will be discussed in the final chapter.
Chapter Eight
Research Analysis and Considerations for An Optimum LIS Investment

8.1 Introduction

This chapter will address the LIS investment problem that was outlined earlier in the thesis, based on the foregoing analysis, as well as from the arguments and evidences compiled. It will also propose solutions that are specific to the case study in Sabah, and derive some observations that may be of use to other developing nations.

8.2 Evidence for Investing in LIS Improvements.

It is clear that the management of land information, particularly when related to the processes of land development and land applications in Sabah, suffers from some deficiencies. The main consequences to the users, *prima facie*, include delays in obtaining approvals to land development requests and land titles, whilst from the government's perspective, it results in ineffective responses to informational queries regarding land status and loss of potential revenue. In addition, the negative impression by the public on the Sabah Lands and Surveys department in discharging its functions and responsibilities has also been questioned. This stems from the huge work backlog of the department, particularly in handling land applications, cadastral surveys and cadastral plan checking, all of which normally results in the provision of land titles.

This thesis has also quantified the cost of inefficiencies and ineffectiveness in the state's management of its land related information. It was estimated that delay in many forms of land application, e.g. land titles, was "suppressing" the potential value of land to the users. Briefly, the increase in land value as a result of granting title approvals to the end users amounted to approximately a one off created wealth of MR1.2 billion. The state is also losing about MR0.2 million in lost revenue annually resulting from these delays although as indicated earlier, this figure could be three or four times higher. In addition, the efficiency benefits of a LIS infrastructure to the LS department were also assessed. Assuming that all land information records were digitised and made available on-line to
the internal users, then a saving of MR1.1 million can be gained annually by the LS department.

Less obvious however are the benefits of secure land tenure to the communities or land dwellers who can use their titled land as valid collateral for raising capital or loans. The impact on the farmers’ incentive to till their land productively may also be affected, as discussed in the earlier Thailand study by Feder (1987), or by Williams and Stanfield (1993) in Trinidad and Tobago. Because titled land can be legally transacted, land occupiers may also have higher opportunities to participate in the formal land markets, e.g. they may now buy, sell, lease, rent out, subdivide, mortgage, etc. their secure interests in land.

The obvious question that follows from such an analysis is the investment, or the total costs, that should be allocated for realising the quantified benefits above, which are currently being foregone due to existing inefficiencies and ineffectiveness. This is addressed in the following.

**8.3 Present and Future Scope of LIS Investment in Sabah**

Until June of 1996, the official amount spent on computerisation since 1979 was about Malaysian Ringgit MR 9.9 million while the maintenance cost for the whole hardware (excluding those still under guarantee) was around MR 0.5 million. The maintenance agreements usually last for six months before they are renewed or extended.

A significant point within the LS Department (and in other government agencies) is the fact that to date, no prior quantitative benefits analysis evaluation studies have been conducted by the department, nor in any of the other governmental bodies who have invested in the technology. The overall attitude of the major players concerned is one of “computerisation”, with emphasis on the monetary justifications, accountability and feasibility of the system not high on the priority list. In terms of service benefits, there are some measures of success although from the business case point of view, some projects may need further assessment, particularly in addressing the real *user needs*. 
One of the best success story in the department is the use of computers in photogrammetric plotting. The overlap output before the use of computers (i.e. manually) was about 100 overlaps per year at 1:2500 scales. Over the past two years however, this has increased to more than 170, even with reduced staff going on training or study leave. The increase in output which presently averages at about 70% should help in addressing the current backlog overlap which stands at over 1000. This benefit however is not solely due to computers; part of the incentive is the New Remuneration Scheme or the Skim Saraan Baru (SSB) which attaches weight on output by staffs as a measure of competence and salary increments. The achieved output however would not have been possible without the aid of computers which reduced the time accorded to plotting the overlaps.

The use of computers for assisting in revenue collection has also achieved a considerable measure of success. The main benefit is that it allows the monitoring of payments by land owners, and searches are less tedious as aspects of records management and retrieval becomes a simplified matter with database technology. It allows users to pay for their land quit rents at any Land Office in the state and the system also allows for the printing of receipts; a simple output but nevertheless time consuming if done manually. The Land Revenue System (LRS) which has evolved from the Land Data Bank is instrumental to the department in managing, monitoring and compiling land quit rent collections and the arrears by the department. It should also allow the possibility of future longer opening hours by the land revenue counter.

The draft title preparation or Auto-documentation section in the LS department is one of the earliest to be computerised not only in the department but also the Far East (Simpson, 1976). This section which handles all lease transactions in the state essentially captures all the relevant records (e.g. as contained in LSF 9003 form) on magnetic disks and prints out draft titles. The transactions or memoranda handled with computers are approximately 2000 per month, with amendments amounting to about 500 monthly. The benefits of computers here is obvious; without the use of computers, the amount of output for printing the draft titles, recording the transaction details, etc. will be significantly reduced and will require more staff. Improvements to the current system are presently on going and the current concerns, among others, are with the data classification (e.g. of title, transaction, details, etc.).
The department's Land Information System (LIS) can broadly be divided into three main information components, which have further sub-component systems:

- Title Information
- Cadastral Information
- Land Use Information

Figure 8.1 classifies these major components and indicates the system description and data sources of the proposed Sabah LIS (SALIS) (Moinin, 1996). The goal is to integrate all the information contained above into a working and functional LIS allowing decision makers and users to query, retrieve, analyse, store, update and obtain spatial data in hard copy form; output from the system will include attribute and graphical data. Presently, each sub-system or module is at a different stage of development, data conversion and maturity. The implementation was initially based on computerisation, addressing the current problems which can be solved with computers and more latterly, towards attaining the LIS vision.
FIGURE 8.1: A General Outline of SALIS

SALIS

Title Information
Cadastral Information
Land Use Information

PRODUCT

ASCII
DXF, IGDS
DXF, IGDS

SYSTEM

I.R.S
TIS
TRS

LAPMOS
LDS
LAPMOS

CDMS
CPS
PDMS
RSS

SOFTWARE

COROLIC
IN-HOUSE

RPG/400
IN-HOUSE

MICRO
STATION

TOPDES

MICRO
STATION

PCI (EASI
PACE)

DBMS

UNIFY

AS/400

INFORMIX

INFORMIX

INFORMIX

ORACLE

HARDWARE

CMC-XL-40
(ITU)

COROLIC
IN-HOUSE

RPG/400
IN-HOUSE

TOPDES

PCI (EASI
PACE)

IBM AS/400

PCU 80

INTERGRAPH

ACER PC

INTERGRAPH
& ADAMS

ACER PC

SOURCE

LAND
APPLICATIONS
LAND
ACQUISITION
RECORDS

REVENUE
DEALINGS
LAND
APPLICATIONS
RECORDS

EXISTING
MAPS

FIELD SURVEY
DATA

AERIAL
PHOTOS

EXISTING
MAPS

REMOTELY
SENSED
DATA

TIS

CIS

LUIS
It is necessary to review the future computerisation plans of the LS department in order to relate future LIS investment to the situation in Sabah. Under the current Seventh Malaysia Plan (7MP), a proposal was requested by the LS department to the Federal Government amounting to MR8,775,600 for future computer acquisition (LS department, 1996, Working Paper). The main argument was to build the infrastructure for integrating the department's existing, albeit separate, computer systems, i.e. the Title Information System (TIS), Cadastral Information System (CIS), and the Land Use Information System (LUIS). Five distinct phases were proposed covering the five year Malaysia Plan period, each requiring substantial investment in hardware/software, for realising the department's LIS vision, which is summarised in the following [Figures in bracket indicate cost]:

- Module 1 (MR248,600) - Networking infrastructure within the LS department to replace the current 'batching system', i.e. periodic updating of Land Title information to the state Land Data Bank.
- Module 2 (MR521,000) - Pilot project for the creation of a State Digital Cadastral Database (DCDB) and 'Survey Office Management System'.
- Module 3 (832,600) - Computer acquisition for testing the Survey Office Management System'.
- Module 4 (MR951,400) - The creation of a client-server environment targeted for internal users, i.e. seniors officers and staff of the relevant sections.
- Module 5 (MR6,222,000) - To extend the networking access of Survey Office Management System to other district land offices.

It can therefore be seen from the above that there are initiatives by the LS department to create a LIS infrastructure, although presently it is being developed internally to suit its own needs. However, in the Working Paper mentioned above, i.e. the request for funds under the 7MP, no quantified benefits analysis was provided; the justifications were mainly explanatory with no assessment on where and how savings can be made.

Meanwhile, the progress of data conversion in the LS department as of mid-1996 is as follows:

---

• between 1991 to September 1996, 95% of the department’s spatial data sets consisting of land development plans have been digitised, while attribute data conversion, i.e. land titles information, have reached 35%.

• 80,000 land application files have been captured at the LS department, which were mainly designed for the effective searches for individual land applications.

It should however be stated that some of the data converted may not necessarily have been based on the needs of the users at the land application stages; at present, their contribution towards addressing the backlogs appears to be questionable, judging from the department’s huge work backlog. This however may change in the future as the department is still in the early stages of its LIS development. Taking the total computer allocation under the 7MP as a point of departure, i.e. MR8,775,600.00, an alternative scenario is proposed.

8.4 An Optimum LIS Investment Model in Sabah

While the vision of the LS department in the creation of a LIS and a Digital Cadastral Data Base (DCDB) is timely, the author is of the opinion that future investments and commitments to the LIS technology will greatly benefit if a comprehensive ‘LIS User Needs and Systems Review’ consultancy study or report were undertaken on the current land development planning, cadastral surveying and mapping system in Sabah, involving all the relevant departments. There are two main reasons for this proposal.

Firstly is the fact that to date, no such user based study on the efficacies of land information management processes and computer needs in the state has been undertaken. Expert advice and experience from experts or consultants should therefore be of value to the state in general and the LS department, in particular, on issues associated with the future administrative, institutional structure and technical requirements of surveying and mapping needs in Sabah. Secondly, it is also felt that any broad strategy recommendations from credible authorities should attract the attention and increase the awareness of the users of the many issues involved in spatial data management with computers, as observed in this thesis.
Such a study should ideally be contracted to an independent expert body or organisation, preferably of international repute in the area of land information management, whose experience should extend to developing countries. The matters that require immediate attention are those relating to an assessment of the current ‘processes’ of land development, and the effective use of technology to address problems. Within the State’s LIS implementers, there also appears to be an underestimation of the technology requirement, before it can be used in specific problem areas or applications. In addition, some of the contributing factors to the backlog in Sabah may not necessarily be addressed by computerisation but rather, may be due to unclear instructions resulting in lack of enforcement, or irregular practices. The study should analyse these instances and also review the State’s current strengths, weaknesses, opportunities and future threats in its management of land information. It is important that the investigation address not only the causes of the inefficiencies and ineffectiveness identified in this thesis, but also develop means to address them. It should be based on user needs, with the view of simplifying or streamlining current procedures and minimising bottleneck areas.

The exact cost of such an undertaking to the state is unclear. However, if the state of Victoria in Australia paid Aust$1 million for its 18 month GIS study to the consultants (Chan and Williamson, 1995), then it can be anticipated that it may cost a similar or higher amount to Sabah, because of the similarities in population size and area; this translates to approximately MR2 million. From the state’s perspective, it would appear to be prudent to act, where appropriate, on the findings and recommendations of such a review.

Alternatively, the state can also opt to continue developing its own system. Such approaches however should be balanced to meet the needs of users who require land related data at the cadastral (LIS) level, as well as those at the environment or resource level. Acknowledging that there is a significant amount of wealth to be created by titling untitled land, it would be necessary in the first instance to address the problem source at the LA stages, which essentially, is due to the lack of comprehensive, reliable, accurate and up to date land information. While it is appreciated that some data may need to be further collected e.g. by site inspections or aerial surveys, it is essential for the offices of
the Assistant Collectors of Land Revenue, or Lands Offices, to have immediate access to such requisite and up to date data, particularly the associated graphical and other attribute information required to deal with any enquiry regarding the status of any other interest in land.

The cost of past data conversion to the state, as estimated earlier in chapter four (section 4.9), amounted to approximately MR0.9 million over four years. If the remaining spatial data sets were converted internally, then it can be anticipated that it may cost another MR1 million or so to complete the 70 percent attribute data, in addition to the 5 percent spatial data mentioned earlier in chapter four. It is however crucial that the converted data meets the needs of the users, i.e. that no further search or verification is necessary, once the users are connected on-line to the relevant data-bases; otherwise, provision must be made for further data conversion.

In terms of future staff requirement, the LS department may have to employ staff trained in computers to manage and maintain the department's growing acquisitions and investment in computers, e.g. programmers, computer engineers, etc., as no staff or posts exist at present. Their contribution should not be limited to developing the system but should also include the provision of training for the internal users. Assuming that five graduate staff with computer related background were required for the Sabah LIS in the near future, then this would cost approximately MR 112,500 per annum (assuming a basic salary of MR1,500 and 25% overhead costs per person). It is assumed that the present operational staff are sufficient to cope with any future requirement in data conversion.

The cadastral survey process required to survey all land parcels however is a significant cost component. Based on cost data of the privatisation of Native Title Surveys by the LS department, the average cadastral survey cost for a land parcel over the past seven years is approximately MR750 per Hectare, or equivalent to MR304 per Acre (LS department Annual Statistics Reports, 1989-1995). The current backlogs requiring cadastral surveys include the following (Summarised from Table 7.3 in the previous chapter):
The cost of cadastral surveying alone would therefore amount to MR106,831,072. Unless radical approaches such as those proposed by McLaughlin and de Soto (1994) can be designed to overcome the lengthy processes involved following the completion of cadastral boundary survey tasks, i.e. towards the production of a land title (e.g. instantaneously granting land titles to natives on site based on e.g. occupational evidences, agreement with adjoining owners or other credible sources), then it will be necessary for the state or the land owner to incur the costs of such an undertaking.

Hence, in order to realise the benefits resulting from minimising the inefficiencies and ineffectiveness in land information management in Sabah, the following costs may therefore be necessary:

(1) Current annual expenses for maintaining the LS department: MR33 - 35 million annually
(2) Consultants report: MR2 million (one-off)
(3) Data Conversion (Staff Costs): MR1 million (over 4 years), or higher, if past digitised data are inadequate in meeting the needs of the users.
(4) Hardware/Software acquisition under 7MP: MR 8.8 million
(5) Additional Staff Costs: MR112,500 per annum for 5 computer graduates
(6) Cadastral Surveying: MR106,831,072 (Estimated cost if cadastral survey tasks were contracted out to Private Licensed Land Surveyors)

From the above, the total cost required to minimise the shortfalls in present land information management procedures is approximately MR118 million, excluding the existing annual expenditure of maintaining the LS department, i.e. MR 33 to 35 million. The most significant is the cadastral survey cost, which is necessary for demarcating and
defining the land parcels. On the other hand, the benefits of a LIS infrastructure can be summarised as follows:

(1) One-off created wealth to the state resulting from titling untitled land: MR1,226.3 million
(2) Annual Lost revenue: MR0.2 (minimum) to 0.8 million
(3) Annual Efficiency Savings: MR1.1 million

Considering that the costs amount to MR118 million while the benefits above add to MR1,227.3 million, the benefit to cost ratio would therefore amount to approximately 10:1, with the major benefits resulting from the increased market value of land as a result of titling. Hence, an important end objective of the investment will be for the production of land titles, which represents a valid, legal and secure claim of land ownership to the individual.

8.5 Funding Sources

It is clear from the above that significant funding will be required for tackling the current surveying and mapping inefficiencies and ineffectiveness in Sabah. The major funding sources could include the following:

- The Federal Government. A fresh initiative will be required from the state government for specifically funding the cadastral survey work required to tackle the backlog problem. The arguments presented in the previous chapter concerning Federal funding in Sabah provide ample evidence that a request for more development funds for improving its land information system infrastructure in the next Malaysia Plan (for the period 2000-2005) is reasonable and equitable. Moreover, the anticipated increase in income to the Federal Valuation and Property Services Department as a result of more land transactions should also be considered, because property transactions and related stamp duties fall under this department’s jurisdiction; the Sabah LS department is responsible only for carrying out the valuation of state lands and land designated for acquisition. Although as indicated earlier funding may be gradual, this remains a possible and realistic option.
• The Sabah State Government. The Sabah government may face difficulties in funding the cadastral surveying aspect because of the considerable amount, which is close to ten percent of the annual GDP. Moreover, there may be other pressing state developmental projects or immediate socio-economic needs. If however funding can be obtained, then it will be more beneficial to continue contracting out the cadastral survey work to the licensed land surveyors and let the LS department concentrate instead on ensuring that the final titling output is produced with reasonable speed, cost and quality.

• Lands and Surveys Department. One option that may be possible is to allow the LS department to fund the project on its own, i.e. to eventually be self-funding. This may be possible if the department is allowed a certain degree of autonomy particularly in controlling its income sources, or given the opportunity to generate its own future income by adopting a business approach in conducting its surveying, mapping and other land information management tasks. Although such an initiative may not have a precedent in the department and will require a major review of all its operations, products, services and informational assets, experience in advanced nations such as that of the Ordnance Survey in Great Britain prove that with the commitment and strong leadership, it is possible for a survey and mapping organisation to be self sufficient and accountable to the state, as well as the populace.

There appear to be significant advantages to the state if participating government agencies adopt a business approach to any investment for a proposed integrated land information system. This requires the development of strategies and targets based along the lines of cost recovery and incentives for generating income. The availability and commitment of loans, aid in the form of grants or other similar schemes should be made available by the state to the land information agencies concerned to enable them to participate in the development of the LIS vision, as well as to encourage them to build up their data holdings, provided that the converted data has a common coordinate referencing system and can be digitally integrated when and where necessary. Cost sharing should also be encouraged to distribute the cost of expensive equipment; this indicates also that data owners should be able to sell their data, i.e. through the setting of agreements or consortia for sales or user fees.
8.6 Recommendations for the LS department

In Sabah, there are many advantages for the state to aim for an eventual multi-purpose cadastre based land information system that should evolve from the LS department, essentially because of its unique position in being the custodian of a wide range of land related data holdings. However, if the benefits are to be realised in the shortest possible period, some specific issues must initially be addressed by the department because clearly from this research, there are too many steps involved in the processing of a land application or any land related development schemes, that result in delays.

In order to address this issue, strategies should therefore be developed to simplify the land development process. This may necessitate questioning the validity, relevance or practicality of existing procedures. For example, there appears little justification for the archaic law on the need to obtain approval from the Chief Minister's Department (State Secretary of Natural Resource) for a simple change of land use, e.g. from agricultural, to residential or commercial. Presently, such requirements are a necessity even for an acre (or less) of land, in addition to the already extensive provisions and bureaucracy involved in the application process, preparation of development plans, surveys, occupational certificates, etc. from the LS department and other relevant government agencies including the local district offices and town and country planning; all of these steps require a significant amount of time and contribute to a slow, rigid and expensive process.

Hence, this may require *inter alia*, a review of the existing laws and processes, the adoption of new approaches in validating and approving land development requests, or investments in information technology, with a view to speeding up the land information flows within and among government departments that are located sporadically throughout the state. Any changes should not however compromise on certain criteria, such as the reliability of existing data sets or their formal recognition, from the users’ perspectives.

The modernisation effort in land information management within the Lands and Survey department as implied earlier, has concentrated mainly on the office processes but has not accorded similar attention to the field procedures. The continued use of chains in cadastral surveying is notable because it is the only government department in Sabah that still
adopts this technique for measuring distances and moreover, there are no more chain vendors in the state. Hence, there is a need to review the economic rationality for its continued use in the department, in light of the availability of modern alternative means, e.g. electromagnetic distance measurements (EDM), to cope with the cadastral surveying work backlog in the state. The number of division four staff within the department, which accounts for approximately two thirds of its workforce and its significant maintenance cost to the state’s economy at approximately two percent of the GDP, testify to the fact that the system begs for some improvement measures.

Another issue relates to the investment in spatial based data within the LS department. Its digitisation program of cadastral maps has essentially concentrated on the creation of spaghetti based data, i.e. with no topology and no coded features that can be selected within the computer. However, experience within the Ordnance Survey (OS) of Great Britain suggests that this may not be a good investment for the future because as observed by the Chorley Committee (DoE, 1987, p.67) on the digitisation program at the OS, “A digital topographic database should not seek merely to replicate the hard copy map”. The Chorley Committee also commended the approach by the Ordnance Survey of Northern Ireland (OSNI) whose aims was to (DoE, 1987, p.62) [all emphasis added]:

“... create an online topographic database, holding data in point, line and polygon form together with the associated attribute data, rather than a cartographic data bank. This distinction is important in that it highlights the aims of manipulating the topographic data and linking them with other data in a flexible manner, rather than merely using topographic data to produce maps as a background for this other data.”

This comment suggests that any digitisation program should preferably have some form of topology. However, it is equally important that the program meets the needs of the internal users which may be to the detriment of external user needs. There is therefore a requirement to balance both needs. The reality is that computerisation of cadastral maps to meet multi-purpose user needs (e.g. land markets, land tax, utilities, urban and rural land management, multipurpose, etc.) is a complex and difficult task; it implies among others, issues that are technical (e.g. updating and upgrading the central data base, standards for data conversions), institutional (e.g. who is responsible for maintaining, collecting, distributing updates) and financial (e.g. considerations relating to data
ownership and charging for access) in nature. It is worthy to note the observations by Williamson and Enemark (1995) that:

"An important issue in establishing a Digital Cadastral Data Base (DCDB) is that computerisation of the cadastral maps in general cannot be justified for land registration or land market reasons. Therefore computerisation of the map requires the support of other users both financially and institutionally".

A final point concerns the role of the LS department and the Licensed Land Surveyors (LLS). The requirement that the LLS deposit their cadastral maps and plans for checking by government staff was designed to ensure that they conform and meet certain standards required by the cadastral survey system in the state. However, it appears that the department can ill-afford to provide these services for free because of the checking involved and the quantity of cadastral maps to be checked, that includes both departmental outputs as well as those of the LLS. A nominal fee should therefore be charged to the LLS for time lost due to defective plans as well as for implementing a more systematic checking procedure, e.g. first come first served basis, as well as for funding related LIS initiatives.

In addition, the cadastral surveying industry in the state is currently worth around MR18 million per annum, based on the five percent survey fees retained by the Sabah Surveyors Board, for all cadastral survey work undertaken by the LLS. This is fairly significant (almost one percent of the state’s GDP) considering the fact that as of mid-1996, there were 24 LLS operating in Sabah. Hence, it does not appear reasonable for the LS department to continually subsidise all the cadastral plan checking required, e.g. corrections, charting onto standard sheets, land titles preparation forms, etc. Any mistake on the part of the LLS results in time lost to the departmental staff, delays and additional work for those concerned.

8.7 Strategies for Sabah’s LIS (SALIS)

Based on the foregoing analysis, some issues must be addressed by the state in order to build the foundation for a LIS infrastructure in Sabah. It goes without saying that the unique position of the LS department as the custodian, collector and maintainer of the
legal and fiscal cadastre (i.e. land information on the ownership, value and use of land) as well as a large set of other land related data sets, including topographical data and information on the land markets transaction, renders the department in a comfortable position to take the lead in the evolution of a modern LIS. The location of other state functions concerned with the management of land related data, in particular the land valuation office and the land registry, also adds weight to the argument that any nucleus for an integrated state wide land information system must take shape with the LS department as its core. The issues that must be addressed include the following:

- Co-ordination
- Institutional arrangements
- Skills development

8.7.1 Co-ordination

Co-ordination used within the present context refers to the agreement or consensus on the use of certain basic core data sets by relevant government agencies for spatially locating their data sets. This usually means the use of a common base map, i.e. one that is agreed upon as the definitive map on which to base other providers’ (or users’) specific land information. The main reason for this is that it facilitates future co-ordination of land information because if the geographical referencing system is common among the many users, then no matter what the type, content or size of the land information recorded, there will be less ambiguity when it comes to the integration and correlation of physical or personal data that relate to any regional, polygon, linear or point. More specifically, the use of the land parcel or real property boundaries as the basic unit for referencing all types of spatially related data provides the integration base for social, economic and demographic information, since the land parcel is typically the fundamental land unit upon which all land improvements and habitations occur.

The use of the cadastral sheets produced by the LS department is shared by the local authorities and district offices, the Town and Country planning as well as other government agencies. The extent of co-ordination at present however, does not extend beyond this setting. No clear mechanisms exist in e.g. the provision of updated cadastral
sheets to the users, nor is there any common usage of maps between the LS department and the Public Works Department (PWD), although the latter frequently refer to the former for their cadastral maps in cases where the coordinates of controls are required. Such instances indicate that no extensive co-ordination in the use of a common base map in Sabah exists at present, which is what is necessary if an integrated national LIS is contemplated. Such a strategy to develop a networking infrastructure therefore implies the use of one or more of the following mechanisms:

- Common base maps
- Common survey control network based on an agreed coordinate system, usually a three dimensional Cartesian coordinate system
- The use of common and standard naming conventions or classification of land use, e.g. a street names or building gazetteer, to facilitate data exchange

The corollary of the above is that while the use of a common linkage enabler is proposed, each agency maintains its own set of information and agrees to share certain parts of their data sets with others; one agency may be assigned the responsibility of collecting the common data sets. Figure 8.2 below illustrates the basic ideas associated with such an arrangement. It shows that whatever the type of land information under the various jurisdictions, each should be spatially referenced within a common coordinate system.

**FIGURE 8.2: Land Information System Layer Concept (Adapted from Dale and McLaughlin, 1988.)**

![Diagram of Land Information System Layer Concept](image-url)
8.7.2 Improving Institutional Arrangements

Arrangements that are institutional refer to the enabling mechanisms that act as the co-ordinator of common concepts, schemes, visions or objectives between the various data holding agencies. One of the main aims of the strategies for Sabah should be that of a communicator between the various departments to ensure that there is no lack of understanding in the nature, functions and requirements for the proposed LIS. As mentioned earlier in the thesis, the Victorian state government’s LIS vision resulted in the formation of an administrative structure specifically assigned to implement the strategies, i.e. the Office of Geographic Data Co-ordination (OGDC).

The creation of a lead agency to co-ordinate efforts for a LIS infrastructure with the views of raising the ‘LIS benefits awareness’ such as reducing duplication in spatial data management and other inefficiencies and ineffectiveness, should aid in addressing some of the difficult issues involved in convincing the various departments to participate in modern data handling techniques, or sharing the cost of its investment. However, there are also other available options.

The institutional improvements may be initiated from an existing agency, although it is essential that any such agency be given the proper mandate to assume the roles of a co-ordinator and facilitator. Within the context of Sabah, the LS department appears to be the most suitable to take on this role, although the involvement of other departmental heads in the executive committee is necessary in order to gain participation and support. There are many specific roles that need to be undertaken including e.g. an initial cost benefits study of the LIS infrastructure, user requirement studies, the drawing up of aims and objectives, etc. as well as other issues necessary to co-ordinate the use of land information in a shared environment where the overall cost of data collection and maintenance to the state are minimised, and its use maximised. Alternatively, considerations should be made as to whether a slightly increased investment in existing structures can provide greater economic and social benefits.
If the private sectors are active users or providers of land related data, it may also be possible for them to take on the leading role in a LIS infrastructure. The licensed land surveyors (LLS) may for example group together and propose arrangements that can contribute towards the creation of an environment where spatial data may be shared or from their perspective, easier to access and at lower cost. The role of title insurance companies in the United States as the 'guarantor' in the registration of land parcels is an example, although their proprietary and insular nature (i.e. their lack of a common coordinate referencing system) have been criticised (Larsson, 1991, p.53). In Sabah, the role of the LLS with respect to the LS department is mainly concerned with the conduct of cadastral surveys. Hence, the limited LLS authority in many aspects of land information within government means that the lead role should preferably be carried out by a government agency although their participation in any such initiatives is necessary in order to gain their perspectives on matters related to land.

8.7.3 Skills Development

The widespread lack of qualified managers, users and providers of land related data that are proficient in the use of computerised data and procedures is a generic shortcoming in many developing countries. It adds to the difficulties of introducing digital data into their daily operations and maintenance. For example, it may be very demanding for staff accustomed to manual working practices extending more than one decade to teach new computer related methods that are totally alien to them. The immediate consequences may range from a significant reduction in output in the short term, to resistance or total rejection. The nature of computer usage, which is constantly improving and requires continuous re-training also adds more complexity to what is a difficult task.

However, while there may be limited options available for situations where senior staff are concerned, it is essential that any LIS infrastructure strategy considers the longer term issues. In this context, the observations by Holstein (1992) merit attention:

"Policy guidelines should be established on how education and training in LIM [land information management] are to be achieved. They should include education and training aspects of LIM for both user and supply agencies, the community, its funding, and ways to attract funding. Directions should be given on vocational training, and a balance sought between managerial seminars and professional development, technical
training support and longer term educational programs, in-country and out-of-country courses. Directives should be issued with guidelines on how to develop staff and LIM career paths, and what mechanisms would encourage public sector cooperation with universities and colleges. Private sector involvement should be encouraged, as might be achieved by its use in pilot projects and joint ventures."

The implications of such an undertaking are clear; the state or the lead departments must understand that computers require skilled and experienced personnel in using the technology to tackle any inefficiencies and ineffectiveness in existing land information management processes. The skills required may range from being technical, professional to managerial in nature but the main emphasis should not be confined to those concerned in the technology’s proper usage and maintenance alone, but also be capable of initiating innovations in data applications to cope with any internal or external changes in data demands or requirements.

8.8 Lessons for other Developing Countries

This research, as demonstrated in the previous two chapters, has approached the LIS investment problem by quantifying existing inefficiencies and ineffectiveness in present procedures of land information management in the area studied, i.e. Sabah. It proposes the notion that an optimum investment level in a modern land information system (LIS) should be determined by minimising inefficiencies and ineffectiveness procedures, rather than seeking to maximise its absolute benefits, many of which are not easily quantifiable. This user based methodology should be useful for other developing countries because if the shortfalls are quantified, the estimated amount provides very strong reasons for those concerned to rethink and review existing approaches, while at the same time, indicating how much should ideally be invested in a modern land information system.

However, as indicated in the foregoing chapters and above, there are other crucially relevant factors that must be considered before any investment is undertaken, e.g. where should it go to, in what specific area of the land information flow process, how can funding be obtained, or what institutional arrangements need to be addressed in advance. Hence, many issues are involved, some often complex and inter-linked, if the management of land information were to be computerised. This is because the technology not only requires much investment in terms of infrastructure but also, in human resources and more
significantly, in data conversion. It can be argued however, that any investment should be based on the following points:

- User centred approaches in any initial analysis, proposals and consequential studies.
- Propose systems that are simple, flexible and responsive to changes
- It is essential that any present shortfalls affecting the optimal operational level of the agency concerned be addressed soonest, before investments in a LIS are considered.
- Consider all manual (i.e. non computerised) options, e.g. changes to laws, processes, etc. because the costs of a LIS, extend beyond those that are tangible and are usually uncertain.
- Any devised model should be incremental or gradual in its evolution and allow time for its internal diffusion.

Within the land market context scenario, any investment towards the creation of a modern cadastre or a digital cadastral database should have the following objectives:

- it should support an efficient, secure, equitable, low cost and effective system of recording, identifying, buying, selling, leasing and mortgaging interests in land which will promote an active land market which in turn, supports economic development.
- it should permit the efficient and effective integration of cadastral data with other spatial data sets, and particularly topographic data to support other applications such as utilities and facilities management, urban information systems, land valuation, land development, environmental planning, road networks, demographic applications and spatially related business applications.
- it should permit the aggregation of cadastral data, to *inter alia*, support regional and national initiatives for defence, transport management and demographic analyses.

**8.9 Recommendations for further work**

While this thesis has analysed and described the main issues that should be taken into consideration by a developing state contemplating to invest in a national land information system, there are some areas that should be subjected to further research:
• The wider impact of the LIS effectiveness benefits within the present context, i.e. land titling and land development requests, should be further studied, analysed and assessed within a controlled environment, say within a region or particular locality. This may indicate e.g. how native land owners utilise their land, whether there is an increase in land transactions, or whether other variables such as changes to the laws had an effect on the end-users and the land markets. Any findings should help in the formulation of policies to help the unfortunate levels of society.

• Another useful study would be to evaluate the impact of land information to the socio-economic development of the state concerned, e.g. the quantification of delays to development projects, and their consequences within a specified time frame. Any conclusive indications of lost opportunities in this respect should be useful arguments for reforming present procedures and investing in a modern land information system.

• Specifically for Sabah, further researches should be undertaken for modernising the present procedures, laws and processes of land administration, for improving the speed, efficiency and effectiveness of decision making at all levels of the land development process.

• Test and refine the proposed model in this thesis in other jurisdictions or states with different form of inefficiencies and ineffectiveness in the management of land information.

8.10 Conclusions

This research has investigated the LIS investment issues from the perspective of developing countries in general, albeit analysing the specific concerns and relevance of the issues of a particular developing state, i.e. Sabah, East Malaysia. The costs, benefits and values of such an investment were discussed, as were the institutional issues and possible financial arrangements and options involved in their implementation.

The general finding is that because land information is a public good whose possible uses and implied values are subjective to the user, it is difficult to predict the accuracy of an
investment, or that it will guarantee its perceived benefits in the future. The research proposes that investments in the modernisation of an existing land information system should be driven by the needs of the end users and that any amount should be based on minimising existing consequential costs due to the inefficiencies and ineffectiveness in data management, its use, provision, or accessibility. These should be quantified where possible, and any investment amount should be based on the attainment of these aims and objectives. While the research focused on a single developing state, most of the issues raised are of relevance to other developing nations.

It also has to be stated that computerising the LIS processes of a developing country is a complex and difficult undertaking. This thesis has provided a simple but effective means to aid land information decision makers in determining what are the steps involved, or rather, how much should be invested in modernising their current land information management procedures. It has demonstrated that while some information management elements may be addressed with computers, any modernisation effort should not ignore the varying and often evolving, data needs, institutional, financial and organisational requirements of a modern land information systems; their costs may not always be apparent but their consequences are likely to be significant and far reaching.

Specifically for Sabah, the evidence in this research concludes that in order to minimise its current shortcomings in land information management procedures, the optimum investment level was estimated to be in the region of MR118 million, with the eventual benefit to cost ratio, assuming all inefficiency and ineffectiveness procedures were adequately addressed, to be in the region of 10:1. However, it would be unrealistic to suggest that the current inadequacies will cease to exist in the future or that the benefits will be realised, if the inherent inflexibility in the current land development process were not addressed adequately. The inherited regulatory tools of managing the state’s land related information do not appear to be appropriate nor conducive to the evolution of an efficient, effective and modern land market; there are too many delays and bottlenecks in the land development processes. In the final analysis, tools will remain tools and can never be blamed for any undesirable consequences; it is up to the decision makers to initiate changes.
Bibliography


Bromley, R.O.F. and Coulson, M.G. (1989): GIS and the work of a local authority, the example of Swansea City Council, Dept. of Geography, University College of Swansea. 137 pages.


Appendix A: Checklist Used during the Field Study/Research Attachment.

This report sets out the general form and intent of the questions that will be used during the data collection phase of the author's field study. The problem will be analysed from two perspectives:

- Data users
- Data providers.

This research is essentially concerned with the cost justifications, i.e. the benefits, of a modernised LIS for a developing country, as opposed to the traditional methods of data collection. The main data issues will include those related to data finance (pricing), cost benefits analysis and user needs. Depending on the respective departments' main functions and the importance of the spatial data used, other factors will be considered as some issues may inter-relate and overlap. The generic issues are indicated in the following.

A general 'user needs analysis' question may include:

- In what form is data mainly used in your task/section/department?
- What are they used for/purpose?
- How are they obtained; internally or externally, are other government agencies involved?
- How long does it usually take you to obtain the data that you need, including locating, accessing and retrieving it?
- How often are the data updated? Do you have any control over this?
- How satisfied are you with the present data provision, e.g. do they suit the functions of your task needs/section/department efficiently and effectively?
- If the data that you mentioned above could be available instantaneously (on-line) or with a drastic reduction in access time, what benefits do you foresee for your task/section/department?
- What other type of data would you like to be available.
The questions set out above could further be presented and structured from the viewpoints of the user and provider.

**Questions relating to functions of/as Data Users**

- **Data product category**
  - What is the category of main data used? e.g. topographic, transportation, cadastral parcel, ownership, etc.
  - What are the data details?
  - For what are they used for, i.e. what is your main area of activity?
  - How and where are data archives stored/deposited?

- **Data Source**
  - What is the percentage of internal and external data usage used by your organisation?
  - Who are the main data providers?
  - How are the data obtained?
  - Are the data free for your organisation?
  - Who pays for them?

- **Data Costs**
  - How much do you spend on internal and external data? This may need to be tabulated for both internal and external data.
  - Need to examine unit costs for internal data.

- **Present Efficiencies**
  - How satisfied are you with the present or existing data?
  - If not satisfied, why?
  - Can you suggest areas where this might be improved?
  - How do you see future efficiencies can be made?
  - What new data and information is needed?
  - What methods should be used to obtain the extra data?

- **Data impact on present activities (importance)**
- If say the data presently used were to become unavailable, how will this impact your organisation?
- Are there other possible sources of data?
- Who are the alternate data sources?

**Questions relating to functions of/as Data Providers**

- **Costs**
  - What is your main means of data collection? Collect own, buy, rent?
  - How do you classify the costs? Which consumes the most?
  - What is the total cost of data acquisition cost over the past few years?
  - Are there printed literature on costs?

- **Product type or service**
  - What is/are your main product/service?
  - What is the main data type?
  - In your work, which aspect of the data collection phase consumes the most effort?
  - What is the final output form?
  - How often is the update done and does it meet the user needs?

- **Output Uses**
  - What are the main uses of the data/service that you provide? E.g. facilities management, transport, communications, urban planning, land administration, etc.

- **Major uses**
  - Who are the major users including, e.g. which section, department, private users?
  - How regular is the supply, e.g. periodic, cyclic, continuous, project or task specific?
  - In what form are the data supplied?

- **Improvements or development**
  - If additional funding were available, what improvements would you prefer to the product and why?
Appendix A

• Computerization
  - Were there been any recent computerization efforts in your section or department?
  - If yes, what were they?
  - Did they affect the output of your department? How?

• Performance monitoring
  - Are there any mechanisms in place for performance monitoring?
  - How are they done? E.g. meeting stated targets or objectives, comparison with other organisations, orders/requests by users, etc.
  - Are there any external auditors?

It will be important to identify, compute and compare the costs and benefits of the present system and that of the proposed scenario. Methods for quantifying the costs and benefits, e.g. avoided costs and cost savings, have been elaborated in earlier reports and will not be covered again in the present discussion. Suffice to stress also the importance of identifying the functions of the various agencies and the uses to which land related data is utilised in their capacity as data users or providers.

**Analysing the Problems/Costs incurred due to lack of land information.**

During the research study, it will also be important to identify and determine the effects or problems that arise due to *lack* of land information. These are categorised generally below with an indication of how their impacts will be estimated monetarily. It is expected however that some of these 'reverse processes' of computing efficiency and effectiveness benefits, i.e. due to inefficiency and ineffectiveness may be hard to measure precisely. In cases where arguments may arise to disprove a figure or doubt its methodology, a descriptive analysis of the causes and effects will be undertaken, substantiated by observations, discussions and literature searches.

(1) Inefficiencies in urban and rural management.

This will obviously depend on the function of the department, e.g. utilities, local authorities, government departments, etc. Generally, the main intention is to develop an
awareness as well as the extent and consequences of any existing problems in the management of land information. Questions can include:

- Are there problems that arise due to lack of spatial locational data (such as maps, owners of land, coordinates, Mean Sea levels, topography, building, street locations, etc.)?
- If yes, then what are they and in what form, e.g. delay in project approvals, problems in work maintenance, monitoring, inefficiency in operations, ineffectiveness in decision making?

(2) Duplication of information

This line of inquiry may require an initial study of the data that are held in the various departments. Questions include:

- What land related data do you use?
- How do you obtain them (own, buy, provided) ?
- How much do they cost to your organisation in terms of the overall expenditure, or how much of the resource is allocated to land related data?
- What land related data is held by your organisation (in what form, how up to dated are they, who updates them)?
- Identify data that are commonly used and collected.

(3) The effects on the land market and unfairness in access to land information

This particular problem as mentioned in the previous report, arises due to the lack of land information in the economy. The lines must be drawn of course between what is confidential and personal information, and those that should be available to the land markets or those who operate in them. Secrecy in the land markets (e.g. information on land buyers, sellers, developers, etc.) results in middle persons acting on behalf, or as proxies, of the interested parties. A common occurrence is that of a property seller looking for a buyer where the middle person (brokers) will affect all land transactions, usually to the detriment of both parties and loss of possible revenue to the state. The
purpose of the following questions is to identify whether the present system has any such shortcomings in its management of land information.

For the land markets, questions may include;
- Does there exist situations where the sale, transfer, mortgage, lease of land or property occurs with the aid of “middleman”? If yes, then how, e.g. in what situations or under what circumstances do they occur? How does it affect the agency or departments involved, e.g. in terms of income collection, revenues, etc.
- Undergo user needs analysis above.

For property or land valuation;
- What type of land related data are most commonly used?
- Undergo user needs analysis above.
- What data held by the state or other state agencies do the users require?
- What land information are confidential?

(4) Lack of Environmental information

The environment is a big issue in the world today due to the realisation that the land resource is not infinite in nature. Environmental Impact Analysis today is embodied in most major infrastructure development projects. This depends to a certain extent, on the availability of spatial information. The few questions on this topic attempts to determine the awareness of the state’s environmental impact assessors;

- How satisfied are you with the current spatial data provision for the purposes of your work?
- Do additional data exist now but are not directly available to you?
- Do you require additional information?
- How do you justify the need for further information or their access?
Listing of Expected Data to be Collected.

During the course of the field study, the following are expected to be obtained or estimated:

- an analysis and general evaluation of existing land data provision, use, access and infrastructure.
- a knowledge of the functions and land data flow processes of the departments or agencies visited.
- an understanding of the processes involved in collecting, use and dissemination of land related information within the relevant sections and departments.
- an assessment of the necessary and ‘nice to have’ spatial related data for each section and department, i.e. their relative importance.
- with regards to data, their frequency of use, their accessibility and cost of access.
- the estimate of a unit cost of information in a suitable unit.
- an estimate, if possible, of the costs of digitising the relevant data.
- an estimate of the cost per annum of data collection.
- an estimate of the costs of instituting a minimal networked LIS configuration within all state agencies, with the main aim of data integration
- the benefit estimates that should accrue to the different sections (or other departments) with the implementation of a LIS; an important emphasis will be placed on when do these accrue, by how much and in what form.
- estimate of the values of higher access or availability of information to the respective users.
- the tabulation of these costs, benefits analysis, uses, etc. and presenting them graphically where appropriate.
- identify the major variables and relationships contributing to the costs and benefits of a LIS for the case study.

In addition to the foregoing, further literature search and interviews with those in authority may be necessary to determine the following:
(i) Identifying sectors of the economy that presently uses land information and determine its allocation, expenses and contribution to the strategic, management and operational processes of decision making. This may be possible by estimating the data costs (and benefits) of the various agencies responsible for collecting and managing land related data.

(ii) Assessing the impact of a modern LIS on the current processes particularly in its ability to avoid, reduce and displace costs, as well as the benefits of better land information management to all levels, hierarchies and personnel of the organisation affected.

(iii) Viewing the tangible justifications of LIS from the main variables affecting its effectiveness;

- data conversion
- internet-working capabilities and data integration
- expertise level and education attained

(iv) Finally, an estimate of the costs invested in land information by the economy as a percentage of the GDP will be estimated and any justified investment will be linked to this figure.

Implementing an LIS is a complex process. There is no doubt that institutional and organizational issues are crucial factors but this research will focus on the economic reasons of LIS implementation and will attempt to justify why it must prevail. Many factors in resisting computerisation of the land information management and processes exist. For example, it may be due to the reluctance to release data or information as this is perceived as a loss of autonomy, authority or power. Although these reasons may be justified from an organizational perspective, this research attempts to prove inter alia, that the losses to the economy as a result of not integrating data (hence information and knowledge), is significant. Losses to the state may be due to the duplication of efforts, the inefficiencies and ineffectiveness in handling spatial data in e.g. the management and targeting of resources, unsystematic, sporadic and unintegrated data collection, delaying development projects, etc.
Dale and McLaughlin (1988) suggests five issues that should be considered for any study on Land Information System (LIS), i.e. institutional, legal, survey procedures, fiscal and financial matters. Their check-list for evaluating a cadastral system will be used as a guideline for aiding the field study in Sabah.

**Conclusions**

The main aim of the research attachment will be to compile the evidence for constructing the case for determining an optimum investment level in a modern, computerised land information system. It is anticipated that the data required will be quite substantial and may prove to be costly in some instances. The basic methodology will be a combination of literature search and extensive interviews with as many involved users as possible. However, a central approach adopted for the data collection phase is to view the costs and benefit issues from the perspective of the user and the producer/provider. An understanding of the data flow processes related to its collection, use, dissemination, etc. is necessary in order to anticipate the impact of instituting a LIS. User needs will be emphasised at all times. An essential component will include that of comparing the existing and proposed scenario in terms of costs and benefits, of the land information management procedures. The proposed scenario with an instituted LIS will incorporate the data obtained from the perspectives of the data users and providers. The application of a strengths, weakness, opportunities and threats analysis will also be applied to every existing situation analysed and affected by the use of computers.
REFERENCES.


## Appendix B: NA LIS COST MODEL

Cost Model for Malaysia's NA LIS Pilot Project for the City Hall, Kuala Lumpur (Adapted from LCDM, 1995)  
(For Illustrative Purposes only)

<table>
<thead>
<tr>
<th>Government Agencies</th>
<th>Estimated Area Coverage</th>
<th>Existing Data Availability</th>
<th>Estimated Spatial Data Capture Cost (MR)</th>
<th>Total Spatial Data Cost (GRAND)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land Cov (Area Sq Km)</td>
<td>Coverage</td>
<td>Digital Format (%)</td>
<td>Manual Format (%)</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Land Cover</td>
<td>Total Area Coverage</td>
<td>Coverage</td>
<td>Manual</td>
</tr>
<tr>
<td></td>
<td>Agriculture Data</td>
<td>243</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Land Use Map</td>
<td>243</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Soil Map</td>
<td>243</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Provisional Lot Land Use</td>
<td>243</td>
<td>0.00%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Political Map</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cadastral Sheet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certified Plan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Topo Sheet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cultivated Vegetation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>aerial Photographs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Satellite Images</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Miscellaneous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Agriculture</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Cadastral Map</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Building Map</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Transportation Map</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Sewer Network Map</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Zoning Map</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Living Quarters</td>
<td>243</td>
<td>100.00%</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Topo Sheets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sub-total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: $2,650,012
Appendix C: Checklist for Cadastral Surveys Plan Checking and Plan Drawing (Source: LS department)

- Field Book Checking
- Registration Plan No.
- Checking (First Checker)
  1. Plotting
  2. Side reference
  3. Bearing, Distance and Stone No.
  4. Boundary Agreement
- Computation
  2. Area
- Plan Drawing (for S. Ps. only)
- Inking & Colouring
  1. Complete inking
  2. Colouring
- Charting
  1. Locality
  2. Metric sheets
- L.S.F. 9003 Draft Title Detail Preparation
- Final Checking (Second Checker and/or Drawing Office Supervisor Overall details)
- Approval
  By District Surveyor
**Appendix D: Check List for Title Lease Preparation**

TO BE COMPLETED BY OFFICER
BEFORE SUBMITTING
TO PTU\(^1\) FOR SIGNATURE

**DISTRICT OF:**
**REF.:**

<table>
<thead>
<tr>
<th>LAND APPLICATION(LA)</th>
<th>FOLIO</th>
<th>YES</th>
<th>NO</th>
<th>N.A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has L.A been approved and signed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any MNR(^2) approval?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has letter of offer been signed and accepted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has 25% premium been paid and receipt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If L.A. falls on Forest/State Reserve, has excision of area been gazetted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any special note on the offer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any Special Terms &amp; Contracts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the surveyed area in the same vicinity as the area applied for?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the surveyed acreage in excess of the area approved?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any special PTU instruction?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the survey carried out by Private Licensed Surveyor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the survey carried out by Government Surveyor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CHECK LIST COMPLETED BY: ..........................................

Date: .................................. Signature of Officer

---

\(^1\) PTU - Director of Lands and Surveys Department.

\(^2\) MNR - Ministry of Natural Resources.
### Appendix D: Check List for Title Preparation

TO BE COMPLETED BY OFFICER BEFORE SUBMITTING TO PTU FOR SIGNATURE

**DISTRICT:**

**REF.:**

<table>
<thead>
<tr>
<th>1. <strong>SUBDIVISION/REPLACEMENT TITLE</strong></th>
<th>FOLIO</th>
<th>YES</th>
<th>NO</th>
<th>N.A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have the owner/co-owners submitted application in writing and agreement of allotment for the subdivision lots on sketch or on memo of surrender?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any Secretary of Natural Resources approval?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has letter of offer been accepted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has premium been paid and receipt Nos. authenticated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have all land dues been paid up to date?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has the subdivision been surveyed in accordance with the layout/development plan approved by the Local Authority concerned?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has issue original copy of title been received?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has signed memorandum of surrender been received?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are any subdivision lots reserved exclusively for Bumiputra/Pribumi?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any remainder areas or lots being left out on the survey plan or 9003?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there any special PTU instructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is subdivision prohibition? (restrictive clause, caveat, Court’s prohibitory order and any other encumbrances?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the survey carried out by Private Licensed Surveyor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the survey carried out by Government surveyor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CHECK LIST COMPLETED BY:**

**Date:**

**Signature of Officer:**