information strategies for Malaysia: geographical, organisational, political and technological implications for development

Alhabshi, Sharifah Mariam Mohammed

Information Strategies for Malaysia: Geographical, Organisational, Political and Technological Implications for Development

Sharifah Mariam Mohammed Alhabshi

PhD Thesis
University of Durham
Department of Geography
1998

PhD Abstract: Sharifah Mariam Mohammed Alhabshi
Department of Geography
University of Durham, October 1998

Information Strategies for Malaysia: Geographical, Organisational, Political and Technological Implications for Development

Malaysia has undergone radical social, economic and political development over the last four decades. The information systems put in place to provide informational support for managing development projects have also changed from manual systems in the 1960s and 1970s, to computerised systems based on batch and on-line processing and networking in the 1980s, and multimedia in the 1990s. Two large scale information system programmes were studied in detail. The National Project Monitoring System (SETIA) and the National Land Information System (NALIS) involved co-ordination of individualised information systems and sharing of information by agencies at Federal, State (including District) and local authorities. Collection of information and the subsequent analysis of that information was guided by two theoretical frameworks: first the organisational perspectives framed by Web models which help in understanding the dynamics of computing in development; and second the subjective epistemological stance framed by structuration theory which helps to frame an understanding of the complexities of social relations surrounding information systems development. This research demonstrates how organisational behaviour, and a socio-political culture influenced by economic interests and personal ambition, can complicate large scale information systems development. Reluctance to share information; differences of appreciation and awareness and varying levels of understanding of the technology in use; inadequate and incompatible information; inadequate working strategies and standards; and imbalanced infrastructural support are among the major reasons for lack of success. However, in the implementation of information systems, problems related to human factors are not unique to Malaysia; rather they are common even among 'advanced' countries. But developing countries like Malaysia are often more sensitive to changes in economic and political environments. The concluding chapter of this thesis places the information strategy issues in the context of Malaysian and Southeast Asian political and economic events of 1998.

Acknowledgements

There are several people to whom I owe a debt of thanks for their help during the production of this thesis. First and foremost, I would like to thank my two supervisors, Dr Christine Dunn and Professor Michael Blakemore. Dr Christine Dunn, as my first supervisor provided forbearing effort in checking every detail of this thesis production. Professor Michael Blakemore, in spite of his heavy work schedule, read the draft and made many useful comments to improve it. I cannot thank them enough for their interest, encouragement, and criticism which has made the writing of this thesis an interesting and challenging exercise.

Secondly, I would like to gratefully acknowledge that this research was undertaken with the support of the University of Malaysia Sarawak. In particular, I would like to thank Professor Ghazally Ismail the Deputy Vice Chancellor of Research and Services, Faculty of Social Science, and the staff of the Finance and Administrative sections for their unfailing support in meeting my administrative needs.

Thirdly, I owe a debt of gratitude to Mr Yunus Tamin, Director of Information Division Ministry of Land and Co-operative Development, Mr Mohaizi Mohammed, former Director of the Land and Mines office Melaka and Mr Kho Teng Hong, Deputy Director of the Sarawak Land and Survey Department who provided generous access to information on SETIA and NALIS which was not easily forthcoming otherwise. I would also like to record my thanks to Professor Ian Masser, Dr Heather Campbell, Dr Mahes Visvalingam and Dr Janet Townsend for their valuable advice and assistance during the early stages of my research.

Finally, on a more personal level, I would like to thank all my friends and colleagues in the Department of Geography, University of Durham, who have provided advice, encouragement and above all friendship in what has been an immensely enjoyable time for me. My final thanks go to my family for taking over (again) my domestic responsibilities and making my study away from home worry-free.

There are many others who have helped, and although they are not mentioned here by name, I thank them sincerely.

Copyright

Declaration

I confirm that no part of the material offered has previously been submitted by me for a degree in this or in any other University. If material has been generated through joint work, my independent contribution has been clearly indicated. In all other cases material from the work of others has been acknowledged and quotations and paraphrases suitably indicated.

Signed.....

Date.....

Table of Contents

Lists of Tables

List of Figures

Lists of Maps

List of Abbreviations Used in the Thesis

ADPC	Automatic Data Processing Committee
AIS	Agricultural Information System
APS/PELTAN	Agriculture Production System
CALS	Computer Assisted Land Surveying System
CAMS	Computer Assisted Mapping System
CIS	Census Information System
CLAMS	Computerised Land Administration and Management System
CLARES	Computerised Land Registry Enquiry System
CLRCS	Computerised Land Revenue Collection System
CLRS	Computerised Land Registration System
CPFS	Computer Property File System
DOE GIS	Department of Environment Geographic Information System
DSMM	Department of Survey and Mapping Malaysia
EDP	Electronic Data Processing
Environ IS	Environment Information System (Sabah)
EPU	Economic Planning Unit
EPU-GIS	Economic Planning Unit Geographic Information System
FIS	Forest Information System (Selangor)
FMS	Fast Mapping System (Department of Survey and Mapping Malaysia)
FOMISS	Forest Management Information System
FRIS	Forest Resource Information System (Sarawak)
GISMA	Geographic Information System - Melaka
GIS-MBI*	Geographic Information System - Local Authority Ipoh
GIS-MPPP*	Geographic Information System - Local Authority Pulau Pinang
GIS-MPSP*	Geographic Information System - Local Authority Seberang Perai
GIS-PWD	Geographic Information System - Public Works Department
GIS-TCPD	Geographic Information System - Town and Country Planning Department
GOM	Government of Malaysia
ICU	Implementation Co-ordination Unit
INTAN*	National Institute of Public Administration
IPS-MACRES	Image Processing System - Malaysian Centre for Remote Sensing
KULGIS*	City Hall Kuala Lumpur - Geographic Information System
LAN	Local Area Network
LAPIS	Landed Property Information System (Property and Services Department)
LASIS	Land and Survey Information System (Sarawak)
LIS	Land Information System
LNMS	Local Network Management System (Telecommunications Malaysia Berhad)
LRIS/SPSA	Land Revenue Information System
LRS	Land Revenue System
MAMPU	Malaysian Administrative Modernisation and Manpower Planning Unit
MASTIC	Malaysia Science Technology Information Centre
MDC	Multimedia Development Corporation
MELIIS	Melaka Land Information Infrastructure System
MIMOS	Malaysian Institute of Microelectronics Systems

Mini-CALS	Mini Computer Assisted Land Surveying System (State Survey and Mapping Department)
MLCD	Ministry of Land and Co-operative Development
MOSTE	Ministry of Science Technology and Environment
MSC	Multimedia Super Corridor
NALIS	National Land Information System
NDAPC	National Data Automation Processing Council
NITC	National Information Technology Council
NFIS	National Forest Information System (Forestry Department Kuala Lumpur)
NLC	National Land Council
NMC	National Mapping Committee
NRSC	National Remote Sensing Committee
PEGIS	Penang Geographic Information System
PIS	Property Information System
SALIS	Sabah Land Information System
SDO	State Development Office
SETIA	National Project Monitoring System
SFMIS	Sabah Forest Management Information System
SIB*	Integrated Computerised System
SIMKET*	Local Authority Information System and Assessment
SIRIM	Standard Industrial Research Institute Malaysia
SISMAK*	Klang Valley Information System
SMAT*	Local Authority Information System
SPJ*	Road Registration System
ISS/SISMI*	Islam Information System (Prime Minister's Department)
SMAKP*	Information System at Town Country Planning Pahang
SMART*	Local Government Information System Sarawak
SMAT*	Land Information System Selangor and Johor
SMP*	Planning Information System Perak
SMPKE*	Chief Executive Information System (the Prime Minister's Department)
SPBT*	Local Authorities Computerised Integrated Accounting System (Perak State Local Government Division)
SPHT*	Land Revenue Administration System
SPTB*	Computerised Land Revenue Collection System
STAR*	Reserve Land Information System (Terengganu)
STATISTIC-GIS	Statistics Department Geographic Information System
SUTRA*	System for Managing and Mapping of Utilities and Infrastructure (Public Works Department Kuala Lumpur)
TEGIS	Terengganu Geographic Information System
WAN	Wide Area Network
WPIS*	Information System on Muslim Land

*Note: These abbreviations are translated from Malay into English

Chapter 1 Introduction

1.1 Background

> "Governments will achieve better results by being realistic in what they set out to accomplish. They must strive to match what they do - and how they do it - to their institutional capabilities, not to some idealised model" (World Bank, 1997b, p. 39).

This research is the product of a combination of several years of interest in Malaysian IT developments. The broad goal is to explore the irony of development - why stated development objectives can have little resemblance to development results. Governments rightly are concerned with setting a strategy and creating the conditions for implementing a strategy. Much further down the line are the individuals, groups, organisations and disciplinary cultures for whom strategy often means change and sometimes a threat to the 'status quo'. In the early 1990s in Malaysia information and technology seemed to be a major government agenda. We are almost coming to the end of the decade, yet the results of these programmes are still unclear, and it is still not apparent which of the large scale information technology undertakings are becoming a reality.

An underlying theme of this study is to explore the meaning of 'development' as used by government in the context of Malaysia. For example, the government argues that Malaysia is considered much more well-off than other developing countries, but, what does this really mean? The thesis explores one significant aspect of development, programmes of establishing computerised information systems as enabling tools for development. The aim is to explore how these programmes are implemented and why they developed in the ways they did. As Osborne and Gaebler point out:

> "[People] simply want their governments to be more effective. It is for those who know something is wrong, but are not sure just how to bring it to life; for those who have launched successful experiments, but have watched those in power ignore them; for those who have a sense of where government needs to go, but are not quite sure how to get there" (1992, p. xv).

This chapter begins by discussing selective areas of government development and growth policies and initiatives. The importance of a rich understanding of this issue in order to make implementable IT management and policy prescriptions is emphasised.

This is followed by presenting the aims of this thesis. Finally, the structure of the thesis is summarised.

1.2 Growth and Development

In the 1980s and early 1990s, the Malaysian economy was one of the developing world's best performers (UNDP, 1996). It grew at 6.7% per annum from 1971 to 1990. This growth was led by the manufacturing sector, which grew by 10.3% per year (GOM, 1991a). Performance was even stronger between 1994 and 1995, when the economy grew at 8.1% and the manufacturing sector at 12.3% per annum (GOM, 1993; 1996). There has been impressive structural transformation of the economy, with the manufacturing share of Gross Domestic Product (GDP) rising from 14% in 1971 to 31.5% in 1994 (GOM, 1993; 1996).

But development in pursuit of economic growth is not always an 'appropriate' goal since the benefits of growth have different impacts on different groups. One Malaysian example is the highway upgrading project, where an objective of central government was to improve communication for the public. The work, however, was privatised. The result is high fees being charged to users of new or upgraded highways to recover directly the development costs. Although people can now travel more conveniently and quickly they must pay directly for 'enjoying' the extra service. Developments that are initially set up for all the people can end up primarily benefiting a minority. However, this dilemma is not unique to Malaysia. Many governments are considering the 'user pays' approach as a means of overcoming taxation and budget problems. This even extends to the provision and use of government information which, in the USA is deemed to be a freely available public good, but which elsewhere sometimes is regarded as a commodity that can generate income.

The structure of Malaysian development can be assessed by looking at the evolution of manufacturing activities from light to heavy activities. In the 1970s, Malaysia started with a fairly light industrial structure, dominated by food processing, wood and textiles. By 1980 there had been a gradual change to manufacturing industries. Subsequent to that the rate of upgrading of Malaysian industry was very rapid, and

by 1990 Malaysia had a relatively advanced industrial structure, with the share of heavy industry only marginally lower than that of Korea and Taiwan (World Bank and UNDP, 1995). But according to the World Bank and the UNDP, Malaysian manufacturing sector achievements are not supported by local skills and local market productivity (Jomo, 1994; World Bank and UNDP, 1995; MASTIC, 1996). The World Bank report argued that Malaysia, though leading in high skill technology exports, is weak in terms of a well-educated and technically trained workforce, and in significant areas of research and development. Malaysia's industrial performance owes relatively little to Malaysia's own labour market, but is dependent considerably on an inflow of Foreign Direct Investments into sophisticated industrial and export activities. The report suggests that to achieve an 'advanced' industrial status Malaysia could not continue to depend on Foreign Direct Investment. Rather to continue its competitiveness Malaysia has a requirement to develop its own skills and knowledge through strong research and development programmes.

1.3 IT and Development

Current Malaysian initiatives for IT development, like manufacturing industrial projects, are encouraged through private investments; in particular foreign multinationals. As with industrial development programmes the introduction of large scale information system programmes was formulated in line with the government's vision to give Malaysia advanced country status. With regard to choice of IT, government believed that the use of the latest systems would ensure the support they needed in improving the efficiency of administrative systems and at the same time help to accelerate programmes for infrastructure development (MAMPU, 1993; Abdul Hamid, 1994). An awareness campaign regarding IT was actively enforced in early 1993 by the Malaysian Administrative and Modernisation and Manpower Planning Unit (MAMPU), the Malaysian Institute of Microelectronics Systems (MIMOS) and the National Institute of Public Administration (INTAN) in collaboration with various international agencies, for example, the Central Computer and Telecommunications Agency in the United Kingdom. MAMPU, as a government advisor in organisational management, formulated guidelines to be used by all public agencies in purchasing, upgrading and installing new computerised systems. A body responsible for the development and publication of standards, the Standards and

Industrial Research Institute Malaysia (SIRIM) organised thirteen committees to draw up IT standards. Working group 2 committee, for example, is responsible for devising standards in areas of telecommunication, information interchange and IT equipment interconnections; and working group 12 committee is responsible for standards in areas of Geographic Information Systems (GIS). In 1994 further development was made in areas of IT management when the National Information Technology Council (NITC) was established to act as a think-tank focusing on the development of IT in a nationwide context. However, IT management institutions like the NITC and MAMPU have succeeded only in drawing up the *objectives* for IT development, and the standards working group committees were not able to bring together relevant agencies to identify IT requirements. In establishing a national GIS/LIS standards, for example, there is continued disagreement over various issues (for example, issues on geospatial data and metadata requirements; pricing and control on information) among institutions such as the National Mapping Committee (NMC), National Remote Sensing Committee (NRSC), and Military Mapping Council (MMC) (Mohamed, 1994; Mohd Zin, 1994). The lack of infrastructural standards allowing for data and information access and sharing has forced many organisations to continue embarking on individual information system programmes. Among land-related organisations, for example, there are currently various types of Geographic and Land Information Systems (GIS/LIS) implemented independently.

The problem of developing appropriate data/information sharing and exchange infrastructures is not unique to Malaysia; although to some extent the nature of the problem varies between countries. For example, in Britain there has been a diversity of interests involved in geographic information ranging from computer (hardware and software) vendors to information providers, public pressure groups and the academic community; and there is no single body responsible for various types of geographic information (Chorley and Buxton, 1991; Masser, 1996). In the absence of such a body the Ordnance Survey has played a role in the development of national geographic information strategies (Masser, 1996). Through the work of the Ordnance Survey Britain has been able to have a national series of digital maps based on a country-wide National Grid. In building a national information infrastructure Britain's main issues are to link other data sets to the core database (Masser, 1996). Some

areas that need to be addressed include that of pricing policy, in particular for Ordnance Survey data and methods of accessing data (Masser, 1996). The pricing and access issues faced by Britain, however, are different to those of the United States. The United States federal government places most of its data in the public domain; in other words there are no copyright restrictions (Nanson et al., 1996; Chrisman, 1997). However, this is a rare case for many countries around the world have maintained copyright laws and cost recovery programmes of some form (Rhind, 1992). In the case of developing countries issues of access to information are still only vaguely understood. As Fox (1991) explained few Asian countries, for example, have "*policies for establishing co-operation between different agencies, let alone policies for co-ordinating data collection efforts or for sharing information*" (p. 63).

An indication of the Malaysian government's views on research and development in IT, and related skills provision, is contained in the Prime Minister's 'Way Forward', popularly known as 'Vision 2020'. The Vision proposes nine challenges, one of which is to build a strong development foundation based on information technology. The Prime Minister argues that information technology is one of the most potent means of realising the goal of becoming a 'developed' country. Information technology is seen as the means of establishing an economy driven by intelligence, skills and diligence, and whose participants are in possession of a wealth of information, with the knowledge of what to do and how to do it. Information technology is said to "*nurture the positive environment for the establishment of a scientific and progressive society and will enable the nation to secure a diversified and balanced economy*" (NST, 1 August 1997). Vision 2020 sets clear goals for IT development and for achieving advanced country status. But how the Vision is to be implemented is not clearly stated. Implementation takes place in the context of existing structures and activities, and the goals can be interpreted differently by those responsible for implementation.

The pace of development in Malaysia is strongly guided by the vision of one person, the Prime Minster. Mahathir has made this clear since his first position as a Cabinet minister. As Minister of Trade and Industry from 1978 to 1981[1], Mahathir marketed

[1] Mahathir was elected Prime Minister of Malaysia on July 16, 1981.

Malaysia as a centre for direct investment by American, European and Japanese manufacturing concerns. He argued:

> "What are we after when we welcome the multinationals? [He asked]. The first benefit...is an inflow of capital. Next is the creating of job opportunities - the single most important raiser of living standards. Then there must be some form of technology and skill transfer..." (Mohamad, 2 October 1979).

Mahathir never lost sight of the interests of the multinational companies. However, he had a bolder and more ambitious vision which neither the older import substitution industries, nor the multinational based export oriented industrialisation, could realise. Mahathir did not intend development activities to be confined to a dependence on external multinational operations. He explained as follows:

> "We do not want to be grounded in the mediocrity of mere assembly operations [because] our future lies in the greater value-added secondary and tertiary processing of our raw materials and the higher technology industries" (Mohamad, 30 September 1986).

He meant Malaysia to achieve the classical 'take-off' on to a higher stage of industrialisation by way of a 'heavy industrialisation' drive, arguing that:

> "The push towards the development of heavy industries represents another new dimension of national development. I believe heavy industries will bring substantial benefits to the economy in terms of technology, skills and the numerous spin-offs, and will lay the foundation for Malaysia to become an industrialised society. We will not give up being producers of various agricultural commodities but we should overcome the mental block which condemns us to being the producers of primary commodities to find the growth of the industrialised countries. We must raise our sights and have the dynamic comparative advantage to sustain the development of heavy industries" (Mohamad, June 1984).

However, Mahathir's development ideology was not without challenge from among local intellectuals and Cabinet members, but he was able to overcome his critics. For example, Mahathir's heavy industrialised drive was argued against by some on the grounds that the domestic market was too small and that the products had a low export potential given existing gluts for automobiles and steel (Chee, 1989; Jomo, 1989; 1994). The absence of economies of scale made it likely that the projects would

require considerable levels of subsidy and protectionism which in turn would burden the local consumers; the projects would be highly dependent on foreign technology with a comparatively low degree of local participation in terms of content, expertise and management (Chee, 1989). Others (see, for example, Machado, 1987) argue that the projects needed massive capital investment and foreign borrowings over long gestation periods which would divert funds from other projects and render profitability uncertain.

Despite criticism, the Prime Minister carried out what he believed to be a necessary economic shift. He realised that in order for Malaysia to become a developed country it could not continue with conventional manufacturing industries. The Multimedia Super Corridor (MSC) project was launched to move the country from a manufacturing base to an information based or multimedia based economy. As with the heavy industrial shift, many people, including members of Cabinet, had their reservations. The critical factor in developing the MSC is technology that allows composition and delivery of the content. Malaysia does not own that technology. Research and Development and skills are still at the planning stage. In other words, the Multimedia Super Corridor lacks the right supporting structure to spawn off technology start-ups (Bullis, 1997).

It is impossible for skills and knowledge to be generated within a short-term period. For example, ISEAS (1986) and the World Bank and UNDP (1995) found Malaysia's skills training sector and educational programmes to be in need of major changes. They suggested that the private sector should be given more opportunity to participate in training programmes; that the Education Department should make changes in the school curriculum, for example, emphasising in areas related to national development policy such as in areas of IT; that improvements should be made to decrease the high drop-out rate among secondary level students; and that the enrolment of university students in science subjects should be increased. Further they stressed that the results of the improvements could not be expected in the short-term, for training and education takes time to mature. These suggestions have been taken up in general terms by related educational and training departments. But policy-makers, in particular the Prime Minister, believe that current IT skills and knowledge

shortages should not become obstacles to government development plans; rather Malaysia should use its other assets such as material resources and political will to embark on development undertakings. In 1996 the Prime Minister said:

> "First, Malaysia's physical location at the centre of ASEAN and its multicultural links with the biggest Asian markets is unique...With new airport and communications infrastructure being built, Malaysia will be a highly efficient and effective hub for the region; second, [Malaysia has the cost advantage as compared to other newly industrialised economies in the region] *my translation*; we have no inherited systems or entrenched interests determined to defend their current positions. We have the political will and power to rapidly change any existing laws or policies that impede the ability of companies to capitalise on the benefits afforded by the information age. We will not be bogged down by excessive politicking; finally, we...have a track record of meeting our commitments. We are a pragmatic government which has consistently proven our critics wrong even when we adopt unconventional policies and strategies" (NST, 1 August 1996).

The Prime Minister's personal vision is clearly communicated to all layers of society. SETIA and NALIS, information system programmes which form a focus of this research, are among the two IT programmes that could be considered as initiatives that follow the strategy set by the Prime Minister. But how far could government programmes follow the track record set by industrial implementation programmes which are highly dependent on multinationals and Foreign Direct Investments? Or could government agencies operate as private corporations? The Prime Minister believes that it is feasible:

> "We have introduced many changes to the administrative system. If previously we co-operated less with the private sector, today we consider the public and private sectors as a team that works together to develop the country" (Mohamad, 30 April 1993).

Currently (late 1998) in almost every significant line of industry, advisory committees staffed by representatives of leading firms work closely with government agencies, making the most of important recommendations. For example, Daim Zainnuddin, a businessman, is the government's main financial advisor. The division between businessmen and public officials is becoming so thin that sometimes public servants find it rather difficult to make distinction between 'professional' business advice and public policy. The transfer of public authority to private hands frequently comes at the

initiative of large companies. But sometimes the government itself will make the first overtures, organising private associations, and then handing them the powers of the state, thereby supposedly moving toward decentralised forms of policy-making. In fact, these measures can merely transfer public power to favoured producers who can readily control markets without being held democratically accountable by the public for the sovereign authority they exercise. The Multimedia Development Corporation (MDC), for example, an agency that manages MSC, acts with public authorities on most matters, but it is an authority answerable only to the Prime Minister.

Sometimes administrative personnel are drawn from the very industry that they are charged with regulating, their business background being taken as proof of their 'expertise'; they return to higher positions in the same industry after serving their terms in office. For example, the secretary general from the Ministry of Industry and International Trade joined the administrative position of Heavy Industries Corporation of Malaysia; senior engineers from the Department of Works have joined highway project firms; senior officers from the Defence and Police Departments have joined Malaysian airlines and shipping corporations. Likewise, many accept higher paying jobs in companies whose interests they favoured whilst in office. This promise of a lucrative post with a private firm can exercise a considerable influence on the judgements of the ambitious public administrator. There exists, then, a large number of decision-makers who are with the government but not quite within it, who exercise public authority without having to answer to the public and who determine official policy while considering their first interests and obligations to be their private businesses. Again, it must be stressed that these tensions are not unique to Malaysia. In the United Kingdom the Nolan Committee reported in 1995 on 'Standards in Public Life', in particular addressing possible conflicts of interest (The Nolan Committee, May 1995).

There is then the issue of whether Malaysia has enough organisational leaders capable of manoeuvring their agencies along the route of private development. As Cleary, Henry and Associates (1989) argue, sometimes public programmes are far more difficult to plan coherently than are private ones. They argued that problems faced by public programmes go beyond the boundaries of the programme that they are charged

with managing. Planning and setting priorities can be substantially more difficult because of less focused organisational goals. In addition, public administrators have to balance a range of other variables, including constituency pressures, the wishes of selected interest groups, the interaction of legislative committees, and a plethora of prospective social and economic changes that virtually no-one can predict. Programme planning in the public sector therefore bears little, if any, relationship to what planning means in the private sector. Consequently, programme objectives in the public sector are characterised not by their definition, but by their lack of it.

Osborne and Gaebler (1992), however, argue government involvement in the market is not new. They argued that:

> "Governments have done [setting rules of the marketplace] since the day government was invented. Zoning laws set the rules for real estate development. Securities laws set the rules for stock markets...Government constantly change rules of the marketplace to solve problems" (p. 280).

They argued though that many governments in the developed countries (the argument is applicable for developing countries as well) have not realised that market mechanisms have always been used to achieve government goals. One should not look, they argued, at what a government does, but rather at how the government operates. They stressed that:

> "the shift is under way all around us, but because we are not looking for it-because we assume that all governments have to be big, centralised, and bureaucratic-we seldom see it. We are blind to the new realities, because they do not fit our preconceptions" (p. 321).

Nonetheless, there are some (Kettl, 1995; Fox, 1996; Frederickson, 1996) who argue that one should also look to quality of change made by government. As Kettl (1995) argues, some of the common changes suggested, such as downsizing, has *"largely become a symbolic tactic, a way for elected officials to resonate with the concerns of the voters without directly attacking the problem of making government work better"* (p. 38).

Similarly Frederickson (1996) argues that:

> "The reinventing government...turns the old policy-administration dichotomy on its head. In the traditional dichotomy, Congress (city council, state legislature) makes laws, and the civil service, under the oversight of the president (mayor, governor), carries it out. In reinvention, the elected executive and the empowered public service engage in 'steering,' 'missions,' and in getting 'results.' These are all metaphors of political power that speak to the realignment of that power in the direction of elected executives" (p. 269).

The differences of opinions among these authors suggest that sometimes it is difficult to justify government action or in-action. But for Malaysia, government practice, in particular its emphasis on large scale development projects and dependence on the finance and skills of multinationals, confronted government in mid-1997 when the Asian economic crisis hit the region. The government could not come up with bold measures to stop out-flow of foreign businesses, closing down of local businesses and the increase in job losses. Government staff themselves had their contracts cut which meant postponing programmes of various types. One such programme is that for training and education; cuts were made at school and university levels on facilities like computers and advanced training in IT (NST, 20 September 1997; 30 July 1998; 3 September 1998). The prospects for improvement in Malaysia's economic environment have remained uncertain. Since September 3rd 1998 when the Deputy Prime Minister was dismissed Malaysia's long-term political stability and possible economic recovery has been a subject of international debate.

1.4 Study Aims and Objectives

The present research used two national scale public computerised information systems as vehicles through which to explore experiences of information systems development in Malaysia: the Integrated Project Monitoring System (SETIA) an established information system programme and the National Land Information System (NALIS) a newly organised computerised information system programme. The two programmes are different in nature but have similar general objectives - to manage information efficiently and effectively for use in planning and decision-making processes, as well as the sharing of information by users (public agencies) at different geographical locations. A total of 91 agencies[2] from Federal, State (including

[2] In the present study generally the term agency is used to describe a broad range of offices such as in ministries, departments, units, divisions, etc. In case where specific reference is required the exact name of the office is used.

District) and local authority levels were investigated to provide the necessary information in understanding the government and public servants in the undertaking of information systems development for Malaysia. Using these two case studies the main aims of this thesis are:

- to evaluate the process of information technology adoption in the organisational context and to explore the strategy (if any) of making information technology choices.
- to identify in detail where significant IT adoption has taken place.
- to assess adaptation issues, that is, how much the adopted information technology has been adapted by the organisations.
- to explore the broader contextual factors, external and internal to agencies, that may have affected IT programme development.
- to assess how IT has improved communications within and between organisations; and within areas in Peninsular Malaysia and between the regions of Peninsular Malaysia and East Malaysia.

With these aims in mind this study explores the following, more specific issues, involved in the implementation of information systems in Malaysia:

- The role of government has been considered as critical for influencing the diffusion of IT in organisations and societies, and in the development of supportive IT infrastructures and capabilities (Kraemer et al, 1992; 1994). In this thesis it is argued that government development policy has a significant influence on the computerisation activities of programme agencies. Similarly, computerisation activities in strategic government departments such as MAMPU, ICU and EPU collectively exert an influence on government IT policy. This thesis therefore finds it necessary to explore issues at national policy level as well as issues at the levels of individual programmes and organisations. Information from these levels provides a picture of the elements that created Malaysia's IT environment.

- Many authors (Cartwright, 1991; Masser and Campbell, 1991; Taylor, 1991b) have argued that developing countries often have a tendency to embark on ambitious IT planning rather than adopting a small-scale and gradual approach. But because of the cost and complexity of advanced systems many IT programmes have been abandoned or have failed to meet their desired objectives. This thesis seeks to evaluate how far this assertion is true in the case of Malaysia's IT programmes initiatives. In addition, some (Bawden, 1989; Masser and Campbell, 1991; Goodman, 1993; Campbell and Masser, 1995) have argued that in the implementation of IT programme many organisations have failed to draw management information strategies to identify, for example, user requirements, the types of information available and ways of sharing data. This has often resulted in a mismatch between user needs and what they receive. This problem is viewed as the reason for agencies' reluctance in co-operating with an IT programme. This thesis evaluates how far this issue is relevant to Malaysian organisations.

- Malaysia has implemented several large-scale computerised information system programmes but very few have managed to survive beyond their pilot study stage (Chee, 1989; Han, 1991). Similarly, many individual information systems have been implemented but few have managed to achieve their planned objectives. Some authors for example, Campbell (1991), Hastings and Clark (1991), Hutchinson and Toledano (1993) and Sahay and Walsham (1996) argue that sometimes organisations are more interested in demonstrating the technology than in solving real problems. This thesis assesses how far this problem extends to the Malaysian IT development context.

- The government claimed (Mampu, 1993; Abdul Hamid, 1994) that the reach of computer system implementation has expanded to cover not only units of particular agencies through the use of local area networks (LANs) but also to every State and District through the use of wide area networks (WANs). Through nationwide investigation this thesis assesses to what extent LANs and WANs are used by Malaysian public agencies. The level of LAN and WAN use will help to illustrate the extent to which electronic information exchange and

sharing activities occurs between and among agencies. In addition, the availability of LANs or WANs will help to explain the design adopted for NALIS which is highly dependent on LAN and WAN linkages for successful information sharing and exchange.

1.5 Thesis Structure

This thesis is divided into eight chapters. Chapter two describes Malaysia's geographical and economic position with respect to other countries in the Asian region. A discussion of the region is then related to the general socio-economic profile in Malaysia, in particular its development and political preferences. The second part of chapter two describes the case studies.

Chapter three provides the conceptual background to the research. It aims to explore wider problems and issues of information technology and development experience in other countries, both developed and developing. The chapter explores the relationship of 'development' to the implementation of new information technology, such as Geographic Information Systems (GIS). The development path chose by government, the type of technology preferred by government and generally types of technology are considered 'appropriate' for most developing countries are emphasis in this discussion. Implementation experiences of various countries are used to outline the factors which are necessary for successful implementation of Geographic Information Systems in developing countries.

Chapter four provides a theoretical foundation for the research. Two theoretical perspectives, Kling's Web model and Giddens' Theory of Structuration, which are used to guide the empirical and analytical aspects of the research are discussed in further detail. The Web model is used to explore the dynamics of computing use and development in organisations. Structuration theory takes on the discussion of human actors in organisations, and helps to form an understanding the meaning of an organisation from the subjective point of view; that is, treating organisations as subjects whose meanings are to be appreciated and understood rather than as objects that could be taken-for-granted.

The theoretical constructs lead to the information collection methodology in Chapter five. This chapter consists of three major discussion areas: research focus and strategy; the information collection approach; and techniques of information analysis. The first part describes the research focus and strategy. The former includes a brief explanation of the researcher's background in relation to the study area. The research strategy then follows, explaining how previous experience helped to develop initial research questions and the identification of initial groups of agencies for the purposes of pilot a study. The latter part of this chapter discusses the techniques used to evaluate the information collected during fieldwork.

Chapters six and seven discuss the results of this evaluation. Chapter six is divided into three parts; the first discusses issues related to the SETIA programme, the second discusses the findings related to NALIS and the final section summarises issues arising from both programmes. Historical accounts of the programmes are related to the present context by drawing on the results of primary data collection from fieldwork.

In Chapter seven two approaches are used to develop further the issues discussed in Chapter six. In the first approach structuration theory is used to reconstruct the social reality outlined in Chapter six. Here through action or inaction organisational actors are explained as a product of their behaviour - how they act and interpret their action to fit the environment in which they live. Part two of the chapter explains how the actions of these organisational actors and political leaders produce and reproduce Malaysia's development pattern and how these actors and leaders consciously and unconsciously help to generate problems in relation to programme implementation.

Chapter eight concludes the research. Discussion in this chapter focuses on knowledge and experience gathered from the case studies, and explores the ways in which geographical, organisational, political and technological issues were selected for action. Here, the research highlights both areas where Malaysian government has achieved its desired development objectives and areas where improvements are still needed. Suggested recommendations take account, not only of the findings of the present research, but also of views that are adopted by other researchers. These

suggestions are drawn in the form of guidelines that could be relevant not only for Malaysia but also for other developing countries.

Many of the issues contained in this thesis highlight government performances in meeting public needs. In the case of Malaysia many of these issues are considered *sensitive* for various reasons including restriction of legal and moral laws. With few exceptions, for example, Jomo (1989; 1994) and Chee (1986) academic writings have avoided discussion of the 'real' government problems and issues. Through the course of the present research various formerly hidden issues were brought to light following, first, the Asian economic crises in mid-1997 and then the dismissal of the Deputy Prime Minister, Anwar Ibrahim, in September 1998 which resulted in political unrest. These happenings open-up many of the 'hidden' government agendas once considered sensitive for public knowledge. However, the Internal Security Act was enforced to control the spread of the unwanted news or behaviour and for many local researchers the dilemma of explaining and publishing the truth continues.

The present research is able to link on-going political and social debates with evidence from the field and to compare it with the grand policies of Vision 2020. The inclusion of these factors differentiates this thesis from previous academic research which is able to evaluate only cautiously the mismanagement of development by government leaders and servants. Notwithstanding the findings of this research and that of other researchers, the openness in confronting development problems in a country with a dominant leader may be understood as criticism rather than taken as a public view on government 'problems'. It remains to be seen whether the post-1980s development ideology which incorporates the concepts of participation and empowerment will help to break down such political barriers to effective implementation of IT in poorer countries.

Chapter 2 Study Area and Case Identification: the context

2.1 Introduction and Study Area

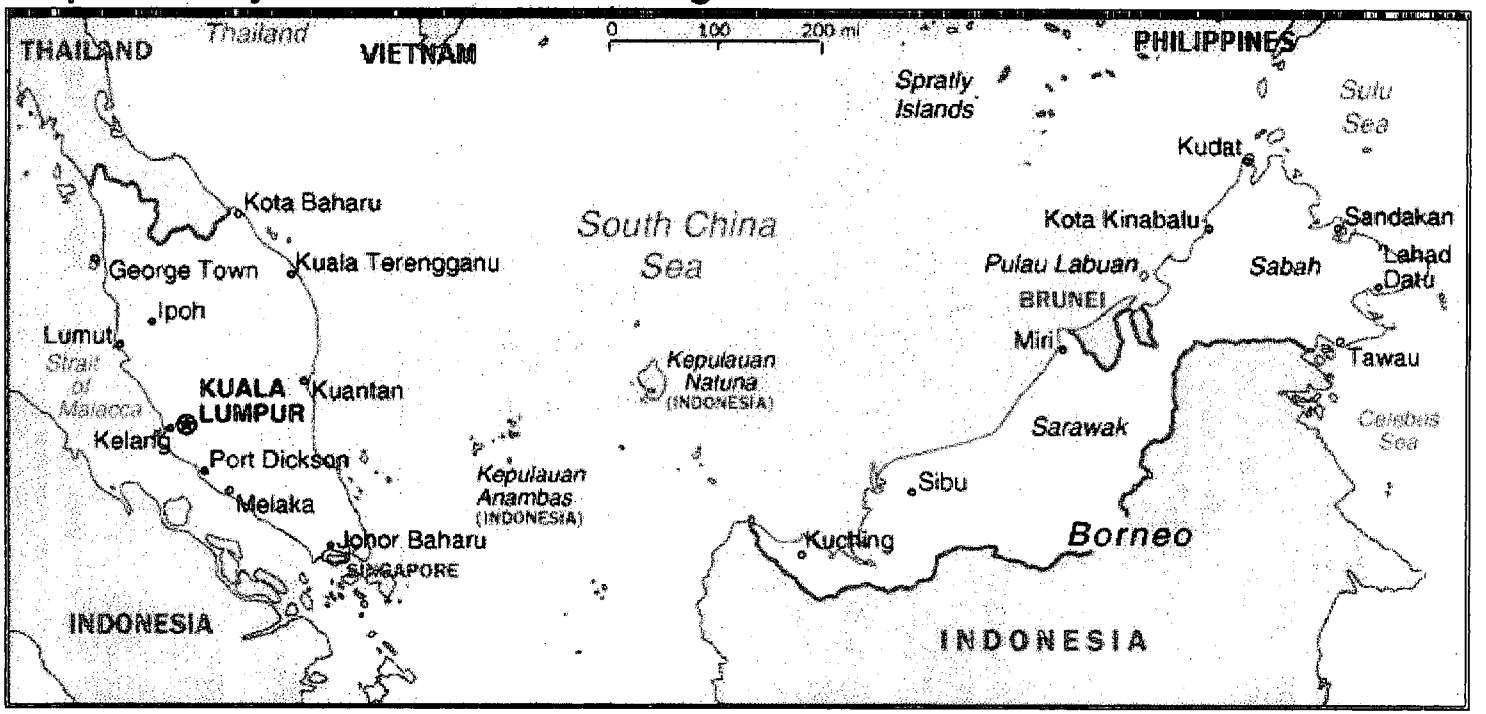
The aim of this chapter is two-fold. First, the basis for selecting the study area will be outlined. Discussion at this level includes understanding Malaysia's geographical, socio-cultural and administrative background, and relationships within the Asian region in general and ASEAN countries in particular. Second, the chapter will explain the basis for selecting specific case studies. This includes placing the case studies within the context of broader national IT development initiatives.

The geographical focus for this research is Malaysia (Map 2.1). One important underlying reason for choosing this as a study area is the researcher's familiarity with and background knowledge of the country. A second reason is grounded in the country's current development strategy which promotes IT-related ventures as a means to enhance development. The third reason relates to the Southeast Asian regional context, which is considered in the following section.

2.1.1 Regional Perspectives

In 1995, when the research for this thesis began, Southeast Asia in particular and Asia in general, formed a strong part of the world economy. For example, the four Asian Tigers, Singapore, Hong Kong, South Korea and Taiwan were exemplary countries in competitive trade. Malaysia was not far behind, and in fact, was on the verge of joining the four Tigers (IMF, 1997). Thailand, Indonesia and the Philippines were praised on certain aspects of their economic development (U.S. DOC, 1995). Two years later, in 1997, the economy of the whole region collapsed. Thailand suffered from plunging stock and real-estate markets, and a banking system in shambles. South Korea experienced high-profile bankruptcies, highlighting the runaway debts of many corporate empires which exposed the banks that owned those debts. By 1998 all countries in the region were experiencing deep financial troubles. Interestingly, international capital markets suddenly noticed that countries throughout this region had been running large trade deficits and economists (see, for example Greenspan, 1997; Krugman, 1997; Noland, 1997) are now re-evaluating the region's economic position. These authors have prop-

Map 2.1: Study Area and the ASEAN Region



osed that the root of Asia's troubles lies not with economics but in poor government policy that has misguided investments and has encouraged lending to weak financial sectors of the market. They argue that financial problems in the region have been apparent for a long time, but that government officials have ignored the situation. These authors argue that Asian economies, to varying degrees over the last half century, have tried to combine rapid growth with a much higher mix of government-directed production than has been evident in the essentially market-driven economies of the West. Through government inducements, a number of sophisticated manufacturing technologies borrowed from the advanced market economies were applied to the generally low productivity and, hence, low-wage economies. Thus for selected products, exports became competitive with those of the market economies, engendering rapid overall economic growth. As a consequence of the slackening of export expansion, caused in part by losses in competitiveness and the dollar appreciating against the Yen[1] aggregate economic growth slowed somewhat, even before the mid-1997 financial crises. The situation was exacerbated by a variety of policy errors. For example, in countries such as Thailand, the Philippines and Indonesia, authorities permitted the development of serious asset-liability mismatches; banks financed long-term domestic lending through short-run foreign borrowing; the financial system was politicised; capital was channelled to politically preferred borrowers; and financial decisions were strongly influenced by non-economic considerations, including outright corruption (The Economist, 2 - 8 August 1997; 9 -15 August 1997; 4 - 10 October 1997; Wehrfritz, 1997). Such practices may be sustainable as long as the rate of economic growth remains high, as financial institutions compensate for the low effective rate of return on loss to these preferred borrowers with high rates of return on other loans. However, as growth slackens, adverse consequences

[1] Noland (1997, p. 2) explains the Asian exchange rate misalignment as such: "*Beginning in 1985, the Japanese yen began a rapid appreciation against other currencies, particularly the US dollar. As the relative cost of production in Japan rose, Japanese firms reacted by moving production offshore, mainly to South Korea and Taiwan. To counteract this shock to the domestic economy, Japanese authorities pursued an aggressive policy of monetary expansion. The result was an asset price bubble in Japan and massive capital inflows into South Korea and Taiwan. By the late 1980s, these two economies came under similar pressure to appreciate their currencies, with similar results: aggressive monetary expansion, asset price bubbles at home and large capital outflows – this time principally to Southeast Asia*".
With the case of Malaysia, for example, Yen loans had grown with the 'Look East' policy from the early 1980s. At the time the Yen provided lower interest Japanese credit compared to other credit options (Jomo, 1989).

emerge. Bad loan begins to inhibit the ability of banks and non-bank lending institutions to supply credit to the economy (Greenspan, 1998).

These economic crises highlight weaknesses of the Asian region, and of developing countries in general, at two levels. First, among countries in the region approaches to development need to be re-considered, for investors are now more cautious when dealing with Asian countries. Second, unequal distribution of wealth becomes more revealing in the global context. Countries like Indonesia, the Philippines and Bangladesh, for example, remain what they have always been; exporters of raw materials and importers of manufactured goods. Income in Thailand and even Malaysia, despite high-scale economic activities, is not related to local skills and local industries. The basis of productivity is profit provided through dependency upon Foreign Direct Investment, multinational corporations and foreign aid (United Nations, 1987; World Bank and UNDP, 1995). Governments, investors and developers of this region are now fighting to rebuild their status. For Malaysia, the financial catastrophe hit when government promises to the people were at their highest. The following section describes Malaysia's government, society and its development planning.

2.1.2 Study Area Profile

Malaysia is a federation, consisting of thirteen States and two Federal Territories. Eleven of the States are in Peninsular Malaysia and the remaining two States, separated from Peninsular Malaysia by about 800 kilometres of sea, are Sabah and Sarawak. The country's total land area is 329,758 km^2. Peninsular Malaysia makes up about 40%, 37% covers Sarawak and the remaining 23% covers Sabah. About sixteen million people live in Peninsular Malaysia and almost two million live in each of Sabah (1.8 million) and Sarawak (1.9 million) (Table 2.1). The social and cultural complexity of Malaysia lies with its population which consists of three major communities in Peninsular Malaysia (Malays, Chinese and Indians) and several minor groups includings Thais, Vietnamese, Eurasian and European; eight communities in Sabah (including Murut, Bajau and Malay); and seven in Sarawak (including for example, Malay, Melanau, Sea Dayak, Land Dayak).

Table 2.1: Estimated State Population Distribution (1997)*

State	% of Land Area	% of total Population	Population Density (no. of people per km^2)
Peninsular Malaysia: Federal Territory of Kuala Lumpur	0.1	6.9	5,897.1
Kedah	2.9	7.9	172.1
Kelantan	4.5	6.9	99.9
Melaka	0.5	3.3	408.5
Negeri Sembilan	2.0	4.1	126.0
Pahang	10.9	6.0	35.1
Perak	6.4	12.4	119.0
Perlis	0.2	1.0	264.1
Pulau Pinang	0.3	6.4	1,236.7
Selangor	2.4	11.2	290.0
Terengganu	3.9	4.3	72.0
East Malaysia: Sabah	22.4	8.4	26.0
Sarawak	37.7	9.4	15.7
Federal Territory of Labuan	00.02	included under Sabah	included under Sabah
Malaysia	100.0 (total land area 329,758 km^2)	100.0 (20,961,000)	63.6 (average no. of people per km^2)

*Note: Based on Department of Statistics 1991 annual population growth rate.
Source: Department of Statistics, 1991.

These major communities could be subdivided further into approximately ten sub-communities in Peninsular Malaysia and thirty-two sub-communities in Sabah and Sarawak (DOS, 1991). The bumiputeras[2] make up the dominant population. In terms of employment, people from the bumiputeras group hold largely government and agricu-

[2] Bumiputeras are native to the land. In Peninsular Malaysia they include the Malay, who make up eight of its sub-communities (the Indonesian, Negrito, Jakun, Semai, Semelai, Temiar, and other Malay races). For Sabah there are the Kadazan, Murut, Bajau, Indonesia, and seventeen other indigenous groups. In Sarawak there are the Malays, Melanau, Sea Dayak, Land Dayak and eight other indigenous groups.

ltural jobs. The bumiputeras are concentrated in rural areas, and form a direct link to agricultural activities. The Chinese dominate the commercial sector and are directly associated with urban living and higher incomes (Table 2.2). Indians and other ethnic groups make up smaller percentages in the workplace.

Table 2.2: Percentage of Workers in Professional Occupations*

Ethnic group	Chinese	Malays	Indians	Others
% in professional occupations	55.9	28.9	13.3	1.9

*Note: High income jobs - architects, accountants, engineers, doctors, lawyers and surveyors.
Source: Second Outline Perspective Plan, 1991-2000.

Ethnicity of employment patterns changed to some extent after 1980 when the government began rigorously to invest in favour of the bumiputeras. The latter were provided with various types of business opportunities and saving schemes, for example, the National Secured Share Scheme, and investment in government business ventures with guaranteed yearly interest. Nonetheless, since the Chinese have dominated commercial and urban-related businesses for many generations, government efforts to penetrate the commercial sector in this way proved to be difficult (except, for a few selected politically well-connected bumiputeras). In thriving major cities like the Federal Territory of Kuala Lumpur and Pulau Pinang, Chinese dominance remains. However, with continued government assistance in pulling more bumiputeras to urbanised living, dominantly Malay States such as Kedah, Perlis and Terengganu, have become increasingly urbanised. By 1990, the government's national development strategy took a more ambitious turn. Investment planning was directed towards attracting high-quality input ('high-tech' and service industries) from international markets. During this time the economy was at its peak, with growth of domestic economy (GDP) standing at an average rate of 8.2% in comparison to 5.9% in the previous planning period (1985-1990) (GOM, 1991a).

2.1.3 Development Policies and Major Projects

In late 1990, the government introduced a new set of development guidelines for Malaysia, and two major policies were introduced; first, the New Development Plan

(taking the place of the New Economic Policy which began in 1970) and second, Vision 2020. The New Development Plan promised to meet four basic objectives:

- to reduce poverty and relative income inequalities;
- to address employment and the rapid development of the bumiputeras' commercial and industrial community;
- to increase growth in the private sector to achieve restructuring (i.e. balancing ethnic and poverty disparity); and
- to address human resource development to achieve growth and distributional objectives (i.e. expand training in major sectors, in particular IT).

Vision 2020 follows on from the New Development policy emphasising ten major factors, the most important of which is the creation of 'balanced development' to ensure stable growth, to minimise social conflict, to promote racial harmony and to enhance national unity.

Several grandiose projects have arisen from the these main development policies. These projects have included: the TELEKOM building, the tallest building in Asia when it was built; the PETRONAS twin towers, the world's tallest building; Kuala Lumpur International Airport, the biggest international airport in the region; the Multimedia Super Corridor (MSC), a test-bed for IT innovation and duplicating California's Silicon Valley; Putrajaya, a new, administrative capital of Malaysia expected to be a mega-city comparable to Tokyo and Yokahama; and Cyberjaya an intelligent city, to be a learning zone for local people and a living environment for investors working in the MSC. These developments are intended to help make Malaysia an 'advanced' country by the year 2020. State-of-the-art communications and telecommunication technologies are emphasised as major tools in this development, as are perceived as a means of bridging distances between regions, areas and cultures.

The MSC project has been devised as a catalyst to draw investors to Malaysia. The seriousness of this IT venture is apparent since Prime Minister himself has played the lead role in promoting plans for the MSC world-wide. Ten commitments (or the Multimedia Bill of Guarantee) are made to investors. These are:

- to provide a world class physical information infrastructure;
- to allow unrestricted movement of knowledge workers in and out of the country with no employment restrictions;
- to ensure freedom of ownership of companies;
- to allow freedom of sourcing capital globally for MSC infrastructure and freedom of borrowing funds;
- to provide competitive financial incentives including tax allowance for up to 10 years and no duties on the import of multimedia equipment;
- to develop intellectual property protection and cyberlaws;
- no censorship of the Internet;
- to provide globally competitive telecommunications tariffs;
- to tender-out infrastructure contracts, (i.e. to not be restricted by normal tender guidelines which require preference to be given to locals); and
- provide a high-powered agency to assist implementation (i.e. a separate body established especially to manage MSC, with the objective of reducing bureaucracy).

On the supply side, in preparation for the machinery and facilities to support the MSC, seven flagship projects were introduced. First, the establishment of 'smart schools' or schools utilising computers and advanced software for education and administration. Second, the introduction of multi-media smart-cards, to enable MSC residents and eventually all citizens to have a single card that will function as their identity cards, (an electronic purse for making purchases, a driving license and personal storage device). Third, creating R&D clusters to enable companies to share infrastructure, resources and expertise in research and development. Fourth, building an electronic government which involves intra-government, business-to-government and citizen-to-government interactions. The aim is to enable on-line registration, licensing payments and enquiries (this is to allow government to monitor the effectiveness of policies among various agencies and, at the same time, to reduce costs by streamlining internal processes). Fifth, strengthening of industrial strategy by sharing design and expertise through the use of web mechanisms,

that is, reducing the distance problems between industries. Sixth, creating on-line information marketing. Seventh, developing tele-medicine applications, for medical records management, remote diagnosis and optimisation of specialist resources and distributor medical databases.

2.2 A Development Paradox

The paradox of planning for development in Malaysia (and which is common among other developing countries) revolves around the conflict between demand and supply. In most cases demand for development is set before the supply of resources is made ready. One critical supply factor in Malaysia's current development is that of skilled labour. The labour problem, however, is not new, having existed since the first economic shift (from agriculture to heavy manufacturing) in the 1970s, and continuing through the second shift (from light manufacturing to high-technology industries) in the 1980s. Over recent years a training focus on IT has not been neglected but has been slow in comparison to project investments. Malaysia has been able to cope with shortages in skilled labour because Foreign Direct Investment and foreign multinationals have always supplied experts (United Nations, 1987; World Bank and UNDP, 1995). This ability to maintain a close relationship with foreign multinationals has made Malaysia, after Singapore, the second most important industrial centre for the ASEAN region.

The development of MSC has followed the same strategy. Due to shortages of trained personnel in IT, experts have been called from various international markets. The government used a similar argument to rationalise MSC's development, expecting that there would be an exchange of knowledge between foreign investors and local companies and in the long-term hoping that the spill-over from the MSC area would cover the whole country. Some analysts (World Bank and UNDP, 1995; Bullis, 1997; The Economist, 29 March 1997) have raised concerns about Malaysia's continued dependence on Foreign Direct Investment and foreign multinational corporations especially in relation to Singapore as the strong 'high-tech' competitor (Bullis,1997) and the emergence of India as a new and cost efficient 'high-tech' centre in Asia (The Economist, 30 September 1995; 29 March 1997) and this issue will be explored as part of the current research. The same concern has also been highlighted by local companies and public organisations (NST, 1 August 1997).

2.2.1 Skilled Support

Some studies (World Bank and UNDP, 1995; MASTIC, 1996) report that the supply of skilled labour to industry in Malaysia lags behind the development programme created. Two of the reasons highlighted by such studies are: first, the level of student enrolment in schools and universities has remained below the national target at all times; and second, an educational imbalance, with students not favouring technological subjects (all science and technology areas as well as engineering), means that skills are not keeping pace with industrial structural changes in the country compared to other countries in the region. (Table 2.3).

Table 2.3: Educational Enrolments in Selected Countries

	Tertiary Level Enrolment %			
Country	Total % of age group	All Science and Technology Subjects	Engineering Only	Vocational Training Enrolment
Malaysia	**7.0**	**0.15**	**0.07**	**0.17**
Thailand	16.0	0.16	0.09	0.80
Taiwan	37.0	0.92	0.60	2.12
South Korea	40.0	0.96	0.58	1.93

Source: World Bank and UNDP, 1995.

2.2.2 Research and Development

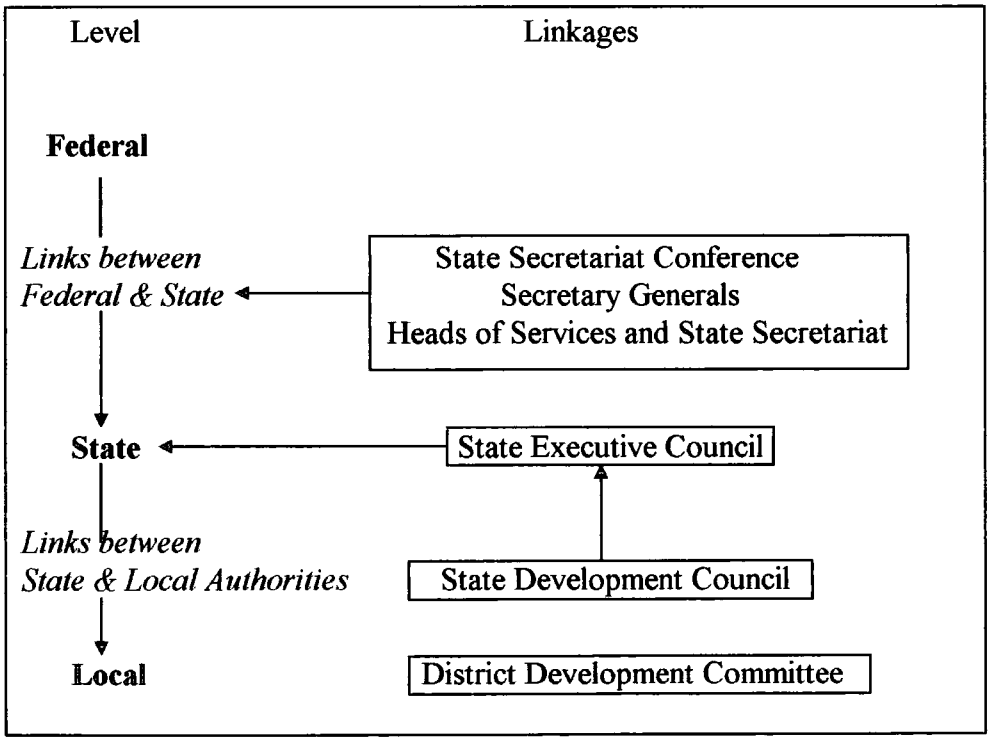
The national R&D expenditure for Malaysia has been estimated as 0.8% Gross National Product (GNP), with more than 80% being provided by the public sector (MOSTE, 1996). The share from the private sector is minimal. From the total allocation of R&D, about half is allocated to agriculturally-related research, 34% to industry and 17% to other sectors (MOSTE, 1996). Agriculture takes a significant share because the sector has had a strong institutional framework. In 1997 there were thirteen public research institutions catering for the agricultural sector whereas in the technology-related sector there were only two; namely, the Standards and Industrial Research Institute of Malaysia (SIRIM) and the Malaysian Institute of Microelectronics Systems (MIMOS). The low uptake of research and development in technology relates directly to skills and training, there being very limited numbers of competent R&D personnel within the industry

(MASTIC, 1996). Government, nonetheless, has a recent history of persisting with policies to accelerate R&D. In 1986, for example, about US$40 million were allocated to universities for R&D. However, the link between academic R&D and industrial product innovation has not been strong (World Bank and UNDP, 1995; MASTIC 1996). This is because academic science, until very recently, has invariably been pursued as an independent research function and has been isolated from relatively low technology domestic industries. The tendency for sectors such as education and R&D to act independently could be explained by the structure and culture of administration, and by the organisations in which sectors are embedded.

2.3 Administration and Organisational Structure

Malaysia administrative structure comprises three levels: Federal, State (including District) and local authority (Figure 2.1). Each level is differentiated in many ways.

Figure 2.1: Existing Government Hierarchy (1998)



At the Federal level, the Ministry is the highest level agency. The primary role of a Ministry is to formulate policies, and to plan and monitor programmes under the portfolio of a Minister. The implementation of Ministry programmes is the responsibility of departments which, in general, operate at State and local authority levels.

Administration at the State level is commonly divided into three levels: District, 'Mukim' (or Sub-District) and Village. The District Officer, who is the local executive in the District, is responsible for administration and development and reports directly to a State Secretariat. The State Secretariat is the most important department at State level. The State Secretary is the chief executive administrator in the State and acts as advisor to the Menteri Besar or Chief Minister, and to the Executive Council. The State Secretariat's function is to plan and co-ordinate all State policies and to ensure their implementation by all departments, including District offices.

Local authority outside the Federal Territory comes under the control of the State Government. This is an independent level of government and is provided with powers and autonomy in many areas. At the local authority level, the bodies that hold executive power are referred to as municipalities or district councils.

Because of the differentiated power between the Federal and State governments there are several council bodies and various committees established for co-ordinating purposes. The highest co-ordinating level involves Secretary Generals, heads of services and State Secretaries. To guard the specific interests of States there is a council of Chief Ministers and Menteri Besar (in the Federated Malay States).

2.4 Organisational and Administrative Culture

A total of 27 Federal ministries and a combination of 338 departments, units, divisions, etc. from Federal, State, District and local authorities make up the administrative structure described above. Every agency has a history of its own and has an individual culture to uphold. The strongest is the bureaucratic culture of public administrators. The latter play a dominant role in most agencies, by holding high level positions. In recent years, more professionals have been selected to head departments of a technical nature but the domination of public administrators over other professionals has not changed. Key agencies such the Prime Minister's Department, the Finance Ministry, and the Ministry of Industry and International Trade (MITI), for example, are run exclusively by administrators. This lack of recognition of professionals is one reason why many technical professionals are leaving public service.

2.4.1 Organisational Culture

Hierarchy is of central importance amongst Malaysian organisations. Because of status, those at higher levels have a stronger voice in decision-making even though lower level official may have more substantive expertise. Government (represented by the Chief Secretary to the Government) has argued that this approach to decision-making has changed. According to the Chief Secretary current management approaches are based on decentralisation, flat organisation, empowerment and team work (Abdul Hamid, 1994). In practice, however, this approach is rarely encountered, due to barriers grounded in seniority, corporate leadership, and political influence. [See for example, arguments by the chairpersons of the Malaysian Institute of Microelectronics Systems (MIMOS) and the Multimedia Development Corporation (MDC) who maintain that this issue is a problem in enhancing MSC's development to national level, (NST, 1 August 1997)].

2.4.2 Administrative Culture

Malaysian administrative culture has been to have remained unchanged since independence from Great Britain in 1957 (Kessler, 1992). Within the overall organisational system decisions always rest with the Prime Minister's office. The present Prime Minister's administration is even more highly regarded because of his assertive actions towards change for the country. In his early days as Cabinet minister (in the 1970s) the present Prime Minister introduced the idea of change for Malaysian society, especially among the bumiputeras. His ideas were implemented soon after he became Prime Minister in 1981. His first initiative for change was adopting a 'Look East' policy through emulating Japanese and South Korean work style ethics. This policy was followed by the 'Malaysia Incorporated Concept', where Malaysia's workers were urged to 'serve their offices' as if they were serving the country. In 1983, the Prime Minister announced the Malaysian government's commitment to privatisation (to changing of the status of business, service or industry from State, government or public ownership to private ownership. The term sometimes is linked to 'contracting out' or 'compulsory competitive tendering'). The privatisation concept was given special focus with the appointment of a businessman as finance minister. Government also legislated a number of changes to existing laws to facilitate privatisation.

2.5 Case Identification

The selection of specific case studies for this thesis is influenced by the present government's motivation to use IT as a means of reaching advanced development status. Government made two levels of emphasis: first, public agencies are entrusted to initiate maximise use of IT, that is, to be used not only by officers but also supporting staff, to avoid duplication of information collection efforts by various government agencies and to encourage extensive sharing and exchange of information both within and among agencies. Second, information systems are to be the means to overcome the friction of distance between geographical areas. Better communications are being sought to minimise the present disparity between East and West Malaysia, and between the east coast (dominantly poor States and Malay ethnic groups) and west coast (dominated by rich urban States and non-Malay ethnic groups) of West Malaysia. One major initiative which has been proposed as part of the goal in this context is the National Land Development System (NALIS). The main purpose of NALIS is to provide the government with an information and technology infrastructure to support interrelated aspects of strategic planning, land and landuse management, resource management, environmental management, and physical infrastructure planning and development. NALIS also aims to provide the necessary organisational and management infrastructure to support the development, maintenance and dissemination of land-related data and information. This organisational infrastructure aims to cover and involve all levels of government in the country, that is, the Federal, State (including District) and local governments.

Before NALIS was initiated there were several similar, less ambitious initiatives, all of which failed, for reasons mostly related to weak co-ordination and data incompatibility. The first idea for inter-departmental land-related information sharing was the National Land Data Bank (NLDB) introduced in 1974. The NLDB was to be an inter-departmental project with a task force made up of representatives from various government departments and agencies such as the Economic Planning Unit (EPU), the Statistics Department, the Treasury, the Town and Country Planning Department, the Sabah Land and Survey Department and the Federal Commissioner of Land Offices. Two years after initiation the programme stopped making any significant progress due to lack

of support from participating agencies. During the same period (the mid-1970s) a similar proposal, independent of the NLDB, was put forward by a group of academics from Science University Malaysia. A pilot project involving three northern States (Pulau Pinang, Kedah and Perak) was carried out during the period 1977 to 1980. Detailed socio-economic data on population and housing, commercial and industrial properties, and land tenure and ownership, were collected and stored in digital format. The programme came to an end because of problems with data sharing and data incompatibilities.

The main underlying difficulties with these two initiatives relate to issues of organisational behaviour. The present study therefore sets out to explore the following basic questions in this context: have there been changes in public organisations since implementation of previous programmes? Has NALIS learnt from past problems and how is the design of NALIS set to minimise organisational weaknesses? One key focus of this research is therefore on organisational behaviour, and it seeks to understand how and why individuals in organisations behave the way they do.

In order to evaluate organisational behaviour in programme management, however, an assessment of NALIS and its predecessor programmes alone is not sufficient. This is because, firstly, direct comparison with predecessor programmes is not possible because their coverage is different and their development is incomplete. Secondly, because NALIS is a relatively new programme, studying NALIS alone will not provide a complete picture of inter and intra-organisational behavioural relationships. The Integrated Project Monitoring System (SETIA), a thirty year old computerised information system programme has, therefore, also been selected as a case study. The SETIA and NALIS programmes are different in terms of the types of data they collect but are otherwise similar in three main aspects. First, both are national scale computerised management information systems; second, the objective of both programmes is to satisfy data/information needs for central national planning and to provide exchange of information services between different levels of government; third, both are central government initiated programmes with the distribution of tasks cutting through levels of government and hierarchy.

As a programme that has been fully developed, SETIA will be used to provide understanding of the processes of change involved in implementing a large scale information system. NALIS, as a new programme, is used here to provide an understanding of programme initiation and design action. This combination of case studies is expected to provide an understanding of approaches used in planning, administering, and design and implementation of large scale information systems. Ultimately, it is intended that an examination of these programmes will illuminate the ways in which public organisations, through the use of IT, can help to minimise cultural, social and economic gaps that currently exist between different areas and regions of the country.

The IT-related initiatives selected for this study are evaluated in the context of a study area which is not only administratively and socially complex but also economically volatile. Since the programmes selected for study are related to national level development these factors need to be given important recognition.

The next chapter discusses information system development through the processes of adoption and adaptation in developing countries, with special reference to Malaysia. The discussion draws comparisons with organisational and technical issues in developed countries.

Chapter 3 Information Technology for Development

3.1 Introduction

The Prime Minister of Malaysia stated *"It can be no accident that there is today no wealthy developed country that is information-poor, and no information-rich country that is poor and undeveloped"* (NST, 1 August 1996). The speech was made to create awareness among Malaysians of a new and dangerous form of information poverty that could further widen the gap in economic status and competitiveness of a developing country. Should Malaysia be left behind, the Prime Minister argues it will risk a shrinking market share. To remain competitive in a global market, it would be necessary for Malaysia to have a strong information infrastructure so that it can maintain effective communications and develop alliances with industries around the world. The World Bank, likewise, argues that developing countries must adjust to information technology challenges or *"suffer exclusion from the global economy and severe disadvantage in competitiveness of their goods and services"* (World Bank, 1997a, p. 12). Bangemann (1994) similarly argues that:

> "The first countries to enter the information society will reap the greatest rewards. They will set the agenda for all who must follow. By contrast, countries which temporise, or favour half-hearted solutions, could, in less than a decade, face disastrous declines in investment and a squeeze on jobs" (p. 1).

Malaysia, along with certain other developing countries, has responded strongly to such challenges. For example, Malaysia is constructing a 'high-tech' development area called the Multimedia Super Corridor (MSC). The site covers an area of about 750 km^2, lined by optical fibres. Singapore is carrying out a similar undertaking called Singapore One, a project which envisions the networking of the entire island. Budgeted at US$27.6 million work on the high bandwidth T3 Internet links to the United States has recently begun. This connection will make Singapore the only Asian country besides Japan to have high speed connections to the global Internet backbone (SNCB, 1997). Thailand is developing a similar project, and is planning to install six million telephone lines (GOT, 1997). Indonesia has a built a microwave transmission network to bridge communication between its 13,000 islands (which stretch 3,300 miles east to west and 1,300 miles north to south). The Indonesian government's

future plan is to increase installation of at least five million lines, which will triple the number of existing lines (ASEAN, 1995). The Philippines are upgrading their telephone backlog of 800,000 applications, by privatising their long-distance telephone company (GOP, 1997).

However, infrastructure developments such as these in developing countries have been criticised by some (for example Bullis, 1997; Krugman, 1997) as inappropriate. They argue that due to high levels of poverty, disease, and illiteracy, the immediate concern should be towards upgrading basic infrastructure, amenities (such as electricity, telephone, water suppliers) and social services (such as education and health). On the other hand, leaders of developing countries and international institutions, such as the World Bank (1997a) and proponents of IT argue that it is just because these problems exist (poverty, disease, illiteracy) that investment in advanced information infrastructure is appropriate (see, for example, Kraemer, et al., 1992; Pitroda, 1993; Smith, 1995; Broadbent, 1997).

The present study explores these perspectives further and seeks to understand why development choices for developing countries are difficult, especially when relating to the choice of new information technologies such as Geographical Information Systems. The discussion begins by exploring the debate over the term 'development'.

3.2 Development Debates

'Development' is defined and informed by different intellectual traditions. At its most basic level the term 'development' may be used to refer to the level of per capita income, and its growth over time. National income estimates are readily available for a large number of countries and are widely understood by many (ILO, 1972; Chenery, et al., 1974; Sundram, 1983). But, for many GNP is too simple a formulation to describe development (Rostow, 1960; Kindleberger, 1965; Maddison, 1970; Singer and Ansari, 1977). Kindleberger (1965) for example argues:

> "economic growth means more output and changes in the technical and institutional arrangements by which it is produced...Development goes beyond these to imply changes in structure of outputs and in the allocation of inputs by sectors...development draws attention to the change in functional capacity-in physical co-ordination, for example, or learning capacity" (p. 3).

Singer and Ansari (1977) argue similarly that:

> "The developing countries are not all poor countries, though the overwhelming majority of them certainly are. We must carefully avoid, therefore, using the increase in per capita income as an identification of development.. This would be an extremely narrow view. Development consists of much more than an increase in per capita income; it is desired for many and complex reasons of which the increase in per capita income is merely one" (p. 40).

During the 1980s and 1990s understanding of the development process was given closer analysis (Bryant and White, 1982; Menou, 1993; Escobar, 1995). It was realised that focus ought to be given to the complexity of specific circumstances encompassing the socio-economic, cultural and ecological conditions, as well as the prevailing institutional framework and the relevant external and international contexts. The relationship between the complexity of the development context, and failure of known development solutions, came to be well illustrated in the sustainable development debate that had begun to overshadow the development debate since the second half of the 1980s (World Commission on Environment and Development, 1987). The emphasis in development in the 1980s was shifting to questions of inequality and equity in development, and the role of a variety of actors and actions in development, especially those relating to local and environmental matters. The intense interest in the concept of sustainable development since then is perhaps ascribed to a general realisation that it has become imperative to redefine development. Earlier conceptions that equated development with growth and accumulation have been seen as resulting in extensive damage to the environment.

At a different level during the debate the academic community worked to give shape to other important concepts in the field of development, namely the integrated nature of development problems and a holistic approach to development action. The significance of 'context' began to receive more attention again (emphasised by Riggs in 1970). Approaches to the 'Third World' development were criticised as having been exclusively shaped by Western views that gave a central place to progress by means of technological domination over nature (Norgaard, 1988). Western beliefs and patterns of thinking were argued as instigating cultural imperialism and the

downgrading of various non-Western cultures (Norgaard, 1988; Escobar, 1995). As Escobar (1995) puts it, the function of Western is to normalise non-Western populations, or make the non-Western more like them. The state in the 'Third World', according to Escobar is usually an instrument of neo-colonialism which arrogates to itself the ability to speak and write with authority about the problems of developing societies. Mohanty (1991), for example, refers to the images of 'Third World' women as represented in most feminist literature as:

> "essentially truncated life based on her feminine gender (read: sexually constrained) and her being 'third world' (read: ignorant, poor, uneducated, tradition-bound, domestic, family-oriented, victimised, etc.). This, I suggest, is in contrast to the (implicit) self-representation of Western women as educated, as modern, as having control over their own bodies and sexualities, and the freedom to make their own decisions" (1991, p. 56).

This image, Mohanty believes is a paternalistic attitude on the part of Western women toward their 'Third World' counterpart and, more generally, the perpetuation of the hegemonic idea of Western's superiority. Mohanty's critique was supported by Escobar (1995) who states that Mohanty's views applies also to mainstream development literature, "*in which there exists a veritable underdeveloped subjectivity endowed with features such as powerlessness, passivity, poverty, and ignorance, usually dark and lacking in historical agency*" (p. 8). Both authors suggest a move to explore and define the colonial discourse in ways that allow the exercise of power over it.

A new conception of development therefore emerged, not only set against Western epistemology, but also against Western conceptions of development, of development process, and of the desired action. In this context the felt needs and self-understanding of people affected in development are brought to the front and issues of 'empowerment' and 'participation' become key.

3.3 Development Choices

Despite the shifting emphases and changes in ways of thinking about development, in certain quarters, especially among international organisations, bureaucratic and

management solutions to development have not shifted away from technical economic sentiments and technical approaches. Escobar (1995) made the following observation:

> "Indeed, it seemed impossible to conceptualise social reality in other terms. Wherever one looked, one found the repetitive and omnipresent reality of development: governments designing and implementing ambitious development plans, institutions carrying out development programmes in city and countryside alike, experts of all kinds studying underdevelopment and producing theories ad nauseam...Reality, in sum had been colonised by the development discourse, and those who were dissatisfied with this state of affairs had to struggle for bits and pieces of freedom within it, in the hope that in the process a different reality could be constructed" (p. 5).

Development decisions in reality then are motivated by a variety of aims, and are guided by different interest groups that are influenced by factors such as social customs, political systems, religion and colonial history. All these factors directly or indirectly enter into the determination of development choice. For former colonised countries like Singapore, Malaysia, India and parts of Africa the shift away from Western ideology takes time. Administrators and decision-makers are still dominated by a Western educated group. Large areas of development-related laws are still based on those of the colonial period. For example, the Local Government Act (Act 172) and Town and Country Planning Act (Act 173) in Malaysia practically duplicate the those Acts in Britain. Similar examples are found in other institutional systems such as schools and universities. Sometimes embedded ideology stems from a historical discourse that causes major conflict, not only between developing countries but also within groups of various generations and classes within a country. Esman (1980) for example indicated the difficulty for certain African countries to accept administrative reform merely because public administrators were unwilling to break the centralised power of an elite and bureaucratic group. The assertion made by Escobar (1995) is true that colonial influences "*just do not seem to go away*" (p. 12). A top-down approach characterised policy formulation, planning, decision-making and implementation used in the colonial era, for example, has remained popular among many 'Third World' countries. Hutchinson and Toledano (1993) cited a case in India of how a group of government IT experts did not understand the importance of IT dissemination to rural areas. The Comilla programme in Bangladesh provides a similar example of pervading influence of elite groups (Blair, 1978):

> "Clearly, the class structure of the Third World states has a great deal to do with this melancholy truth, and class analysis goes a long way toward explaining why rural development programmes serve a relative few at the top of the economic structure" (p. 65).

Confronting the hard-core bureaucratic elite and the politicians were approaches emphasising power at the grass-roots level. One such effort was the 'appropriate technology' movement first synthesised from Schumacher (1973). This was an intermediate technology concept based on the foundations laid by Ghandhi ideology (for example, see Hoda, 1976). The concept emphasised on the idea that technology should fit into the context of particular location and period. The following section explores development of the appropriate technology movement.

3.4 The Relationship of Appropriate Technology to Development

The appropriate technology movement has grown in importance since the second development decade (1970s) when there was increasing uncertainty over the optimism of earlier development strategies (Corbridge, 1995; Stewart, 1997). Direct application of Western technology, it was argued, failed to produce the desired economic growth, and had contributed directly to employment problems, rapid rural migration and the explosive expansion of urban areas (for example, see Evans, 1984; James and Watanabe, 1985). Western technologies were developed in response to entirely different conditions in term of labour, raw materials, skills, and market responses (Long and Oleson, 1980; Yapa, 1991). Technologies appropriate for developing countries should as suggested by Clark (1988) have:

> "emphasised the importance of improving the productive capacities of people in their existing workplaces wherever these might be, taking the jobs to the people rather than the people to the jobs, of incremental technical improvements across-the-board rather than big-bang quantum leaps and, most important of all, it showed how there was a central role for small scale, labour intensive technologies in economic development" (p. 1).

Appropriate technology views, however, were not readily accepted by some developing countries, especially those with strong 'modernising' market economies like Taiwan, South Korea, Singapore (United Nations, 1987) Malaysia (ISEAS,

1986; World Bank and UNDP,1995), and China (Ho, 1997). Opponents of appropriate technology asserted that imported technology, as opposed to domestic technology, was more efficient and reliable. This stems from the fact that the imported technology must meet world standards to be competitive. It is proven technology, based on designs and processes that for the most part have sustained applications successfully in a variety of situations. Opponents of appropriate technology argue that for developing countries to raise their rate of economic growth over time, they have to develop their own advanced industrial sector as soon as possible. According to this argument, highly intensive investments are the only way for the developing countries to maximise investment in the shortest time. Labour intensive industries tie working capital too long to realise given output. Most importantly to compete with international markets, the most efficient methods must be used. Capital intensive industries provide the degree of quality control and product precision required in international markets.

From the perspective of advanced information technology, the World Bank (1997a) argues that appropriate technology "*ignores the profound social implications of technology and risks consigning the world's poor to a life of third-rate capacity and opportunity*" (p. 1). Smith (1995) states that should developing countries be denied access to newer means of information systems, they will continue to be by-passed by developments and their information isolation will increase. Pitroda (1993) views information technology as a means of equalising differences between developed and developing countries, seeing information technology as:

> "a great social leveller,...It can raze cultural barriers, overwhelm economic inequalities, even compensate for intellectual disparities. High technology can put unequal human beings on an equal footing, and that makes it the most popular tool devised" (p. 1).

There are two principal issues emerging from the controversies around appropriate technology. The first revolves around the relationship of technology to economic growth. The question is whether the technology selected could maximise labour and high quality output. With regard to this it is quite clear that the overriding criterion should be choosing a technique that best meets the needs of the country. In other

words should a labour intensive technique provide the desired quality product, then it is an appropriate technique. The second issue relates to the definition of the term 'appropriate'. It has been argued that the term should not be restricted to a comparison with high or capital intensive technology. A particular characteristic may validly describe what is appropriate for the production of some products in some countries, but not what is appropriate for other products or other localities (Bhalla, 1979). Others (James and Watanbe, 1985) argue that technology is only 'appropriate' (or 'inappropriate') by reference to criteria or objectives which themselves must be specified in empirical terms. The appropriateness of the technology is then made to depend upon its 'consistency' in meeting the objectives specified. Westphal (1984) stresses that the choice of appropriate technologies can be made by only individual producers who are familiar with the specific technological alternatives, and the characteristics of the industry in which they operate. Key roles therefore rest with policy-makers and local experts who establish the environment in which the choices are made. It is then possible for policy makers to interpret appropriate technology in a way that makes it convenient for them. Eckhaus (1977) for example argues that:

> "Recognition of technology's essential role in development does not imply a technological determinism. Not only can alternative products and methods be chosen, but the wider effects of these choices depend strongly on the political and economic environments in which they are implemented...The use of any technology is not an end in itself. The criterion for an 'appropriate' technological choice must be found in the essential goals and processes of development" (p. 6).

Stewart (1985) argues along the same lines that the choice of technology is difficult to judge because it is sometimes influenced by local socio-cultural and political matters. Stewart notes that:

> "a strategy which might appear first best from the point of view of promoting appropriate technology may in fact to be ruled out in a particular context because it appears infeasible, and some apparently second best set of polices be recommended. This is a problem-ridden area because it is very difficult to judge what is and what is not feasible. Yet to ignore it can lead to useless recommendations" (p. 26).

Stewart (1985) notes for this reason the dynamic dimension of technology choice needs underlining. The choice of technology must fit in with the dynamism the

economies and not simply consist in a static resource allocation exercise. Further, Stewart states technology is also changing at a rapid rate especially in some industries, rendering obsolete many existing technologies. The implications of rapid technology change emanating from developed countries also needs to be taken into account in determining policies for appropriate technology.

Several examples are provided here to develop the above issues. Watanabe (1985), in a study of Japanese weaving factories explained that Japan maintained a large scale mechanised operation forty years after the introduction of modern weaving machines (in Germany). This was because the Japanese found that at the time mechanised operation was still profitable for their purposes. The Grameen telephone project in Dhaka, Bangladesh (Hague, 1998) exemplifies a choice that required a move to adopt new technology and which involved the initiative of a local banker. The objective of the project was to improve communications at the grass-roots level so that isolated villagers previously deprived of communication access could be provided with wider communication power and a means of helping them to generate new income. The Grameen telephone initiative indicates that in certain circumstances new technology is the only appropriate choice to cope with competitive activities. In another case in Delhi, India a move was made to re-introduce the rickshaw as an appropriate transportation solution for the lower middle-class travellers (Bhatnagar, 1997). Bhatnagar argues that for crowded and polluted cities like Delhi the reintroduction of the rickshaw was the most appropriate way to help people (rural migrants) to help themselves, thus enabling them to contribute to the social and economic development of their communities.

The above examples indicate that the concept of 'appropriate' may be interpreted differently by different users and in different contexts. For example, a technology appropriate for Delhi may be inappropriate for Kuala Lumpur, even though Kuala Lumpur is also a polluted city. There are considerable social and economic differences the two cities. For similar reasons high-technology information infrastructures may be considered inappropriate for Kuala Lumpur by some (Bullis, 1997; The Economist, 29 March; 30 September, 1997). International investors who invested in the construction of the infrastructure, however, clearly believe otherwise.

Cartwright's (1993) argument perhaps best describes the issue of 'appropriateness'. Cartwright notes that appropriate technology is not necessarily:

> "out-of-date - nor, of course, that all out-of-date technology is appropriate. Similarly, advances in technology are just as likely (at least in the short-run) to make the new technology less appropriate as more appropriate. If new technology is more expensive and more difficult to use than the old technology..., then it is likely to be less appropriate for most applications and most users. 'Appropriateness', in other words, is a function not just of the technology, but ...as a 'socio-technical' relationship between the technology, its users, and its uses" (p. 262).

Choices of technology as such depend on an individual country's interpretation of 'appropriateness'. In many instances and at least in the short term choice of technology is limited to that developed by advanced countries. Developing countries are required to learn how to make appropriate choices among the many available technologies and to try to bargain for suitable assistance. The following section explores some of the issues surrounding foreign assistance.

3.4.1 The Role of Foreign Aid

Notwithstanding the arguments against adopting foreign technology in some developing countries, foreign technology and foreign assistance may seem to be a rational choice (Morrison, 1984; Rush, 1984). Morrison writes that:

> "the poor are not necessarily poor because of their relations or lack of relations with the rich, nor will they make themselves better off (including self-sufficient) by avoiding interactions with the rich...including those interactions that give them access to hard technology. The benefits of international interdependence... creates mutual benefits, even if the benefits are asymmetric" (p. 216).

Accordingly, Rush (1984) argues that having to depend on foreign technologies does not mean that developing countries cannot bargain and receive appropriate choices. Consequently, Morrison argues for foreign companies playing a part in guiding developing countries to make appropriate choices by changing their business-practice-clause. Morrison says that a developed country should not:

> "export utopian, absolute notions that [the developed countries] have no intention of putting into practice [themselves]. In particular, [the developed

> countries] must not get in the position of cutting developing countries off from the hard technologies on which their development plans have been laid...unless [the developed countries] are prepared to (a) develop and supply equally affordable and equally productive AT alternatives and (b) guarantee backup of their basic needs until AT is in place" (p. 218).

Morrison and Rush stressed two important points. First, there is a need for a two-way relationship in making technology choices. Second, there is a need for developing countries to be aware of their country's context, that is, choices should be 'practical' in terms of the country's capabilities.

In light of the above statements the following section explores the use of one advanced information technology, namely, Geographic Information Systems, in poorer countries.

3.5 Geographic Information Systems in Developing Countries

> "GIS technology is not as scientifically objective and value-free as some authors assume. It is a product of industrial and post-industrial societies of the so called 'First World'. The information...taking place in these societies is imbedded in a general context of socio-economic change in society as a whole. The socio-economic realities and priorities of the 'Third World' are quite different and, if GIS is to be of use to the challenges facing developing nations, then it must respond to these realities and priorities" (Taylor, 1991a, p. 1).

Cartwright (1993) follows up Taylor's argument by posing the question that in the light of possible difficulties of implementing GIS in the Third World, *"ought we even to be making the attempt? Is there not something fundamentally inappropriate about using 'high tech' in a 'low tech' environment?"* (p. 264).

In line with Rush (1984) and Morrison (1984) who argued for a two-way understanding in transferring technology to developing countries, some authors have concluded that the users and suppliers of GIS technology must be more aware of the social, political and economic context of where the technology is to be implemented (Masser and Campbell, 1991; Taylor, 1991a; 1991b). Furthermore, local 'experts' in developing countries can play a major part in 'fitting' the technology into their country's context because, firstly, they have an understanding of the technology itself and, secondly, they are aware of their country's own capabilities (Taylor, 1991a).

However, many studies found that gaining understanding between users and suppliers of GIS technology is not a straight forward process. Similarly, reliance on local experts to assist in GIS implementation have also been found difficult for a variety of reasons (Edralin, 1990; Hastings and Clark, 1991; Masser and Campbell, 1991; Hutchinson and Teledano, 1993). The following section explores these issues further.

3.5.1 GIS Implementation

Issues relating to implementation of GIS can be categorised as technical, organisational and institutional. Obermeyer and Pinto (1994) argue that the primary problems that underlie implementation of most information systems are usually organisational, rather than technical. On the other hand, some researchers, for example, Croswell (1989), argue that institutional matters dominate over technical issues. The most important obstacles come from lack of co-ordination and communication between organisations, and lack of management commitment to support to project causes. Common among most studies are views that technical factors are the least problem area in GIS implementation. However, the dominance of each factor may vary with situation, including project scale, design and place. For example, unlike other developing countries, India has only minor problems with the supply of trained computer specialists (Hastings and Clark, 1991; Taylor, 1991b; Hutchinson and Toledano,1993). Hutchinson and Toledano, for example, described the situation for a project on wasteland development as follows:

> "India's rapidly growing computer capability helped to reduce or eliminate many potential technical problems, such as the purchase of equipment and software and the training of technicians. Additionally, almost all technical centres had experience with some sort of GIS package before the start of the project....Almost exclusively, members of the teams from each participating research institute were highly trained...No computing problem seemed beyond their ability to solve" (p. 457).

The key problems for this Indian project related to data shortage and incompatibility. Efforts towards improving these difficulties were hindered by organisational and institutional barriers which could have been identified at the project initiation stage (Hutchinson and Toledano, 1993; Sahay and Walsham, 1996). Disagreements were

identified over issue on the overall project design. The USAID who was to assist the Indian government (represented by the Ministry of Environment and Forests) found the Indian team had no real measuring guidance on why the wasteland programme was to be undertaken. According to the USAID the Indian team interest seemed focused on obtaining the GIS technology and to demonstrate how well they can use the technology. The USAID insisted for the programme to use a goal that can deal with specific geographic area and users. Disagreements between USAID and Indian teams contributed to project delays. Hutchinson and Teledono (1993) report *"thus the issues we* [the USAID] *faced involved the transfer of technology within, rather than to, India. Our role was not to transfer technology per se but to advise the purveyors of the technology on how best to achieve their objectives*" (p. 456). Sahay and Walsham (1996) who follow-up the project progress provided specific difficulties which included the rapid transfer of personnel at different levels; GIS field staff being transferred to other districts after having gone through training; rapid turnover of vendors which disrupted training and installation; lack of consensus about a data model; conflicts between administrators and scientists over the project's purpose; unclear budget allocation; failure to define the agencies responsible for managing the project's progress. Complicated organisational and institutional issues wasted the advantages of having a skilled workforce and disoriented the project's objectives. Taylor's (1991b) study of an Indian land data project reached similar conclusions. Taylor argues that for India, the issue is not technology rather *"it is the use made of that technology which is overwhelmingly important*" and further Taylor notes that *"the Indian model an example of the problems which a lack of co-ordination can bring*" (p. 81).

In a study of GIS implementation in Africa, Hastings and Clark (1991) identify further complexities. For many African countries, the social and political environments are controlled by internal as well as external factors, such as "*former colonists and newer offerers of bilateral and multilateral aid"* (Hastings and Clark, 1991, p. 30). African colonial history has emerged from various roots: Islamic, Turkish, Spanish, Belgian, Dutch, Italian, German, British, French, Portuguese, and others. According to Hastings and Clark (1991) "*foreign aid missions often try to help the most disadvantaged governmental organisations without adequately assessing the reason*

for the disadvantaged status of the organisations" (p. 30). Assessment of organisational and institutional problems sometimes are further complicated with issues of poverty, high population growth and high levels of illiteracy (Hastings and Clark, 1991). Priorities of development technology can therefore be diverse. Differences in preferences can raise conflict among local interest groups and government agencies over priorities of project funds. Besides organisational and institutional problems in Africa, Hastings and Clark report that GIS often operate in poor technical environments, lacking basic infrastructural facilities and limited indigenous skilled support. In addition base information to start a GIS operation can often be inadequate, or not available at all. Clearly, though, Hastings and Clark are writing at the level of a continent and there will inevitably be important differences between, for example, GIS implementation in a local government office in Johannesburg, South Africa and that in a remote district in Ghana.

GIS implementation problems faced by other developing countries, especially those in Southeast Asia, fall between those described above for India and Africa. Regarding technological capability, the level and amount of technical capabilities available in India is rare among many developing countries. Many developing countries (for example, see Specter, 1988; Yeh, 1991) are severely constrained by shortages of trained computer manpower, and shortages are especially apparent in relation to GIS expertise.

Organisational and institutional issues often stem from the culture of government organisations which are rigid, where decision-makers lack up-to-date knowledge of technology (Spectre, 1988), and an inflexible bureaucratic hierarchy which restrains open participation in making technical decisions (Fox, 1991). A preference for large-scale projects, rather than an incremental approach, is another important problem (Cartwright, 1991; Masser and Campbell, 1991; Taylor, 1991b; Cartwright, 1993). As Cartwright (1991) notes many developing countries do not responded to real and pressing organisational problems; rather they are tempted to create vast, general purpose information systems with vague understanding of its uses and the users. Rapid changes and instability of government are other powerful constraints (Cartwright, 1987; Hastings and Clark, 1991; Masser and Campbell, 1991; Taylor,

1991b). Taylor, for example, points out one of the problem faced by Indian IT programme was conflicts with important political power groups. A similar political conflict over information systems implementation priorities was illustrated by Hastings and Clark in some African countries.

Some developing countries match foreign aid with funds from individual governments and in countries such as Singapore, Hong Kong and Malaysia, GIS projects are most often wholly funded by their governments (Yeh, 1991). With regard to infrastructural support some developing countries, such as Singapore (Mody and Dahlman, 1992) and Malaysia (Roa and Samad, 1992), have overcome basic infrastructural problems such as electricity and telecommunications. In these countries data supply issues are not as problematic as elsewhere; rather key problems relate to data incompatibility and technical capability. Generally problems are less to do with general computer-related skills, but rather they are more concerned with skills in the operation of specialised information technology such as GIS.

The issues discussed here are not new to the GIS community in developing countries. Information about them has been disseminated through various channels - seminars (international, national, and local organisational) electronic media (Internet) and academic publications. In many case studies (despite being limited to a selected region) research findings are often followed by suggestions of "do's" and "don'ts," Hedberg (referred to by Cartwright, 1993) for example, uses an African project to suggest twelve points that are necessary to consider when implementing GIS technology in developing countries. Among Hedberg's major points were for GIS implementers to understand the technological background of GIS, in particular that GIS is a foreign invented tool. Successful implementation of GIS therefore requires serious consideration of environmental and cultural differences in the receiving countries.

3.5.2 GIS Operations in Developing Countries

Goodman (1993) states that the "*meaning of implementation success is inherently ambiguous*"(p. 49) because there are various interpretations of the value of technology. In the wasteland study in India, for example, the GIS operation was

regarded 'unsuccessful' because the project failed to meet the specific goals provided by the funding body (the United States Agency for International Development-USAID). In particular it failed to demonstrate the capability at the sub-district and district levels. Indian scientists, nevertheless, did not share that particular goal. Rather their goal was to demonstrate the capability of GIS for management (Sahay and Walsham, 1996) and they therefore viewed the project as 'successful' (Hastings and Clark, 1991). How then can we interpret success? Goodman (1993) argues that, with the use of new technology, it is important to recognise that there must be "*interaction or adaptation among the technological system and organisational characteristics*" that is, the "*technology has both objective and socially defined characteristics*" (p. 50). The meaning of technology must be understood in the context of the tasks and activities in which it is applied. The meaning of implementation success of a new technology could be evaluated by users through defining benefits produced before and after application of the technology. With regard to the wasteland development project there were multiple levels of users. GIS technology could not reach all intended users. In the context of Burrough's interpretation:

> "the goal of implementation should be to introduce the new technology in such a way that it produces tangible benefits, not just for the organisation as a whole, but also for the persons working in it and their clients and colleagues" (1993, p. 59).

The complexity of success criteria explains why it is difficult to cite 'successful' GIS projects, except in cases of agency-based operations because users are more easily identified and goals are more easily defined.

Goodman's (1993) definition of success in the Metro Manila Physical Survey (MMAPS) is one example of successful agency-oriented GIS undertaking. Factors in its success were attributed to its scale and its incremental approach (Yeh, 1991). The author's personal experience indicates that Malaysia has many undocumented examples of successful agency-based GIS projects. Examples include the Agriculture Information System (AIS) at the Department of Agriculture both in Peninsular and East Malaysia, the Forest Management Information System Sabah (FOMISS), the Environment Monitoring Information System (DOE-GIS) at the Department of

Environment; the Landed Property Information System (LAPIS) at the Department of Valuation and Property Services and the Forest Resource Information System (FRIS) at the Department of Forestry Sarawak. All these systems have satisfied users not only at their individual organisational level but also other user agencies.

With regard to large scale GIS, there are two commonly quoted examples of successful GIS use, the Singapore and Hong Kong land information systems. Both systems have applied an incremental development approach. Singapore's land information system, or the Land Data Hub project (Tang-Kwong, 1994), started as a prototype in 1987 and by 1990 the project was able to offer data sharing services. By 1994 the land data sharing services were upgraded from off-line transfer using tapes and diskettes to on-line access. In Hong Kong the project started in 1983 covering only the Lands Department. Participation of other agencies was gradually promoted through the course of the programme's development (Yeh, 1990).

The Singapore and Hong Kong information systems were not without their problems, however. Many of these difficulties, though, were recognised at an early stage and were handled practically and strategically. With the Singapore case, problems relating to GIS skills and data were faced at the time of project initiation. These issues were overcome in-house through mutual co-ordination between and within agencies. For example, to overcome their GIS staff shortages, on-the-job and self-training was developed (Tang-Kwong, 1994). Since the project was implemented incrementally ample time was provided for staff to share knowledge within and between agencies.

In the Hong Kong project issues were handled in a similar manner. Hong Kong's initial problem was not only in relating to staff and data, but also in reaching a consensus among agencies on project methodology. Agreement was reached by deciding to start the project as a Lands Department application. Expansion of project applications was made incrementally over the course of several years (Yeh, 1990).

3.5.3 Towards Successful Implementation

The Singapore and Hong Kong projects discussed above contain several conditions necessary for effective utilisation of IT. For example, Burrough (1993) suggested that

successful use of IT requires that : *a)managers know how to use it strategically, b) operators know how to use it technically and c)they communicate effectively with each other"* (Burrough,1993 p. 59).

Masser (1991; 1994), Campbell and Masser (1995) suggest three necessary conditions for successful information system implementation. These conditions are: first, an information management strategy based on user needs; second, commitment of individuals and clear leadership; third, environmental stability. These conditions are used here to illustrate implementation issues found in the context of developing countries.

With regard to the first condition, Campbell and Masser (1995) argue that an information strategy helps to "*indicate the information priorities of the whole organisation, appropriate methods of handling these data and the necessary training provision, with each department identifying their particular needs*" (p. 46). The Singapore and Hong Kong cases (Yeh, 1991; Tang-Kwong, 1994) indicated at the outset that strategic evaluations were made to understand environmental and organisational constraints. An incremental approach was selected because that was the only way that they could ensure that project users could be accustomed to, and learn and understand the problems of the new technology.

An approach based on slow and incremental implementation is most likely to lead to success in developing countries. However, in many developing countries, staff often prefer to create vast information systems operations (Cartwright, 1991; Broadbent, 1997). This large-scale approach is likely to lead to failure for three reasons (Cartwright, 1991). First, the lack of an adequate base of computer literacy in the organisations where computerisation is to be implemented. Second, the absence of a strategy that considers specific users and user needs. Third, failing to consider questions of data availability and costs.

The second condition for success, as outlined by Campbell and Masser is a commitment of leaders to a programme, the capability to understand project objectives and problems, and most importantly the ability to solve problems amicably.

In many developing countries, since local GIS experts are still, in general, in poor supply a project may lack the 'luxury' of a local expert GIS leader, and may instead have to rely on expertise from outside. This lack of knowledge of GIS can lead to failure through, for example, choosing inappropriate software or hardware (Sahay and Walsham, 1996). The issue of leader awareness and understanding of GIS has been the subject of a study by the United Nations Ad Hoc Group of Experts (Fox, 1991) which recommended that top policy-makers should be provided with short-term intensive training on the fundamentals of spatial information, that high-level administrative and professional staff should be exposed to the workings of GIS technology, and that mid-career training in new technologies like GIS should be provided.

Several colleges and universities in developed countries provide training courses in GIS. Few, however, provide courses in the politics of GIS and geographical information in a development context. One exception is the University of Durham's course which seeks to educate professionals (especially those from developing countries) in ways of exploring appropriate uses of GIS in the context of other geographical methods. In the United States and Canada there are a few similar initiatives provided by universities and community colleges[1]. Similar efforts are also been carried out at some institutions in developing countries such as the Asian Institute of Technology in Thailand (Fox, 1991) and in the Philippines.

The third condition for successful use of GIS relates to organisational and environmental stability. Masser and Campbell (1991) suggest that given the pace of development, and the volatility of the political environment in many developing countries, it is necessary to develop a system that is adaptive to the changing environment. In the Hong Kong case, for example, there was a re-organisation of the Hong Kong government in 1990 (during the project's development phase). Certain adjustment had to be made to fit the project into a new organisational setting (Yeh, 1991). The change did not affect the project's progress, however.

---

[1] In Indiana, several Malaysians are undergoing training in community colleges and state universities. Other groups of Malaysians (mainly senior officers) are also currently undergoing short-term GIS training at the University of Milwaukee, Wisconsin; University of Cincinnati; and Mohawk College in Ontario, Canada.

In the context of developing countries in general, however, overcoming issues of re-organisation is always problematic. For example, in evaluating GIS problems in Africa Hastings and Clark (1991) argued that beside other problems to overcome:

> "One only hopes that there is no major administrative change at the top of the organisation, as such changes often result in the cancellation of new programmes that are not already proven successes to make room for the new administration's initiatives" (p. 34).

The current Hong Kong situation in a way illustrates Hastings and Clark's argument. Some observers (Kraemer, et al.; 1994; The Economist, 5-11 July 1997; Wehrfritz, 1997) have argued that success stories for Hong Kong are gradually weakening since the China take-over. Even before the transfer took place Kraemer et al. (1994) note that:

> "The environment has changed, however, and will continue to change as Hong Kong is assimilated by China. Labour is much cheaper in China, not only for unskilled workers, but also for engineers, managers, and other professionals...Whatever advantages Hong Kong has as a manufacturing centre are rapidly disappearing ..." (p. 243).

Having seen the Hong Kong case, one could argue that sometimes environmental stability in developing countries is not within the control of the individual country. The current Asian financial crisis is an example of environment instability meant here (for example, see Noland, 1997; Wolf, 1997). Instability in a financial situation will directly affect government policies and development approaches, which will in turn affect programme operations. When these complexities arise most often the remedy is beyond the ability of international experts (Hastings and Clark,1991).

3.6 The Future of GIS in Developing Countries

The future of GIS in Asia (and, by extension in other parts of the developing world) is *paradoxical* according to Yeh (1991), while Cartwright (1993) argues that the future of geographic information technology in the developing countries "*seems promising but not assured*" (p. 269). Taylor (1991b) asks: "*Can GIS contribute in a meaningful*

way or are they a technology which is inappropriate to conquering these problems [scarce resources, ignorance, disease, environmental degradation]?" (p. 80).

Some (for example, Dunn et al., 1997) argue that it is especially because of such problems that *"GIS technology in some ways may be more useful tool to poor countries"* (p. 157). Similarly Yeh (1991) believes that GIS could provide invaluable support towards the implementation of a sustainable development strategy (see World Commission on Environment, 1987). Yeh believes that GIS has the capability to analyse and monitor major environmental issues, such as deforestation, pollution and salination. Demonstration of the capabilities of GIS technology, however, must come from decision-makers and scientists from developing countries themselves (Taylor, 1991b). So far, with regard to indigenisation, initiatives are also taking place, but they are slow (Yapa, 1991; Yeh, 1991). Problems faced by these initiatives exist with manpower and the institutional set-up. Another major problem is language, for most GIS software is written for English speakers. Nonetheless, as Yeh (1991) argued the *"development of GIS should be treated as an on-going process"* (p. 25). GIS technology could become:

> "more and more appropriate for developing countries. There are still major obstacles to its widespread adoption, including high costs, shortage of training, and lack of user-friendliness. But these difficulties are not insuperable and may, in due course, be overcome" (Cartwright, 1993, p. 269).

3.7 Conclusion

There is no simple 'solution' to the challenges of development. Similarly, such 'solutions' are not to be found by concentrating solely on technology. On the other hand, they are not to be found by avoiding advanced technology. What is most needed are criteria for identifying appropriate techniques to help make appropriate choices. Currently, with advances in information technology, development of these criteria could be made easier, because information on technology trends and issues are readily accessible. Inappropriate choices can arise for political and social reasons. IT knowledge can become accessible to a wider population if political and organisational will allows it; there is a need for special attention to be given to educating public officials. In the long run, with growing IT knowledge, the public

may be more aware of value issues inherent in technological choices. Such knowledge will not only create new opportunities for people to participate in public decision-making but will also increase accountability of decision-makers to the public.

Successful application of IT is another matter. Most often the relationship of technology to development is confused. Technology should not be treated as an end to development but rather as a potential means for attaining development. In other words, the purpose of using a technology must be clearly understood. For example, is the technology used as a demonstration tool or to help solve an existing problem? Far too often, when technology is used as demonstration tool, the latest software and hardware will be selected and this is a major cause of project failure.

Finally, for development to be of any value, appropriate technology must be employed. A major shortcoming in current efforts to develop appropriate technology is the lack of support from marketing and government sides. Experience from advanced countries indicates that when government takes the initiative in an R&D project, it usually succeeds. Here a project is formulated on the basis of concrete investment, or a production plan, with clear ideas about a target market, costs, and quality requirements. When government works jointly with the market the chances of success will be improved.

This chapter has outlined a number of key issues which should take a central role when considering the place of information technology in general, and GIS in particular, in the context of 'development'. Organisational, technical and institutional themes run as a common thread through the maze of reasons which determine whether a project succeeds or fails, although each individual situation or country brings its own specific characteristics. The following chapter examines these contextual issues from a different perspectives: by exploring information system developments in their different theoretical perspectives.

Chapter 4 Information Systems Development: theoretical perspectives

4.1 Introduction

Two levels of analytical complexity are integral to this research. First, explaining the operation of information systems that cut across multiple ministries and agencies, and multiple levels of government machinery. Second, understanding this operation in the context of the developing country in which it is 'situated,' and all that that entails in terms of social, economic, cultural and political dynamics. The discussion in this chapter is organised into three main parts. The first discusses ways of adopting a theoretical framework. Here there is a focus on the relationship between theory and research method and its role in developing a theoretical framework. The second part of the discussion focuses on ways of generating theoretical propositions. Discussion at this level entails exploring the current issues relating to understanding organisation and organisational theories. Finally, focus is placed on understanding theoretical perspectives which are most relevant to the present research.

4.2 Theory in Research

> "The idea of theory, or the ability to explain and understand the findings of research within a conceptual framework which make 'sense' of the data, is the mark of a mature discipline whose aim is the systematic study of particular phenomena" (May, 1997, p. 28).

Theory helps to determine the type of data one needs to collect in the field. Without theory, explanation and interpretation of the research findings are impossible since we have no framework to enable us to engage in a systematic discussion of substantive issues (Bernstein, 1976; Giddens, 1982; Walters, 1983; Johnston, 1986; Giddens and Turner, 1987). The importance of theory is therefore undoubted; but how to choose and apply a theory that fits one's research is open to debate. Selection involves understanding the research method needed to guide the research; this is because theories and research methods are related, in the sense that theories guide methodology. However, as with theories, there are several choices of research method offered for qualitative research. Here, three of these approaches are explored, namely grounded theory, ethnography and case study approaches. The objective of exploring these approaches is to show the relationship between research method and theory, that is, the emphasis is on factors that

help towards building a theoretical framework. A detailed discussion of the research methodology itself is presented in Chapter 5.

4.2.1 Theory and Research Design

The development of theory from data is the basis of the grounded theory approach (Glasser and Strauss, 1967). Here the best approach to generate theory is by using the researcher's own experience of the social world through the process of data collection: *"whereby the analyst jointly collects, codes, and analyses his data and decides what data to collect next and where to find them, in order to develop his theory as it emerges"* (Glasser and Strauss, 1967, p. 45).

The ethnography approach places importance on portraying images of others *"as they are experienced and understood in the everyday lives of people who actually live them out"* (Cook and Crang, 1995, p. 4). Ethnographic methods do not necessarily begin with strong theoretical formulations, rather the method allows theoretical tendencies to emanate from the basic definition of ethnography itself - to focus the shared beliefs, folk knowledge, and behaviours of some groups of peoples (Goetz and LeCompte, 1984).

Finally, a case study approach requires 'theory' to be developed prior to data collection (Yin, 1993; 1994). Theory in the context of Yin's definition is a research framework which constitutes five criteria. These are:

1. The study's questions,
2. Research propositions,
3. Units of analysis,
4. The logic of linking the data to the propositions, and
5. The criteria for interpreting the findings.

Yin argues that thinking of answers for these five criteria will enable one to construct a preliminary theory (research framework) related to one's study before the conduct of any data collection. Yin suggests that there are several ways in which one could develop the framework. Reviewing existing works is one of the ways. Other means are by reviewing the literature most related to the area of study, conducting discussions with related

professionals, asking challenging questions about the study topic and being aware of the full range of theories that might be relevant to one's area of study.

The three approaches as outlined above have apparent differences in theory building because each suggests contrasting techniques for data collection. In some ways variations in techniques may offer different advantages and disadvantages for certain researchers (Van Maanen, 1988). For example, in the ethnographic approach the researcher seeks to draw directly from their fieldwork. In certain cases, there are very real limits to what a researcher can and cannot learn in a given fieldwork setting, such as, access to a particular area or organisation (Van Maanen, 1988). Since the reliability of information is directly dependent on the phenomenon being studied the method of data collection is restricted to a participation-observation technique (Van Maanen, 1988; Yin, 1993). Notwithstanding its limitations, the ethnographic approach was argued by Lincoln and Guba, (1985) as being most valuable when there are strong clashes in values. Here it could help to define a 'negotiated' set of recommendations. With grounded theory there is strong resistance to premature theory building, and its application is most appropriate in cases where no particular prior theory appears explainable (Yin, 1993). But the method may be impractical to some who are provided with 'program theory' at the start of a study (Yin, 1993). A case study approach, with its preference is to draw out the theoretical framework at the beginning of a study, is therefore more appropriate to such a situation.

Each approach provides elements that are helpful in developing theoretical insights for the study. This research has taken the approach to relate methods to one another, an approach which has had its advocates among those who write about how research should be carried out. For example, Webb (1966), states that:

> "Every data gathering class -interviews, questionnaires, observation, performance records, physical evidence - is potentially biased and has specific to it certain validity threats. Ideally, we should like to converge data from several different data classes, as well as converge with multiple variants from within a single class" (p. 35).

Denzin (1970) suggested a similar approach, through what he termed 'strategies of multiple triangulation'. Pettigrew (1973) advocated similar ideas, noting that:

> "methods are not atheoretical. Research methods have a differential ability to shed light on theory. It is no accident that those concerned either with the symbolic interactionist perspective or with the analysis of social process have preferred to use observational methods" (p. 53).

The research design for the present study has been guided by the spirit of the above suggestions. The present study adopted multiple methods, multiple data sources and multiple levels of analysis. The following section explores the means of combining these methods towards a coherent theoretical framework by way of viewing and understanding specific existing theoretical perspectives.

4.2.2 Constructing a Theoretical Framework

To adopt to a certain theoretical perspective one needs first to understand 'what is being studied'. For this present study there are three broad areas of study - development, information technology and organisation. The broad contextual perspective of these study themes has been discussed in Chapter 3. The review of contextual perspectives provided an understanding that the issues faced by this study in the context of Malaysia are not that dissimilar from experiences faced by other developing countries. Nevertheless, the evaluation and analysis of each study was approached quite differently, because each study had its individual contextual focus and objectives. In other words, despite demonstrating similar issues, the factors that generate these issues differ from study to study. However, at the broader level reviewing similar studies does help to enrich the perspective of one's research requirements. With regard to the present study, based on the examples of previous research and the subject matter of this study, a combination of theoretical perspectives seemed pertinent.

The approach is commonly found in the work of Kling, (1980); Kling and Scacchi, (1982); Kling and Iocono, (1984) and Pettigrew, (1985). Kling (1980) for example argues that:

> "In coming to an understanding of computing technologies, particularly newer ones, it is important to understand which conceptions of social life are likely to aid in discerning critical social aspects. Analysts do not select random sets of concepts on which to base an examination of computing: They cluster useful concepts into coherent bundles which constitute a perspective on social life" (p. 63).

Pettigrew (1985) suggests a similar approach, and argues that in research:

> "One approach is to discount ethnocentrism...[a second] is to be ostensibly a more reasonable man, and go into the mine lights ablaze, looking from many perspectives of process, and hope to see and explain without being blinded by all distractions and reflections. [A third] works towards making contingent statements...[fitting compatible theories, and a fourth] ...by combining [for example], political and cultural views..." (p. 42).

In the light of the above suggestions, different theoretical perspectives are drawn upon to help in the design and analysis of the present research. This then requires an understanding of the unit of analysis, that is, the organisation and its related source of theories. The discussion is developed by way of exploring the nature of organisations and different interpretations of their meaning.

4.3 Organisation and Organisation Theory

An organisation can be defined as: "*a consciously co-ordinated social entity, with a relatively identifiable boundary, that functions on a relatively continuous basis to achieve a common goal or set of goals*" (Robbins, 1990, p. 4). This definition combines the understanding of a number of researchers and theorists. For example, the focus on *achieving a common goal*, is also characterised by Blau (1970) who defines an organisation as *"a number of men* [sic] *that have become organised into a social unit that has been established for the explicit purpose of achieving certain goals"* (p. 1). Robbins' phrase *consciously co-ordinated* is in line with the perceptions of Johnson et al. (1973) who notes: *"The organisation's function is the means, or bonding agent, by which separate human and material resources are fused together to form an integrated operating system"* (p. 65). The word *system* in the context of Johnson et al., (1973) is interpreted as:

> "an organised or complex whole; an assemblage or combination of things or parts forming a complex or unitary whole...the word system connotes plan, method, order, and arrangement...the focus of systems management is on providing a better picture of the network of subsystems and interrelated parts which go together to form a complex whole" (p. 4).

The phrase *continuous basis* as used by Robbins links to the earlier work of Stogdill (1963), who viewed an organisation as an open system, having constant exchange with

its environment through a continuous inflow (input) and outflow (output) of energy from the external environment. Inputs in this context include material, financial, informational, and human resources. Organisations draw their energy supply or input from various environmental elements including other organisations. Outputs are products and services sent into the environment. Productivity, the efficient combination of input resources resulting from system operations, may also be regarded as an output.

Katz and Kahn (1966) further expanded on Stogdill's definition of an organisation to incorporate the idea of a cycle of events with patterns of energy flow - input, throughput, output, and then recycle. The output provides new energy, and, if it is a product, it is sold and the money is used to purchase new inputs. Katz and Kahn (1966) state that:

> "the structure is to be found in an interrelated set of events which return upon themselves to complete and renew a cycle of activities. It is events rather than things which are structured, so that social structure is a dynamic rather than a static concept. Activities are structured so that they comprise a unity in their completion or closure" (p. 21).

Following the work of Johnson et al., Stogdill, and Katz and Kahn, approaches to the concept of an organisation began to be expanded further. The definition of organisations was *systems of systems within systems*, without regard to problems either of boundaries or of the distinctiveness in the way of the organisation's functioning (Robbins, 1990). Finally, came the postmodern[1] perspectives which radically changed the concept of organisation. Here the meaning of an organisation is contextually embedded in social discourse, that is, *"resides in the contexts and occasions where it is created and used by members"* (Boje et al., 1996, p. 2).

Notwithstanding the different ways of defining an organisation, the essence of all definitions includes co-ordination and interaction of members. In other words an organisation must exist to achieve something. Factors that make organisations different are their structures. In general the term organisational 'structure' is defined as: *"how*

[1] As defined by Fox (1996) 'postmodernism' and 'postmodernists' are used to signify the theory as opposed to 'postmodern' which signifies the era.

tasks are to be allocated, who reports to whom, and the formal co-ordinating mechanisms and interaction patterns that will be followed... " (Robbins, 1990, p. 5). Further this organisational structure also has several components. In this context it has been claimed that there are two perspectives: modernist and postmodernist (Clegg,1990; Hatch, 1997). Modernist perspectives associate organisational structure as complex, formal and centralised, more in line with Max Weber's definition of bureaucracy. The postmodernist views organisation as: "*informal or flexible; and its management structure is functionally decentralised, eclectic and participative, overlapping in many ways with non-managerial functions*" (Clegg, 1990, p. 17). The meaning of structure in the context of a postmodern view is that relationships form through human interaction. Individuals interact, and over time these interactions stabilise into recognisable relationships that define social structure and contribute to the ways that work is accomplished. The approach taken by postmodernism seems to be one based on radically and rapidly changing conceptions of organisations, and it involves a movement away from substantive conceptions of social actors themselves.

The following sections explore key factors that separate postmodernism from modernism. The discussion explores the postmodernism debate in relation to organisation and organisation theory. There are two levels of ambiguity confronting the postmodernism views. The first ambiguity relates to how best to describe postmodernism; as a historical epoch (new age) or epistemology (how knowledge is obtained or created). The second level of ambiguity questions the basis of postmodern organisation theory. The following section explores the development of opinions concerning these ambiguities.

4.3.1 Postmodernism and Organisation Theory

Some argue from the perspective that postmodernism is an era after modernity (Fox, 1996; Frederickson, 1996). In a general context the transformation is associated with the widely noted move from an industrial (modern) to a post-industrial (postmodern) society; from an economy based primarily on the production of material goods (modern) to one based primarily on information technologies, services, marketing, credit, and consumption (postmodern).

Power (1990), however, suggests that there is no absolute line to demarcate the modern and the postmodern; the latter comes to signify both the termination of the former and a differentiated continuation of it. In contrast, Jameson (1991) argues that: "*Postmodernism is what you have when the modernisation process is complete and nature is gone for good*" (p. ix). Key aspects of postmodernism, exemplified by Jameson, are the changes of values towards depersonalisation and a detachment from the 'real world'. Commercialisation (commodification) is the key to postmodern society where, for example, privatisation of public services means that goods are transferred from the government sphere to the economic sphere as a matter of necessity. The welfare of '*the masses*' is of minimal value, and only the logic of commodification counts. Featherstone (1988), like Power, suggests that in one sense the situation could be seen as a transition from one era to the next. But from a different context he argues that it could also mean that postmodernism is a break or abandonment from the modern era. This suggests the emergence of a new social totality with its own organising principles.

Hassard (1995) argues that postmodernism is signalling a new historical period and is also suggesting a new form of epistemology. For example, Hassard (1995) argues that there are many signs that society is moving towards a postmodern era. What one needs to do is simply describe the right way (based on a realist notion of what is '*out there*') to see the world. Descriptions of an industrial production shift explained by Fox, (1996) and Frederickson, (1996) are examples of the realist notion meant by Hassard. The notion of postmodern epistemology stresses how one sees reality as *'in here'* (Hassard, 1993). That is, reality is defined by the individual's subjective experience, albeit under social and cultural influences. In other words, there is no claim made about whether or not reality exists independent of the observer. It is assumed that reality cannot be known since all knowledge is mediated by experience. This view opposes that of a modernist epistemology which argues that the phenomena they study exist '*out there,*' and thus their theories can be tested against reality to assess their correctness (Hatch, 1997).

With regard to the second level of ambiguity some (Cohen, 1986; Reed, 1993) argue that a postmodern organisation theory lack robust grounding. Reed, for example, argues that a postmodern epistemological break was assumed, rather than being demonstrated through detailed analysis and assessment of the intellectual trajectories that organisation

theory has followed since the early twentieth century. Reed (1993) explains what actually happen was between the 1970s and 1980s talk of crises has merely reinforced perception of postmodernism without really discovering an alternative formulation or formulations that could provide a sense of direction and purpose.

But this situation had changed by the end of the 1980s, according to Reed. There was a general movement in organisational analysis away from a paradigm of incommensurability[2] and polarisation arose between conflicting groups (modernism and postmodernism). There was growing awareness of the need for the field of study to be based on a shared intellectual heritage and a recognisable historical continuity. Cohen's statements put the theoretical debate in place:

> "one of the most important results of post-empiricism has been to overturn the Cartesian duality of objectivism and relativism. While no neutral algorithm exists for the choice between theories, this does not imply that science is an irrational enterprise. Rather scientists are obligated to submit good reasons for the acceptance of their programme in preference to competing schools of thought. The criteria to which these reasons refer are established as a result of the historical development of community of inquiry within which justicatory arguments are made. This implies a rejection of the thesis of incommensurability of meaning between theories....On this bias, the rational appeal to scientific criteria involves a limited degree of rational persuasion" (1986, p. 129).

The cumulative impact of the shifts in theoretical focus and direction provides a context in which a different kind of research agenda for organisation analysis is beginning to emerge in the 1990s (Reeds, 1993). Reeds argues that, in part, postmodernist thinking, particularly in regard to a renewal of interest in organisational culture and symbolism, has some influence on the changing agenda. On the other hand, it is important to remember

---

[2] Assessment of organisation theory's paradigmatic status has interested many. Thomas Kuhn (1962, 1970) claimed that traditional wisdom in the philosophy of science does not equate with the historical evidence. Kuhn's suggestion is that dominant theories of scientific practice are incompatible with the facts of how science has actually progressed. For Kuhn the everyday reality of science is more akin to the life-cycle of the political community than to the dictates of formal logic. When science changes, a new approach emerges based upon fresh dictates of an alternative community structure, the new tradition, like the old, being what Kuhn terms a 'paradigm'. Kuhn argues that a change of paradigm orientation cannot be based upon open debate, because there are no logical arguments to demonstrate the superiority of a paradigm over the other. Being a proponent of a particular paradigm means that one can never concede to the premises of another. In sum, *"the normal-scientific tradition that emerges from a scientific revolution is not only incompatible but often incommensurable with that which has gone before"* (Kuhn, 1970, p. 103).

to connect the new theoretical views with older well-established traditions of thought and mature research programmes. Clark (1988) provides a similar argument as such:

> "From within this model (post-modernism), it is possible to 'forget' the struggles which have taken place over the politics of data control and access; to 'forget' the struggles over the introduction and use of technology; to 'forget' the struggles which take place at the chip-producing and assembling ends of the Imperial communicating chain...the development and integration of new technologies...are enmeshed in, not separate from, the complex of economics, cultural and political struggles....What remains striking about this process is how narrow the range of meanings has remained in the dominant media of communication" (1988, pp. 395-398).

The above arguments argue for a continued search for collective understanding of a complex and ambiguous phenomenon as 'modern organisation'. The authors contended that the activity can only be maintained if the shared sense of long-term historical and intellectual continuities between current concerns and past achievements is carefully evaluated. As Hassard (1996) notes, "*in their current form, neither the ethnoindustrial nor the sociophilosophical prospect offers a robust basis for developing postmodern organisation theory. Instead, we suggested that the synthetic perspective appears to offer a more promising location for theory building*" (p. 59).

4.3.2 Bureaucracy and Organisation Theory

Some researchers argue that organisation theory idea is a product of modernity because it is based on the notions of bureaucratic division of labour (Clegg, 1990), with management rooted in the application of logical activity (Carter and Jackson, 1991) and adopts rational designs of organisations to minimise uncertainty and maximise efficiency (Gergen, 1992). These descriptions suggest that a bureaucratic organisation is a modernist organisation.

The classic perspective of bureaucracy was proposed by Max Weber who sought to describe an ideal authority system; one that would be rational and legal (Pugh and Hickson, 1989; Robbins, 1990). The system is called rational because the means are expressly designed to achieve certain specific goals (like modern machines). It is legal because authority is exercised by means of a system of rules and procedures through offices which an individual occupies at a particular time. Offices are arranged in a hierarchy, each successive step embracing all those beneath it. There is a set of rules and

procedures within which every possible contingency is theoretically provided for. There is a clear separation between personal and business tasks. In such an organisation, authority is based in the office and commands are obeyed because rules state it. Government organisation is commonly associated with a bureaucratic form. In Weber's (1978) term government is a 'bureaucratic authority'. For example, common to all governments is a structured hierarchy of offices, for example, a Cabinet, Parliament or Congress and the Civil Service (Cox, et al., 1986). Within this set of institutions there are clear divisions of labour, a clear authority hierarchy, formal selection procedures, and detailed rules and regulations.

Bureaucracies have received more than their share of unfavourable publicity (Robbins, 1990). There are those who consider bureaucracy to be dead (Bennis,1970) or no longer functional (Handy, 1989; Clegg, 1990), but there are also those (Miedwald, 1970; Thompson, 1993) who believe that bureaucracy is alive and well. Those who argue against bureaucracy believe that the bureaucratic model is no longer consistent with the values and demands of the present day: bureaucracy has had its time (Bennis, 1970; Clegg, 1990). 'Modern organisations,' Clegg argues, are in direct contrast to Weber's bureaucratic form with initiative, drive and energy coming from the consistent parts, not the centre. This is held to be particularly appropriate to large organisations such as multinationals who are now concerned only with keeping watch on long-term policy and finance. Modern organisations are flatter (with no more than four layers) and are facilitated by a range of factors including 'downsizing' and the shrinkage of middle layers. The benefits not only to a narrowing of status differences, but also to a more effective and direct means of two-way communication.

Handy (1989) claims that change is also affecting government organisation. Handy argues that government organisation is becoming a contractual organisation: "*At the extreme the core of an organisation need contain no more than a design function, a quality-control function, a costing and estimating function, as well as some co-ordinating management*" (p. 80). According to some (Cooper and Burrel, 1988), this is the current contention of all organisations breaking away from the Weber 'iron cage' requirement. As Berg (1989) puts it: *"the final rejection of the grand narrative of*

organisations as tightly coupled rational machines run by conscious and mature men [sic] *in full control of operations and proactive strategic choices*" (p. 207).

However, there are some who disagree that modern organisations have made a break from Weberian ideology (Best and Kellner; 1991; Thompson, 1993; Fox, 1996; Frederickson, 1996). Thompson, for example, argues that many postmodern views are simply a reproduction of old ideas. Similarly Frederickson (1996) argues that many new ideas about change such as 'reinventing government' or a 'new public administration movement' are merely: "*old wine in new bottles... There is probably not much that is new under the sun, but, to each new generation, many things seem importantly new and useful*" (p. 269).

Thompson (1993) argues that breaking from a rational form of authority sometimes acts as a masquerade as part of the trend away from bureaucratic culture. The area of bureaucratic argument generally centres over misinterpretation of meanings. On the issue of centralisation and hierarchy, for example, Thompson notes that:

> "essentially what we are seeing is a duality in which the decentralisation of the labour process and production decisions [for example through mechanisms, subcontracting] is combined with increased centralisation of power and control over the spatially dispersed, but interdependent units" (1993, p. 190).

Technology, for example, is an important 'facilitator' for decentralised organisational operation, but it does not effectively decentralise authority and power. Decision-making is still in the hands of the few. Indeed, computerisation could further strengthen the power of the decision-maker due to better information frameworks (Thompson, 1993). Hyman (1988) similarly argued that:

> "Advances in computerisation and telecommunications facilitate the concentration of 'conception' (research, planning, directive and strategic management) at corporate headquarters, while 'execution' is dispersed around the globe..." (1988, p. 57).

With regard to hierarchy some (Thompson,1993; Frederickson, 1996) have argued that the notion of decentralisation, flatter hierarchies, contracting out, and systems of co-production or public-private partnerships could also mean highly structured organisations. Thompson provided several examples, including the clothes manufacturer, Benneton, which has a decentralised form of subcontracted work inside Italy and

franchised sales throughout Europe. The organisation is firmly held together by centralised marketing and complete managerial control over the design, cutting and finishing of garments.

The impression that 'work rules' are ending is another area which has been subjected to criticism. Some (Thompson, 1993; Frederickson, 1996) accept that traditional tasks-based rules have declined in some sectors of the economy, but that does not mean that the overall bureaucratic regulation has lessened. Rather, Thompson argues that there has been a shift from work-based rules to behavioural rules, such as co-operativeness, adaptability and self discipline. Behavioural rules have become an integral feature measuring individual appraisal and performance-related schemes.

Thompson (1993) goes on to argue that postmodernism has wrongly interpreted changes in the structure of modern organisations. The post-bureaucratic image portrayed by postmodernism can be seen as symbolic, because decentralisation, flatter, or smaller organisations are misinterpreted. Thompson (1993) argues that:

> "With some exceptions the whole concept of bureaucracy has become devalued through its lazy and stereotypical usage. Changes in the form and content of hierarchies, plus shifts in rule-governed behaviour, indicate that we have to constantly renew our understanding of bureaucratic processes. The 'break with bureaucracy' fits nicely into an era when entrepreneurial activities are a highly valued part of the cultural and political climate. It is a pity that postmodernism has seen fit to endorse the sweeping statements and global prophesies so characteristic of pop-management" (p. 194).

In summary the debate around bureaucracy, organisation and organisation theory, provides several points for consideration. First, organisation theory is not static but is adaptable to change. The context of 'change' nonetheless, needs to be understood in the context of shared meaning; that is, through a shared sense of historical and intellectual continuities between current concerns and past achievements. Second, postmodernism brought 'multiple viewpoint perspectives', and it provokes one to question the hidden ways of thinking and speaking. We should use our methods of understanding and discovery about ourselves as well as on the world around us, in order to reveal what it is that we are assuming when we produce or use knowledge. We can be contradictory, paradoxical and incongruous in order to avoid the traps of dominance hidden within a

singular view. Thirdly, both modernists and postmodernists provide constructive means of understanding the broader and specific aspects of organisational environment. Modernism permits an understanding of organisations from the activities they carry out (objective) while postmodernism allows one to be aware that sometimes the categories of language used to describe/understand organisations (such as environment, structure, culture) are not real or natural in an objective sense. Rather they are the product of beliefs held by members of the organisation or society.

4.4 Selected Theoretical Perspectives

In the light of the above observations the present study has selected two theoretical frameworks which allow the application of modernist and postmodernist perspectives - Web models and Structuration theory. The following sections define the perspectives and explore how and why these perspectives are used.

4.4.1 Web Models

Web models are defined as a *family of models* which could "*help make better predictions of the outcomes of using socially complex computing developments*" (Kling and Scacchi, 1980, p. 3). The following sections discuss the meanings embedded in this definition. First, it is necessary to make a distinction between 'a web model' and 'web models'. The purpose is to illustrate that there are some differences in levels of study coverage when one is using one or the other. To illustrate the distinction, the concept of *a system* applied in organisation theory is used.

A "*system is a thing with interrelated parts. Each part is conceived as affecting the others and each depends upon the whole*" (Hatch, 1997, p. 35). On the other hand 'systems' is a system operating within systems or, a nested system consisting of a supersystem, the system itself and its subsystems (Hatch, 1997). A key characteristic of all systems, nonetheless, is the existence of interrelated parts (Boulding, 1968; Johnson et al., 1973). Interrelation implies that there are interactions, interdependence and integration. Interaction means that parts of a system do not operate in a vacuum, but continuously relate with other parts or units with which they try to exchange or maintain some types of relationships. Interdependence means that parts of the organisation do not merely relate and interact with each other, but also provide mutual satisfaction for need,

and a means of attainment for other parts of the organisation. The characteristic can be compared to that of a web which displays a set of interlocking relationships, so that a disturbance anywhere means that the disturbance may be transmitted to other parts of the web. Finally, integration means that the holism of the system is emphasised. The concern here is with the ways in which the organisation is tied together; for example, the parts that share the objectives of the entire organisation and recognise their condition of interdependence and interaction.

With reference to 'web model' and 'web models'; 'a system' is comparable to a 'web model' and a 'nested system' is comparable to 'web models'. Application of either one of the models as such depends on the level of analysis within a study. For illustration, several studies are reviewed here. Data operation management for the Australian Public Service Board (Mandata) (Sauer, 1993) and the Computerised Rural Information System Project (CRISP) (Madon,1994) are examples of studies which use web models for analysis. In the study by Mandata three levels of dependence were indicated. The first level is the project organisation; the group of people who are occupied with the development of the system. The second level is the information system itself. The third level comprises the supporters, such as monetary resources, material resources, information, social legitimacy and control of strategic contingencies. In the triangle of dependence, each relationship is subject to a variety of exogenous actors which influence how it will affect the rest of the triangle. That is, how well the project organisation conducts the innovation process depends on a variety of factors such as the extent to which the application is understood, the technical process employed, the rate of change of the technology, and the quality of the information systems professionals. Likewise, whether supporters decide to continue with their support depends upon factors such as how they perceive the system in relation to their interests, external pressures, and alternative uses. According to Sauer (1993):

> "Web models make it apparent that simple linear explanations are misconceived because the relationships surrounding information systems processes and the dependences on which they are based are highly interconnected" (p. 114).

In the CRISP study the objective was to explore the ongoing interaction between the process of technology adoption and the social context within which the technology was

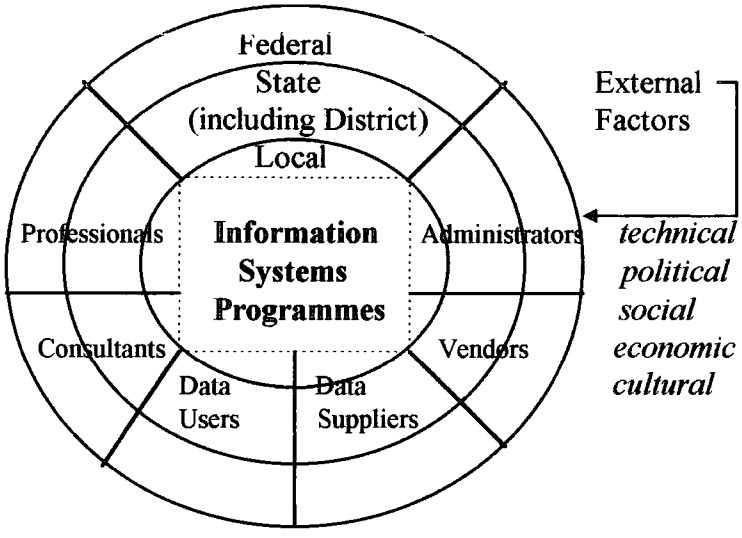
embedded. The study made the assumption that the objectives of an information system should be consistent with the objectives of the wider system which it is serving. To analyse the impact of CRISP two levels of system interrelationships were observed. The first is the situation within the rural development programme that CRISP served. Second was the situation among institutions that were to bring about the development. Between the two levels, each was open to two categorisations of contextual influences - outer and inner. Outer influential factors include national development policies, national technology policies, the structure of institutions, infrastructure, and perspectives of policy-makers. Inner influential factors include the interface between the formal and informal systems, the perspectives of local agents and local resources.

Finally, computerisation in British local government (Campbell, 1990) can be viewed in terms of the application of a web model. The focus of Campbell's study was the relationship between innovation and organisation. Her investigation was specifically concerned with the interaction within and between one type of organisation at one level of operation, that is, the local government level. In contrast, the Mandata approach observed three levels - the public service systems, other related public service system and customers of the public system. Similarly the CRISP study observed two levels, rural and national systems.

In the case of the present study, the contextual boundaries of organisational information systems are observed at three levels - Federal (offices under Federal administration), State (offices under State government administration which includes District offices) and local authorities[3] (Figure 4.1). Detailed discussion of the methodology used for this observation and analysis is provided in Chapter 5. Here a brief explanation is provided by way of relating the work to the term 'web models'. Figure 4.1 illustrates three levels of administrative systems - Federal, State (including District) and local authorities. These make up the organisational context that forms the focus for this present research. There are four levels of relationship observed. The first level of interactions is between the diff-

[3] All local authorities except the Federal Territories of Kuala Lumpur and Labuan comes under the authority of State government. However, in many areas such as in the formulation of by-laws, collection of revenues and taxes, and forming consolidated funds, local authorities are provided with independent powers and autonomy.

Figure 4.1: Illustration of Study Context : three levels of organisational Information Systems



Source: Adapted from Sauer, C. (1983, p.75).

erent levels of administrations, namely between Federal and State (and including District) organisations, and between State organisations and local authorities. The second level of relationships is between organisations at each level, that is, various types of organisations, such as user and supplier agencies. The third level relates to interdependence within organisations, that is between the departments, agencies, units, and offices of an organisation. The fourth level involves relationships within the focal organisation itself; the co-ordinating offices.

At each of these levels, there are sets of participants or actors, such as vendors, consultants, data users and suppliers, professionals, and administrators, who each have particular interests or power with which to influence programme development. Most often interests and power are directly contributed by various factors internal or external to the organisation, such as social, cultural, technical, economic and political factors.

4.4.2 Web Approaches and Related Theoretical Perspectives

The main emphasis of web approaches, (either with reference to a 'web model' or 'web models'), is the enlargement of contextual boundaries beyond that of the focal context. The objective of web approaches in this sense is to ensure that all possible factors are

investigated in order to understand the organisational context in which an information system is being implemented.

A second aspect of the web approach is the ability to analyse the dynamics of IT development and use within the contextual boundaries. Kling (1980) argues that in order to make the predictions, and to understand the ways in which the behaviour of people and groups in organisations influences the development, use, and consequences of computing, there is a need to have a theory about why the issues came about. Kling says that:

> "Any observation or claim about the uses or consequences of new computing technologies...rests on an array of assumptions about these issues, however, implicit...In coming to an understanding of computing technologies, particularly newer ones, it is important to understand which conceptions of social life are likely to aid in discerning critical social aspects" (1980, p. 62).

Within the context of this argument Kling suggests six common perspectives that provide different terms with which to understand how people live and work with computing in an organisation. The six perspectives are: rational, structural, human relations, interactionist, organisational politics, and class politics. Kling argues that each of these perspectives provides a way for research to develop a coherent understanding of the issue under study. Application of these perspectives as such varies with the emphasis of one's research. Robey and Newman (1996), for example, use five perspectives because their research aimed to understand the process of system development from various perspectives - rational, structural, human relations, interactionist and politics. In the Mandata study only one theoretical perspective, namely the interactionist perspective, was used. In practice, according to Kling and Scacchi (1980; 1982), couplings are the most common approach taken by researchers; this is the approach adopted by the present study. The following section explains the major clusters of social assumptions and organising concepts that inform each of the six perspectives (Table 4.1); and within this discussion examples of previous research using one or another of these perspectives are highlighted. Subsequently, perspectives selected by the present study are also discussed.

Table 4.1: Theoretical Perspectives Adopted by Social Analysis of Computing

Computing Elements/Perspectives	Technology	Social Settings	Organising Concepts
Rational	equipment as instrument	unified organisation	rationalisation and formal procedures
Structural	equipment as instrument	organisation and formal units	organisational structure and organisational environment
Human relations	equipment as instrument and environment	small groups and individuals	trust, motivation, expectations and rewards
Interactionist	package as milieu	situated social actors	defining situations and labelling events as social construction
Organisational politics	equipment as instrument	social actors in positions	work opportunities or constraints
Class politics	equipment as instrument	social class as stratified system	ownership of means of production

Source: Adapted from Kling, (1980, p. 64).

Kling (1980) characterises the rational approach as assuming that technology is a tool for achieving the shared goal of greater efficiency. Organisations themselves are viewed as a rational means for attaining shared goals, so an information system should be designed to increase organisational efficiency. Where inefficiencies occur, the blame is placed on the quality of the technical solution rather than on the social system adopting it. Rational analyses, as such, narrow the utility of computing by avoiding the social context in which the technology is developed and used. The limitations inherent in rational analyses has made them unpopular among researchers, because they limit understanding of the dynamics of computing. Eason (1993) for example, argues that:

> "The dominant method by which major information systems are designed and implemented in organisations has been characterised as rational and technocentric. ...These characteristics do not make it easy for user and organisational issues to play a major part in design and implementation. As a consequence users and organisational issues are often barriers to diffusion when attempts are made to implement the solution" (p. 29).

In other studies (for example, Hastings and Clark, 1991; Hutchinson and Toledano, 1993) the weaknesses of a rationalistic view have been identified as the main barrier to achieving a realisation that computer developments are highly susceptible to a changeable economic and social environment.

A structural approach expands the analysis of the rational perspective by including the social context of the computing application. The social context of organisation includes its structure and environment, and rational objectives are achieved when there is a fit among the environment, the organisation's structure, and computing applications. Structural analyses argue that environmental changes can effect a change in an organisation's structure. Application of structural analyses are common in GIS (Stevanovic, et al., 1989; Taylor, 1991; Sahay and Walsham, 1996) and other large scale information system studies (Kraemer et al., 1980; Han, 1991).

The human relations perspective also adopts a rational perspective about social analysis, but it also incorporates social and technical criteria into the analysis. 'Human relations' operates under the idealistic assumption that social and technical goals can be simultaneously achieved, or jointly optimised in the implementation of information technology. The primary means for achieving joint optimisation is the participation of users in the design of information systems. Through the involvement both of users and analysts in system development, the consequences of the application on individuals and groups can be considered as part of the design problem. A human relations perspective therefore widens the shared goal to include social objectives such as job satisfaction and work group autonomy, as well as economic objectives such as efficiency. In GIS or other large scale information studies this perspective is often used in combination with other perspectives. For example, the works of Hastings and Clark (1991) and Hutchinson and Toledano (1993), use this perspective in combination with a structural perspective.

In the interactionist perspective, the focus is placed on the symbolic meaning of technology to subgroups with different interests and values. The organisation is viewed as a 'culture' in which objective reality is interpreted and understood in a social context. Computing is viewed as creating a complex social milieu that brings together a variety of participants in complex social arrangements. This perspective is central to the Mandata study (1993). However, there are some (Kling and Gerson, 1977; Kling, 1978) who couple this perspective with organisational political analysis. The latter focuses more narrowly on the interests of subgroups and the conflicts among subgroups. The organisation is viewed as groups of coalitions. Most often in order to gain control over

computer development, key actors will build sets of procedures about the computing arrangements that others in the organisation will accept. Within this perspective supporters believe that key actors usually develop long term strategies to mobilise support for their own preferences and to block the emergence of conflicting preferences. There are several studies that place central emphasis on this perspective. Examples include the analysis of ICI by Pettigrew (1985) and work by Kling and Iocono (1984), Laudon, (1974) and Kling (1978). There are also a number of studies that have blended this analysis with other perspectives, such as those by Kraemer et al., (1980) and Han (1991).

Finally, class politics examines how the use of computing in organisations can enforce existing class relationships. Kling and Scacchi (1980) characterise class politics as a Marxist ideology; this is commonly used to examine how the use of computing in organisations reinforces existing class relationships.

In the case of the present study, two perspectives, namely structural and organisational politics, are found to be the most fitting in terms of describing the dynamics of computer use and development. The reason for applying a structural perspective is because the present study accepts that the social context of an organisation includes its structure and environment. The organisational objective is achieved when there is an understanding among the environment, the organisation's structure, and the computer applications. Environmental changes play a crucial role in the change of an organisation's structure. The research also accepts the view of an organisation as groups of coalitions (Kling and Iocono, 1984), consisting of various stakeholders with competing interests in organisational resources, including computing infrastructure. Conflicting interests often result in incompatible goals and can be the direct cause of project failure.

In general the web approach has offered a means of conceptualising and exploring the dynamics of computer use and development. The essence of the approach is to be aware that in understanding computing technology one needs to explore the social environment in which the technology is embedded. The six theoretical perspectives in many ways help to develop a perspective on a particular information system problem. In the case of this research the combination of structural perspective and one based on organisational

politics is found helpful in developing initial 'storylines' of how people behave with information technology in an organisation. Having this understanding, the present research is keen to explore the reasons why people behave as they do, on the understanding that there is no simple way to understand people's actions. The idea is in line with the postmodernist claim to:

> "learn to take nothing for granted. Deconstruct all claims of truth in order to determine whose point of view is benefited by a particular way of looking at or arguing about the world" (Hatch, 1997, pp. 46-47).

Giddens' (1984) structuration theory contains the approach highlighted by the postmodernist's view. Giddens' work turns attention away from understanding social structure as a system for defining and controlling interaction and social relations, towards interest in how everyday practices in which organisational members participate construct the very rules of the organisation that they work in. The following sections develop an understanding of Giddens' theory and discuss how it fits into the context of the present research.

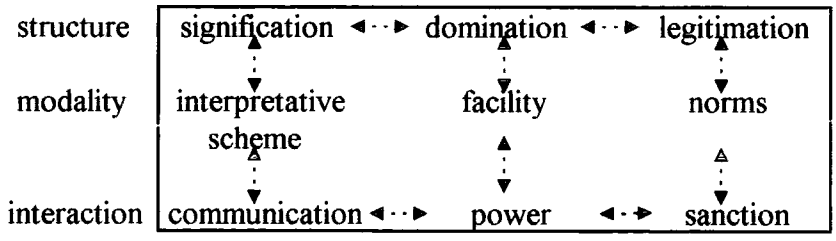
4.5 Structuration Theory

The aim of structuration theory as argued by Anthony Giddens (1976;1982;1984;1989) is to strengthen social research whilst avoiding the weaknesses of major social theories as outlined in structuralism, functionalism, system models, ethnomethodology, phenomenology and symbolic interactionism. Structuration theory touches many points of social research. For the purpose of this thesis, two aspects of structuration theory are used as a means to sensitise the complexities of social relations surrounding information systems. The first is understanding the elements of social practices. The second is the element of a dualistic structure in explaining cause and effect in social practice.

4.5.1 Elements of Social Practice

The basic ingredients in the framework of structuration theory are communication, power and sanction. These three basic ingredients are necessary to enact social practices (Figure 4.2).

Figure 4.2: Analytical Elements of the Process of Structuration



Source: Giddens, A. (1984, p.29).

According to Giddens, communication is important because social practices are organised through meaningful communication. Communications are made with the aid of interpretative schemes or mutual recognition. Interpretation is made by the use of rules, for example, in language *rules of languages are used.* In the context of Giddens *rules* do not necessarily refer to formal rules which might be written in a visible form; rather, rules are related to sense, beliefs, norms, and knowledge (facility). To enact a certain social practice, participants need to draw on a set of rules; these *rules* help to *structure* the pattern of social action. Here *structure* is used as an abstract term. Structure is not viewed in terms of physical dimensions nor as the concept understood by organisation theory or modernist views where structure has three components (complexity, formalisation and centralisation). Rather, here the definition of 'structure' is based on postmodernist views with 'memory traces' which are internal to a person. It is rule-based knowledge. The activity of social practices revolves around the structuring properties of rules, which actors define and redefine to shape the pattern which they wish to organise. Giddens termed this frame of action as *duality.*

Power is the capability to make a difference (Giddens, 1984). Giddens argues that power is not to be equated with the meaning used in social science, where 'power' is defined as intent or the will to achieve a desired outcome. Power in structuration theory is defined as structured properties of social systems, drawn upon and reproduced by knowledgeable actors in the course of interactions (Giddens, 1984). Sahay and Walsham (1996), for example, applied this approach in the study of wasteland management in India. They demonstrated that one of the reason for the project failure (inability to transfer GIS to grassroots level) was a function of knowledgeable actors (scientific institutions) who mobilised elements of the context to enable a coherent and shared understanding, and the

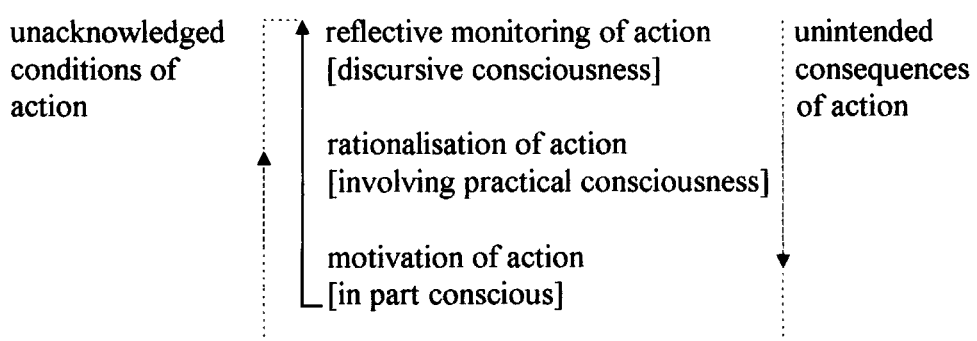
concurrent creation of an asymmetric resource relationship among the critical actors to facilitate change.

The production of interaction is linked to morality. Morality is a group of rules which actors are able to call upon in the production of interaction. According to Giddens 'moral rules' are all types of rules that actors draw upon to make of sense (legitimise) what they say and do (Giddens, 1977). These rules are drawn based on actors' stocks of knowledge, norms, culture, etc. (Giddens, 1984). Taking the India wasteland management study once again, one can argue that each group that participates in the programme was applying its own 'rules' to meet its own desirable objective. The scientific institution group, for example, was unable to adapt to a bottom-up approach (user-oriented approach) because they were bound by the *"prevailing beliefs*...[that there is] *a clear division between the 'technical' and 'social' people, with the former being considered superior*" (Sahay and Walsham, 1996, pp. 394-395).

In the conception of structuration this is explained as a reflexive form of knowledge. It could be understood as 'self-conscious' knowledge and knowledge grounded through a continuous process of creation and recreation. In and through time, these actions constitute a social practice (Figure 4.3). As Giddens argues that:

> "Human history is created by intentional activities but is not an intended project; it persistently eludes efforts to bring it under conscious direction. However, such attempts are continually made by human beings, who operate under the threat and the promise of the circumstance that they are the only creatures who make their 'history' in cognisance of that fact" (1984, p. 27).

Figure 4.3: Stratification Model of the Agent



Source: Giddens, A. (1984, p. 5).

4.5.2 The Process of Structuration and the Duality of Structure

The idea highlighted above is called the duality of structure. This states that social structures constrain the choices that humans make about their activities, but at the same time social structures are themselves created by the activities that they constrain. Furthermore, structures do not only constrain; they enable interaction. For example, Giddens says that in communication, one who wishes to communicate is constrained to follow the same rules of language. Thus when a person communicates something to someone else the process is a conscious (intended) part of the actor's action. When the other person tries to make sense of what has been said, they may repeat it for themselves. Since rules are not encoded, the action of repeating a sentence is based on a person's understanding of rules. Repeating a sentence (reproduction) and the continued repetition of the sentence by another is an unintended part of the actor's action.

The essence of the theoretical framework based on structuration theory is the relational interplay between contextual elements and information system implementation, which, when analysed in terms of the concept of duality of structure, points to the importance of communication of meanings, resources and facilities, norms and values and the central role of actors in mediating between the context and the process.

4.6 Conclusion

This chapter has explored existing theories that could suggest methods to guide information collection for this research and ways to interpret its findings. Two theoretical perspectives are adopted: web models helps to explore the dynamics of computing use and development in organisations, and structuration theory is used to help in understanding actors' behaviour. These theories are selected because they offer two ways of studying an organisation. Theoretical perspectives provided by web approaches collectively take an objective epistemological position (modernist view), and which views organisations as objects with dimensions that can be reliably measured. The perspective seeks explanation for the various forms that organisations take and the outcomes that they achieve. Structuration theory takes a subjective epistemological position (postmodernist view), and treats organisations as subjects whose meanings are to be

appreciated and understood. It tries to understand the organisation through the individuals who are directly involved in the day-to-day activities of the organisation.

Differences in epistemological stances taken by these theoretical approaches highlight the necessity of adopting multiple methods to guide the study design. The modernist perspective focuses on the organisation itself, relying on description and analysis grounded in objectivity which produces comparative views of organisations and information system development implementation in a similar context. The postmodernist perspective offers the application of ethnographic techniques, such as participant observation and in-depth interviews. Approaches provided by both theories fit well with the dual objectives of the present research, which is to understand context and process of information system use and development in large organisations, and to understand the role of organisational actors in the interconnection between context and process. The next chapter describes the methods used to carry out the objectives of the research within the theoretical frameworks discussed here.

Chapter 5 Research Focus and Methodology

5.1 Introduction and Research Focus

This thesis focuses on two large scale computerised information systems programmes: the Integrated Project Monitoring System (SETIA) and the National Land Information System (NALIS). Both programmes involved participation of national agencies, but differences in the types of information handled meant that there were separate agency-based focuses in the two programmes. NALIS concentrated more on land-related agencies, while SETIA, being concerned with more general information needs, involved several different types of agencies across Malaysia. The two programmes are also characterised by other distinctive organisational issues. These relate mainly to technology, human support, and actors that are responsible for handling, maintaining, and storing information. These key differences make it useful to develop a guiding framework to ensure that information from SETIA and NALIS was assessed equally. This framework comprised:

- Identification of the focal agencies for each programme
- Identification of the agencies related to both programmes
- Development of guide questions for IT-related information

This outline guide is discussed in more detail in the first part of this chapter. Fieldwork (information collection) and analysis are explained later in the chapter.

The fieldwork was carried out in two stages; one month was allocated for a pilot study and six months for the main field study. Notwithstanding the fieldwork, several of the issues which concern this study have been followed by the author since 1981 in my capacity as an officer in a Federal agency, and from 1990 to the present as an academician in a Malaysian higher education institution. These roles proved highly advantageous for the present research in terms of gaining access to government agencies. My experience in the government service helped in understanding networks (both formal and informal) of government agencies and key actors in projects and programmes. The next section outlines the research strategy; this is followed by a

discussion of fieldwork planning and development and of the tools used to organise the field information.

5.2 Research Strategy

According to Yin (1994) there are specific forms of questions which a researcher can use to help provide important clues regarding an appropriate research strategy. Yin notes that 'how' and 'why' type questions are most appropriate for case study work because they lean more toward explanation and examination rather than just being exploratory. Many of the factors which the researcher seeks at the outset inevitably remain vague because the situation is embedded in multi-level complexity. Yin (1994) classified such concerns as appropriate for case study work:

> "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident" (p. 13).

This research has selected two case studies to describe, explore and explain the operation and development of large scale information systems in public organisations. As discussed in Chapter 2, the selection of SETIA and NALIS, which are at different stages of their development, is expected to provide an understanding of three aspects of information system development at the national level, these being the designing, the planning and the implementation. With SETIA, the focus is on post-implementation information system activities, and the ways in which organisational actors devise and implement enhancements to existing information systems. With NALIS, the focus is on the early stages of computer information system development; their conception, design, adoption and organisational implementation.

Although, the research focuses on two case studies, the two cases are compared only in the final stage of the analysis, to derive insights that are common to both and specific to each context. The integrity, uniqueness and variety in each case was maintained rather than a design that would have reduced them to a few comparable variables.

The SETIA programme has been the subject of research by a number of authors, notably Han and Walsham (1990) Han (1991) and Masser (1994). In general these

previous studies cover the early parts of SETIA's life and they raise a number of key issues. Han (1991) for example, argues that SETIA is a highly politicised programme, with its establishment being closely manoeuvred by political leaders. As such its future is highly uncertain because many of its participating agencies still lack the necessary knowledge to support the operation of a large scale IT programme. Masser (1994) views SETIA as a *"system built upon well-established administrative procedures"* and argued that it *"represents a near ideal state that is unlikely to be achieved by most other monitoring systems"*. Remarks from these previous studies draw attention to the need to re-examine the operation and status of present day SETIA. In a way the present research intends to answer the questions posed by previous researchers; why do key developments take place and how do they come about?

With regard to NALIS there are no previous academic studies for comparison, although in 1994 the consultancy Renong Berhad was commissioned by the MLCD to undertake a feasibility study for NALIS. The findings of this study were, to some extent, used as a guideline to explore the development of NALIS further. Discussion of Renong's study is provided in Chapter 6 (Section II, part 1). NALIS has certain similarities to SETIA, especially in terms of its coverage which emphasises the participation of agencies across the whole machinery of government - the Federal, State (including District offices) and local authority levels. In the context of Malaysian information system development, no programme of the NALIS scale has claimed implementation success. SETIA, it has been argued, is an example of a failing programme (Han, 1991). Other examples include the National Land Data Bank and National Integrated Data System, which failed even to survive the pilot project level. In the broader context, as discussed in Chapter 3, implementation of large scale information systems is highly challenging for developing countries because many still lack the necessary IT infrastructural support. This research considers how far NALIS could set a precedent for Malaysia in particular and developing countries in general.

5.3. Fieldwork Planning and Development

A major objective of the fieldwork was to gather information that could provide descriptions of government organisational behaviour in administering and implemen-

ting departmental computerisation, and consequently to observe efforts towards meeting national information system goals. At both the levels of government (policy level) and departmental computerisation, the study of processes and actions and how these are conditioned by (and in turn condition contexts) are at the very heart of this research. 'Process' or 'action' is both historical and idiosyncratic and, as Becker (1967) asserted "*what the case study does best is study process*" (p. 239). A historical element is invoked in the research in order to understand the influence of organisations which are relatively stable and enduring on actions. The sequence of action and how action relates to organisations and vice versa can be traced in a longitudinal fashion. As it was not possible to conduct a full scale longitudinal study within the time-scale of this research project, a historical reconstruction and analysis of events was carried out. The inclusion of a historical dimension is crucial, both to an understanding of how organisations influence actions, and their leverage in generating management and policy prescription that would be socially and politically acceptable. As Tilly (1978) puts it, "*we live in history and cannot escape it by assuming it away; when something happens, what has happened before shapes how it happens*" (p. 29).

In Chapter 4 relevant theories were presented and these were synthesised into a framework for guiding both the empirical and analytical aspects of the study. This theoretical framework was used as a general guide to direct the fieldwork, and in attempting to explain what was found in the empirical work. The theoretical framework chosen provided a balance to the risk of over emphasising the idiosyncratic and ignoring the extensive work done in the area of social analysis of information systems. On the other hand, it has to be noted that an over-emphasis on theory would have risked missing important individualities of the cases and the influence and interpretations of real life actors; this is likely to distract from discovering new knowledge. The case studies are guided by the theoretical framework to the extent therefore that the research does not become an accumulation of anecdotes. That said, the description and analysis of the cases provided in this chapter and the joint analysis of the two cases in Chapter 6 are written in 'natural' language.

Since a primary aim was to devise a methodology whereby Malaysia specifically, and developing countries in general, can learn from the experiences of large scale information systems operation, it was necessary to capture the specifics of the contexts of the two cases before the relevance of prescribed intervention strategies could be judged. The case study's intensive approach to research can explain causal relations more effectively through rich description. In addition, its potential for developing what Stoecker (1991) called a theory of the idiosyncratic, by bringing all possible theoretical perspectives to bear and discarding and weighing each until valid and useful explanation of important idiosyncrasies of the case is obtained, holds promise for informing prescriptions that are likely to have impact on decision and policy makers.

5.3.1 Approach to Information Collection

Government information system programmes are multi-level phenomena, with multiple units of analysis at the levels of the individual, organisation and society. In order to obtain a better understanding of the interaction of these different levels, equal attention was devoted to policy and information systems in the empirical work. A multi-method approach to information collection including direct observation, interviews, both structured and semi-structured, and extensive use of archive and other secondary information was adopted. Information was derived from multiple levels within agencies and between agencies extending across regions and States. The types of organisational actors involved in contributing information were also from several different levels of professional and administrative hierarchies (Figure 5.1).

This approach facilitates triangulation, as suggested by Denzin and Lincoln (1994):

> "Because different 'lenses' or perspectives result from the use of different methods, often more than one method may be used within a project so the researcher can gain a more holistic view of the setting" (p. 224).

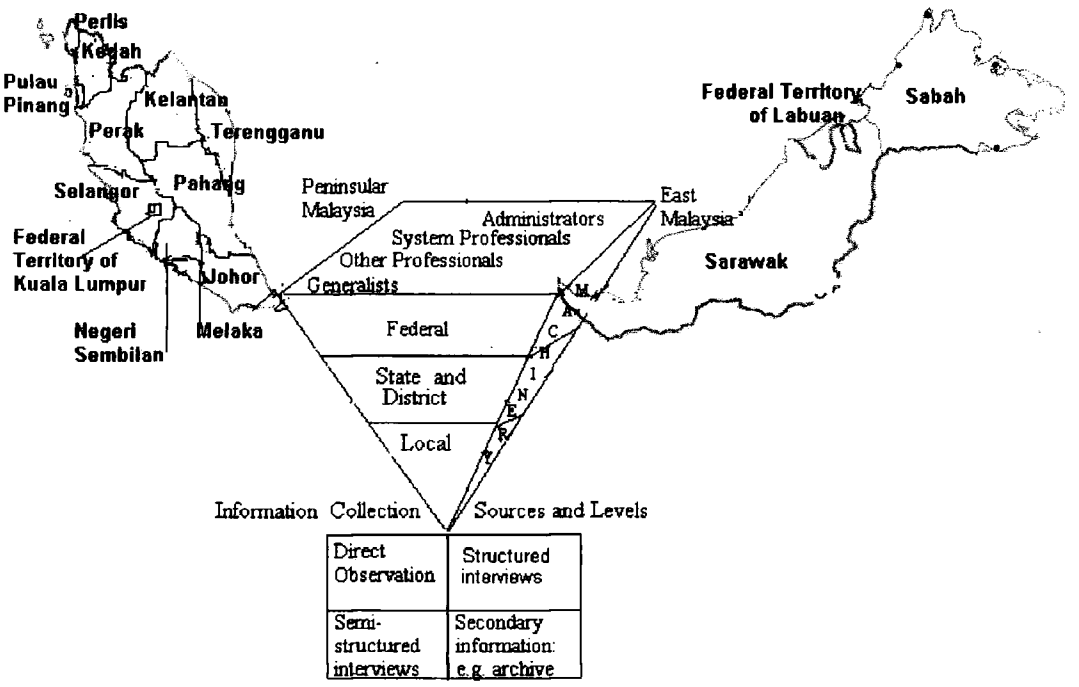
The approach is also in support of the case study inquiry which according to Yin (1994):

> "copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result

relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result

benefits from the prior development of theoretical propositions to guide data [information] collection and analysis" (p. 13).

Figure 5.1: Conceptualising a Triangulation Approach



5.3.2 Pilot Study

Prior to the main fieldwork period a pilot study was carried out in June 1996. The main aims of the pilot study were:

1. to identify new contact persons and agencies related to both programmes.

2. to develop and improve questions design and format (ability to be understood by the interviewee answers) and to highlight new issues which were not initially included in the interview questions.

3. to highlight problems with practicalities: access, estimation of time required per office and area, time of travel between areas, use of tape recorder, expenses required, etc.

Twenty five agencies from author's existing networks were contacted by letter from the United Kingdom. Fourteen of the twenty five agreed to take part in the study and be interviewed. Confirmation of appointments was made by telephone on the author's arrival in Kuala Lumpur. In general, several levels of calls were required to confirm an appointment. In key agencies, notably the Implementation Co-ordination Unit (ICU) and the Information Systems Division of the Ministry of Land and Co-operative Development (MLCD) appointments were facilitated by prior contacts with ICU, with the present Director, the previous IT Division Director and other staff. Similarly with MLCD, the State Secretary in Selangor, Project Manager in Seberang Perai and Director of Land and Mines in the Federal Territory were known to the author. The final list of people interviewed is shown in Table 5.1 and the area covers is shown in Figure 5.2.

All interviews were tape-recorded and, on average, each interview took 60 to 75 minutes. All officers interviewed during the pilot study were well informed on persons responsible for SETIA and NALIS, and IT development issues in general. They introduced many new IT development ideas planned by the government, and identified problems and issues included in implementing the ideas. The initial views greatly helped to strengthen the research scope and to identify relevant issues for further exploration. These issues are as follows:

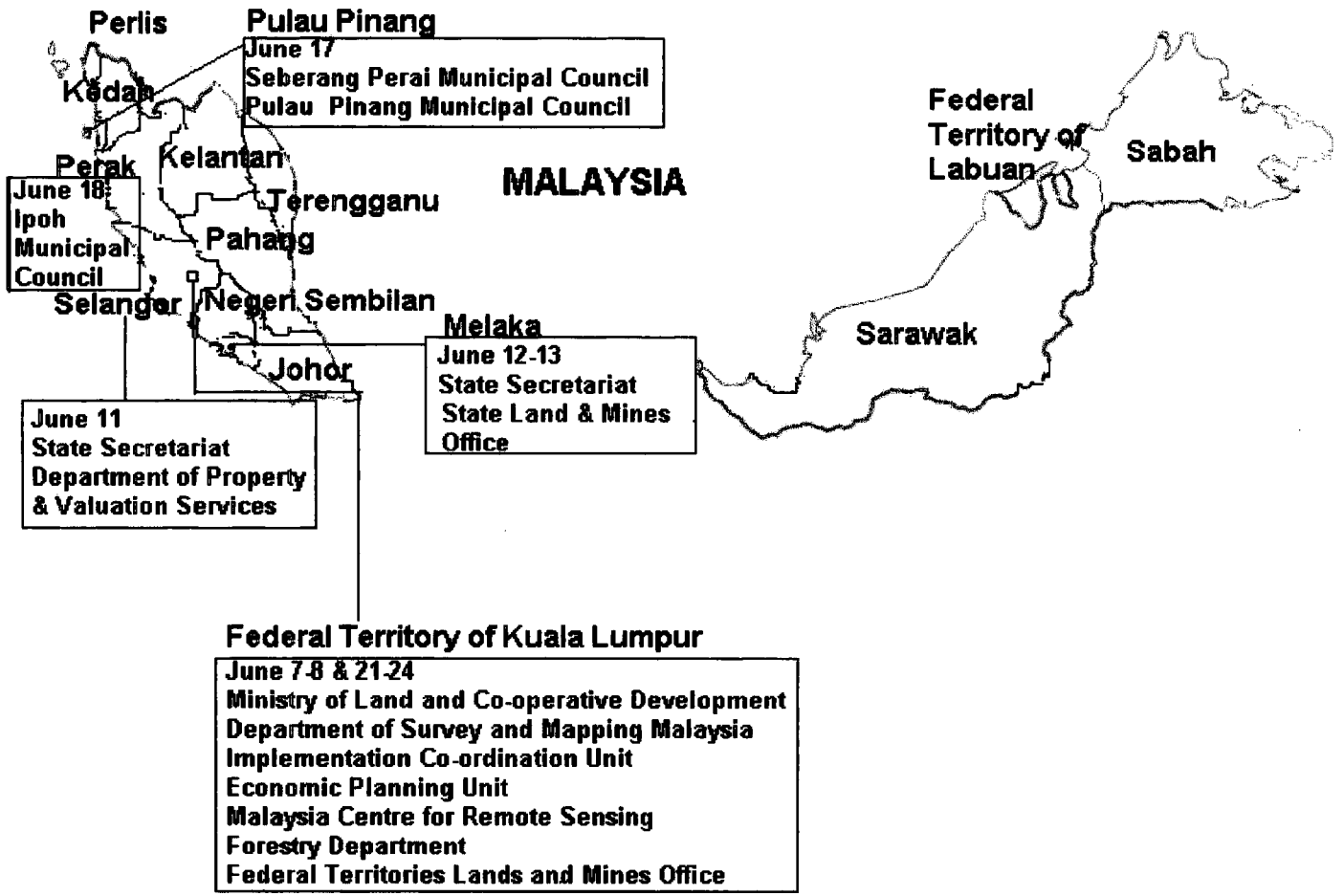
First, it was apparent that administrators or managers are equipped to answer technical questions. In certain cases, in particular for the NALIS study, policy makers were also able to explain detailed aspects of technical matters in their office. For example, at the Melaka Land and Mines office, the director (a surveyor) was the decision-maker, administrator and technical master of his department. He was well versed in all aspects of his department, and certain issues had to be directed back to him for clarification. This example is common

Table 5.1: Pilot Study Interview Schedule

Place, Date, Title, Office
Kuala Lumpur
07/06/96
• Deputy Secretary, Information Systems Division Unit, Ministry of Land and Co-operative Development
• Deputy Director, Department of Survey and Mapping, Ministry of Land and Co-operative Development
8/06/96
• Systems Analyst, SETIA Division, Implementation Co-ordination Unit
• Deputy Director, Macro Planning Division, Economic Planning Unit
Selangor
11/06/96
• State Planning and Economic Officer, State Secretariat Selangor
• Valuation Officer, Valuation and Property Services Department
Melaka
12/06/96
• State Planning and Economic Officer, State Secretariat Melaka
• State Director of Survey, State Land and Mines Office
Pulau Pinang
17/06/96
• Project Manager, Seberang Perai Municipal Council
• Project Manager, Pulau Pinang Municipal Council
Perak
18/06/96
• Assistant Director, Ipoh Municipal Council
Kuala Lumpur
21/06/96
• Assistant Director, Computer Analysis and Computer System, Malaysia Centre for Remote Sensing
23/06/96
• Deputy Director, Special Projects, Forestry Department
24/06/96
• Director, Federal Territories[1] of Lands and Mines Office

[1] Refer to Federal Territory of Kuala Lumpur and Federal Territory of Labuan.

Figure 5.2: Pilot Study Coverage and Interview Schedule



among NALIS' participating agencies where senior officers monopolise all three roles.

Second, IT-related facilities which were itemised before the fieldwork began required further refinement. The pilot study showed that the researcher's initial assumption and knowledge of each agency's IT facilities was too simplistic. Many agencies in fact maintain high profile computerised facilities, and in order to obtain satisfactory inventories several visits were required. Visits to key NALIS agencies in particular needed more time than had been anticipated.

Third, different approaches were required to gain access to each agency. Although Federal agencies were very relaxed and access was straightforward, the situation was different for the State agencies where the best mode of introduction was not to reveal the research as an academic exercise, but to operate in my capacity as a (former) civil servant. Co-operation was then obtained at all levels.

Fourth, the pilot study highlighted several distinctive characteristics of NALIS. These relate mainly to technology, human support, and actors that are responsible for handling, maintaining, and storing information. (These key differences were subsequently used as a guiding framework for the main fieldwork).

In addition to understanding the situational issues, many additional names and officers were suggested by interviewees. In the case of the MLCD and ICU, the co-ordinators of NALIS and SETIA, interviewed officers provided official lists of agencies that are assigned to their programmes. At the end of the pilot study 356 agencies names had been contributed 103 agencies (91 public and 12 semi-government and private) were finally selected, the criteria for selection of which is explained in Section 5.4.1.

5.4 Main Fieldwork Programme

Following the pilot study agencies to be interviewed in the main fieldwork programme were grouped into several categories:

- First, agencies actively involved in land-matters
- Second, agencies actively involved in SETIA
- Third, agencies involved both with land-matters and project monitoring

Forty-nine agencies nationwide were selected as actively land-related and twenty-three agencies were found to be active in SETIA (all from Peninsular Malaysia). Approximately 50% of land-related agencies were also found to be active SETIA participants.

The 91 public agencies selected for the main fieldwork programme are represented by 45 Federal level agencies a combination of 9 ministries 27 departments, units and offices located in Kuala Lumpur and 9 located in the States (Table 5.2); and 46 State, District and local authority offices (Table 5.3).

5.4.1 Identification of Focal Agencies

Focal agencies are identified here on the basis of two factors. First, in terms of the presence of a programme co-ordinator. Second, in terms of the supply of information; focal agencies are those which provide information at the most basic level, such as creating the foundation for land information, using topography or cadastral databases. These focal agencies are summarised in Table 5.4.

Table 5.2: Federal Level Organisations

Prime Minister's Department
Economic Planning Unit
Implementation Co-ordination Unit
Klang Valley Development Authority
Federal Territories of Lands and Mines Office
Department. of Statistics
Kuala Lumpur City Hall
Malaysian Administrative Modernisation and Manpower Planning
Standard Industrial Research Institute Malaysia
Ministry of Housing and Local Government
Department of Town and Planning
Department of Local Government
National Housing Department
Ministry of Science, Technology and Environment
Malaysia Centre for Remote Sensing
Department of Environment
Malaysia Science Technology Information Centre
Malaysia Institute of Microelectronics Systems
Ministry of Finance
Accountant General's Department
Treasury Department
Valuation and Property Services
Ministry of Land and Co-operative Development
Department of Survey and Mapping Malaysia
Director General of Land and Mines Department
Information System Division
Ministry of Primary Industry
Geological Survey Department
Forestry Department
Ministry of Agriculture
Department of Agriculture
Department of Irrigation and Drainage
Ministry of Works
Public Works Department
Ministry of Energy, Telecommunications and Posts
Department of Telecommunications

Table 5.3: State and Local Authority Agencies

Johor	**Selangor**
Johor State Secretariat	State Computer Services Unit
Johor Bharu Municipal Council	Selangor State Secretariat
Johor Computer Services Unit	State Survey and Mapping Department
State Survey and Mapping Department	**Sabah**
State Land and Mines Office	State Agriculture Department
Kedah	State Survey and Mapping Department
Kedah State Secretariat	State Computer Services Department
State Survey and Mapping Department	Sabah Land and Survey Department
State Land and Mines Office	Sabah Forestry Department
Kota Setar Land Office	**Sarawak**
State Town and Country Planning Department	State Forestry Department
Kelantan	State Planning Unit
State Survey and Mapping Department	Department of Agriculture and Development
State Land and Mines Office	State Survey and Mapping Department
State Town and Country Planning Department	Sarawak Land and Survey Department
Kelantan State Secretariat	Sarawak Information Systems Centre
Melaka	**Terengganu**
Melaka State Secretariat	Terengganu State Secretariat
State Mapping and Survey Department	State Computer Unit
State Town and Country Planning Department	State Survey and Mapping Department
State Economic Planning Unit	State Land and Mines Office
State Land and Mines Office	**Pulau Pinang**
Negeri Sembilan	State Survey and Mapping Department
Negeri Sembilan State Secretariat	Pulau Pinang State Secretariat
State Town and Country Planning Department	State Land and Mines Office
State Land and Mines Office	Seberang Perai Municipal Council
State Mapping and Survey Department	State Computer Centre- Penang GIS
Pahang	State Town and Country Planning Department
Pahang State Secretariat	**Perak**
State Economic Planning Unit	Perak State Secretariat
State Development Corporation	Ipoh City Council
State Survey and Mapping Department	State Land and Mines Office
State Land and Mines Office	State Town and Country Planning Department
Perlis	Perak Information Technology Centre
State Survey and Mapping Department	Taiping Municipal Council

Table 5.4: Focal Agencies for SETIA and NALIS

Integrated Project Monitoring System (SETIA)	National Land Information System (NALIS)
• Implementation Co-ordination Unit, Prime Minister's Department	• Information System Division, Ministry of Land and Co-operative Development
• Economic Planning Unit, Prime Minister's Department	• Department of Survey and Mapping, Ministry of Land Co-operative Development
• Accountant General's Department	• Director General of Land and Mines, Peninsular Malaysia, Ministry of Land and Co-operative Development
• Federal Treasury, Ministry of Finance	• Sarawak Survey and Land Department
• State Economic Planning Unit	• Sabah Land and Survey Department
	• State Land and Mines Office
• State Development Office/ State Secretariat Office	• Federal Territories of Lands and Mines Office, Prime Minister's Department

With regard to the SETIA programme, the Implementation Co-ordination Unit (ICU), the Economic Planning Unit (EPU), the Accountant General's Department (AGD), and the Federal Treasury Department are focal agencies. At the State level, the State Development Office (SDO) and the State Economic Planning Unit (SEPU) are the key agencies. Of these agencies, the ICU is perhaps the most important because it is the overall co-ordinator of SETIA. For the NALIS programme, of the focal agencies, the Information Systems Division of the MLCD is given in-depth observation because it is the co-ordinating centre for the NALIS.

5.4.2 Agencies Related to Both SETIA and NALIS

Certain key national level policy-making agencies, in particular the Economic Planning Unit, play important roles in both programmes. At the State level, branch of the Economic Planning Unit, the State Economic Planning Unit, is the major controlling agency. Since the major information sources for both programmes are at State level, two key State policy-making agencies, the State Secretariat Office and the State Economic Planning Unit, play important roles for both SETIA and NALIS. The

main officers (Directors and Assistant Directors) of these agencies are therefore answerable to both programmes.

For this research agencies were selected for investigation based on their level of involvement with the programmes. In the case of SETIA, for example, some agencies contribute to SETIA's databases when working with federally funded projects. On completion of the project, their active participation ceases. The case is different with NALIS, however, where the types and number of participants remained stable throughout. Besides the 91 public agencies, 12 semi-government and private agencies were also included in the interview list. These agencies and companies were selected specifically to explore opinions on the national IT strategy (Table 5.5).

Table 5.5: Advisory Body, Semi-Government and Private Companies

• Urban Development Authority	• Renong Group Berhad
• Election Board	• Multimedia Development Corporation (MDC)
• University of Malaya	• Dexcel Sdn. Berhad
• University of Malaysia, Sarawak	• Intergraph Malaysia Berhad
• International Business Machines (IBM)	• The Sapura Group
• National Information Technology Council (NITC)	• Telecommunications Malaysia Berhad

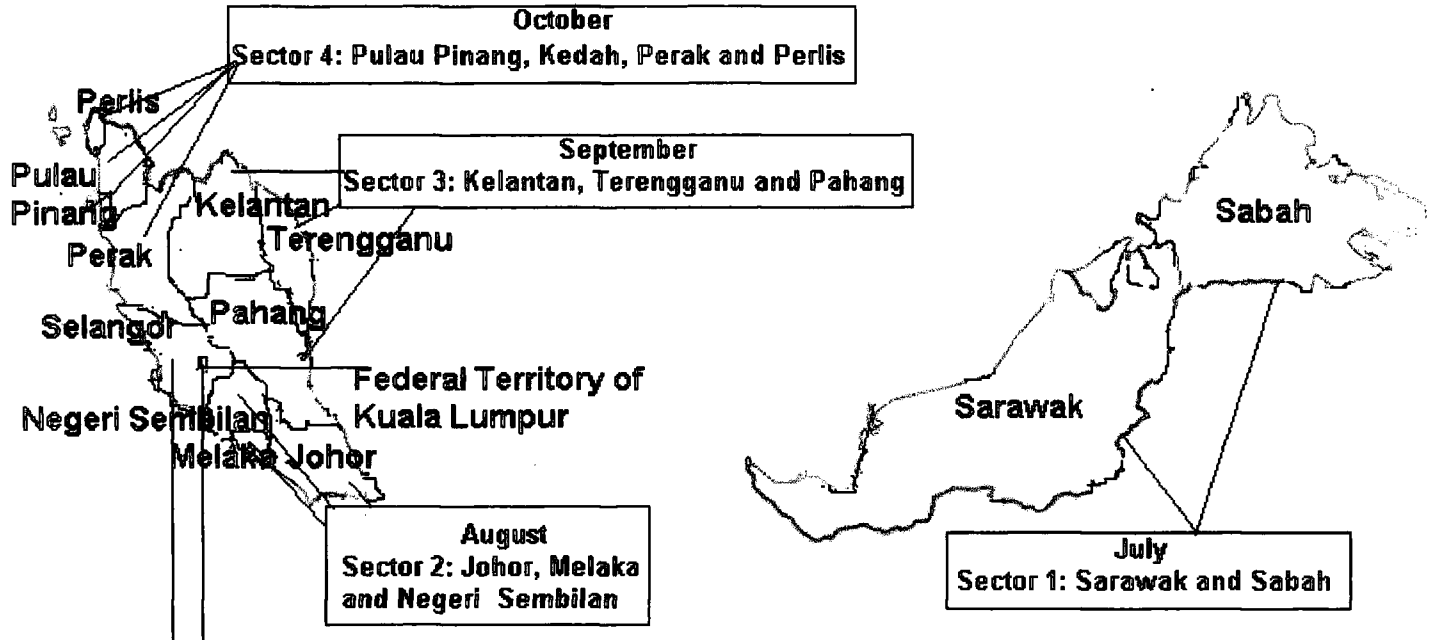
5.5 Information Collection Techniques

The key methods employed to collect information for this study were first, structured and semi-structured interviews, guided by set of pre-established questions. Responses for both types of interview were tape-recorded and, additional notes were taken. Second, direct observation was carried out at seven agencies at Federal and State levels. Third, secondary information collection was undertaken involving archive searches, internal and external departmental publications, archive search, memos, minutes and letters. More detailed discussion of these methods follows:

5.5.1 Interviews

The main interviewing programme was carried out between July 1996 and January 1997. Names of agencies that were planned to be interviewed were divided into five convenient sectors as identified in Figure 5.3. Agencies in East Malaysia were

Figure 5.3: Main Fieldwork Coverage Divided by Sectors



approached first. Through assistance from the University of Malaysia, Sarawak (UNIMAS) seven appointments were arranged in Sarawak and three in Sabah. A total of three weeks were spent in Sarawak and one week in Sabah. During this time appointments were made for other States in Peninsular Malaysia. For practical reasons the intention was to plan complete interviews in a single sector, within one single month. However, for some agencies in the States of Terengganu and Johor, separate visits (November and December respectively) had to be arranged due to previous commitments of officers to be interviewed. These repeat visits to these States placed pressure on the fieldwork budget and schedule than would otherwise have been the case, but such problems could not be circumvented without seriously reducing the interview programme. From the 103 agencies a total of 149 semi-structured and 68 structured interviews were carried out (Tables 5.6a to 5.6e).

Table 5.6a: Interviews Covered in July for Sector 1

State and Agency	No. of Interviews	State and Agency	No. of Interviews
Sarawak		**Sabah**	
• *Sarawak Information Systems Centre	2	• Sabah Land and Survey Department	2
• State Survey and Mapping Department	2	• State Survey and Mapping Department	2
• Sarawak State Planning Unit	2	• Sabah Forestry Department	1
• Department of Agriculture and Development	2	• *State Computer Services Department	2
• Sarawak Land and Survey Department	2	• State Agriculture Department	1
• State Forestry Department	1		

*Note: In addition to interview direct observation was conducted

Table 5.6b: Interviews Covered in August for Sector 2

State and Agency	No. of Interviews	State and Agency	No. of Interviews
Johor		**Negeri Sembilan**	
○ **Johor Computer Services Unit	2	○ State Secretariat	1
● State Secretariat	2	○ State Land and Mines Office	1
● State Survey and Mapping Department	1	● State Survey and Mapping Department	1
○ +State Land and Mines Office	1	● State Town and Country Planning Department	1
○ Johor Bharu Municipal Council	2	**Melaka**	
		○ State Secretariat	2
		○ State Survey and Mapping Department	1
		● State Economic Planning Unit	1
		● **State Land and Mines Office	2
		● State Town and Country Planning Department	2

Notes: ** In addition to interview direct observation was conducted
+ Interview was conducted in December

Table 5.6c: Interviews Covered in September for Sector 3

State and Agency	No. of Interviews	State and Agency	No. of Interviews
Kelantan		**Pahang**	
● State Secretariat	1	● State Secretariat	1
● State Survey and Mapping Department	2	● State Land and Mines Office	2
● State Town and Country Planning Department	1	● State Economic Planning Unit	2
● State Land and Mines Office	2	● State Development Corporation	1
Terengganu		● State Survey and Mapping Department	1
○ State Computer Unit	1		
○ *State Secretariat	1		
○ State Land and Mines Office	1		
○ State Survey and Mapping Department	1		

*Note: Interview was conducted in November

Table 5.6d: Interviews Covered in October for Sector 4

State and Agency	No. of Interviews	State and Agency	No. of Interviews
Pulau Pinang		**Perak**	
• State Secretariat	1	• State Secretariat	1
• State Survey and Mapping Department	1	• State Land and Mines Office	1
• Seberang Perai Municipal Council	2	• Ipoh City Council	1
• State Town and Country Planning Department	1	• State Town and Country Planning Department	1
• State Land and Mines Office	2	• Information Technology Centre	1
• State Computer Centre/Penang GIS	2	• Taiping Municipal Council	1
Kedah		**Perlis**	
• Kota Setar Land Office	1	• State Survey and Mapping Department	1
• State Secretariat	2		
• State Land and Mines Office	2		
• State Town and Country Planning Department	1		
• State Survey and Mapping Department	1		

Table 5.6e: Interviews Covered from November to January for Sector 5

Agency	No. of Interviews
Prime Minister's Department	
Economic Planning Unit	4
SIRIM	1
Implementation Co-ordination Unit	6
Department of Statistics	3
MAMPU	3
INTAN	1
Klang Valley Authority	1
Federal Territories of Lands and Mines Office	2
Kuala Lumpur City Hall	1
Ministry of Finance	1
Accountant General's Department	1
Treasury Department	1
Valuation and Property Services Department	2
Ministry of Land and Co-operative Development	1
Department of Survey and Mapping Malaysia	4
Director General of Land and Mines Department	3
Information System Division	3
Ministry of Primary Industries	
Forestry Department	2
Geological Survey Department	1
Ministry of Works	1
Public Works Department	2
Ministry of Agriculture	1
Department of Agriculture	3
Department of Irrigation and Drainage	1
Ministry of Housing and Local Government	1
Department of Town and Country Planning	3
Department of Local Government	2
National Housing Department	2
Ministry of Science Technology and Environment	1
Malaysia Centre for Remote Sensing	2
Department of Environment	2
Malaysia Science Technology and Information Centre	1
Malaysia Institute of Microelectronics Systems	2
State of Selangor	
Computer Services Unit	1
State Secretariat	1
Department of Survey and Mapping (Federal Branch)	1
Other	
Renong Group Berhad	2
National Information Technology Council	1
Urban Development Authority	2
Election Board	1
University of Malaya	1
International Business Machines	1
Multimedia Development Corporation	2
Dexcel Sdn. Berhad	1
Intergraph Malaysia Berhad	1
The Sapura Group	1
Telecommunications Malaysia Berhad	1
University of Malaysia, Sarawak	3

Structured and semi-structured interviews were used to capture two levels of information. Structured interviews were used to obtain, first, an inventory of computerised facilities in each organisation; and second, to seek clarification and elaboration of issues particularly related to technical matters. The following guideline questions were devised as a basis for the interviews carried out in this structured format:

1. Level of office automation
   - availability of personal computers
   - availability of office automation software

2. Level of computerisation and availability of Management Information Systems (MIS)
   - computerisation in the organisation
   - availability of MIS
   - intra-organisation linkages & networking
   - readiness for inter-organisational linkages
   - expected date for inter-organisational linkages

3. Availability of Land Information Systems (LIS) or Geographic Information Systems (GIS)
   - LIS/GIS applications
   - LIS/GIS databases & data structures
   - Data administration and management procedures
   - LIS/GIS implementation and integration
   - planned LIS/GIS operation

4. Area of coverage
   - relevant digitised database coverage
   - coverage level of administration area

5. Classification as information provider or user (depended on type of information available and provided to or required by other organisation)

6. Information transfer (to: / from: / by types and volume)

7. Information sharing and confidentiality

Structured interviews were carried out with technical staff such as systems analysts, systems engineers and urban planners, all of whom managed daily transactions of

information. Responses were tape-recorded and at the same time written notes were taken. In general each interview lasted between one and a half hours.

Semi-structured interviews were used to provide qualitative depth by allowing interviewees to talk about a subject in terms of their own frames of reference. In other words the researcher did not apply a rigid set of questions beforehand because the purpose is to "*understand the issues in the interviewee's own terms*" (Valentine, 1997, p. 118). This methodology still calls for guiding themes, however, a list of themes was therefore prepared to obtain details from individual offices and officers. These included officers at decision-making levels, such as the Directors of Economic Planning Unit, the Treasury, the Manpower and Management Planning Unit, the Multimedia Development Corporation, and the Ministry of Land and Co-operative Development. Themes related not only to the specific agency, but were also used to explore views of the programme in relation to national development. The following themes for example, were used to guide the discussion with the Chairman of NALIS technical committee:

- The key issues and challenges in launching NALIS
- How NALIS is different to previous MLCD undertakings of the 1970s, such as, the National Land Data Bank (NLDB), the National Integrated Data System (NIDAS)
- How MLCD sees its responsibilities in the development of NALIS
- The role of NALIS in helping to country to develop an integrated LIS

To officers at an operational level, such as the Director of Survey and Mapping, Town Planners, and Agriculture and Valuation officers, questions were guided so as to understand their office relationships to a programme (either SETIA or NALIS) and how they perceived the benefit of programmes to their agencies and themselves. Emphases were placed on skills in handling new technology, such as GIS; the training provided to support the programme development; problems of communication between and across agencies; and how the introduction of the new system (NALIS) affects their daily routine. For officers at State agencies, in addition to questions about generalised operational problems and issues, special effort was made to elicit

opinions on State development preferences. This was necessary because of the differences in administrative practice between State and Federal agencies. Semi-structured interviews on average each took about one to one and half hours, totalling about 225 recorded hours of interviews involving usually administrators and decision making level officers.

5.5.2 Direct Observation

The main aim of using a direct observational method was to support and cross-check against information gathered from interviews and secondary information (Denzin and Lincoln, 1994). Webb et al. (1966) argued that one great strength of observational methods lies in the ease through which the researcher can gain *entree* to the setting, because it is unobtrusive and does not require direct interaction with participants. For the present study, seven agencies were observed. These were:

- Implementation Co-ordination Unit, SETIA Division
- Federal Territories of Lands and Mines office - pilot studies for Computer Land Registration (CLRS) and NALIS
- Melaka, State Land and Mines Office - developing Melaka Land Information System (MELIS). This provides an example of a State level GIS implementation programme.
- Johor Computer Unit, providing an example of State level integrated computerisation effort.
- Sabah and Sarawak computer centres, both of which exemplified integrated centralised computer systems.
- Local Government Division's head office in Kuala Lumpur, focusing on SETIA's information collection process.

Except for Sabah and Sarawak computer centres, where access was provided through the University of Malaysia Sarawak (UNIMAS) access to agencies were made through existing personal networks. Observation most often coincided with interview periods. On average, three days to a week were spent in each office. The exception was the Federal Territories of Lands and Mines office (for CLRS/NALIS studies), where three weeks were taken in observing, the negotiations carried out for the pilot project for NALIS. Few of these offices were used as a temporary base when

working in that particular geographical location. For example, for the month of December, when interviewing in the Kuala Lumpur area, the Federal Territories of Lands and Mines office was used as a base. The request for a temporary working base was readily agreed because senior officers from these offices were known to the author. Access was provided to their information system operations and sometimes were also invited to observe related programme discussions and meetings. When at the Federal Territories of Lands and Mines office, for example, the author was given the opportunity to observe two NALIS pilot project weekly technical meetings. The meetings involved technical officers from seven agencies (Survey, Valuation, City Hall, Town Planning, EPU, and Statistics) and the Federal Territories of Lands and Mines office was the co-ordinator. For Statistics and City Hall, a different officer attended each of the meetings and the officers were very junior compared to those from other departments; these junior officers acted as passive participants. Through conversation with officers from Statistics and City Hall it was apparent that their senior management were opposed to NALIS. Representation was merely an act of official duty rather than of serious interest in the project.

At each of the observation sites issues emerged to give added detail to the research and to give richer insights to the process of IT organisation. For example, at the Local Government Division's head office in Kuala Lumpur, officers went through a repetitive routine of making reminder calls to implementing agencies (local authority and District offices) requesting submission of project progress information. Underlying concerns about the lack of co-operation from staff at the grassroots level, were apparent as were frustrations about the need to correct information before inputting it into the SETIA system.

Efforts taken by the State surveyor at the Land and Mines office, Melaka, to introduce GIS to offices in the State were apparent through various means - distribution of pamphlets, video presentations and briefings. These efforts seemed, however, to focus attention on the ability of GIS to produce impressive rather than seeking understanding of why GIS maybe useful for planning. The Director of Land

and Mines[2], commented that he found the process of explaining the capabilities of GIS tiring and frustrating.

5.5.3 Secondary Sources

Secondary information collection was carried out to understand events and relationships of past and present situations. For example, before carrying out interviews searches were made to develop appropriate questions for selected issues. After the interviews were conducted, further documentary searches were required to compare the interviewee's interpretation and those recorded in documents relating to those events. The activities in fact were carried out as a continuous process. A total of 143 agency documents and reports were collected for the present study. They consisted of agency annual reports including statistical reports from Educational Departments, Statistics Departments and Human Resource Departments; economic and financial reviews; legal documents; and historical literature on SETIA's development and land development.

The final phase of the fieldwork involved gathering comparative information on Malaysia's information systems in the context of its neighbours, in particular ASEAN countries. The search was conducted at the end of the seven months of fieldwork. While in Malaysia, the Asia Pacific Development Corporation, and the Institute of South East Asian Studies were visited. Visits to the Commonwealth Secretariat and the School of Oriental and African Studies were made on return to the United Kingdom. Documented materials on development and technology (in particular on Information Technology) were searched as further secondary sources.

5.6 Information Analysis

Information analysis was divided into four main stages.

- organising structured interview material;
- translating and transcribing structured and semi-structured interviews;
- classifying and analysing transcribed information;

[2] The said director has subsequently left the Department of Land and Mines to join a private survey firm.

- coding the transcribed information.

5.6.1 Organising Interview Material

Structured information consisted of written notes relating to quantitative and semi-quantitative information, such as existing and planned computerised facilities, and tape-recorded answers which were generally used to clarify the written notes. The products from these interviews were organised into tables, and recorded materials were translated and transcribed for subsequent interpretation alongside the tabular information. Problems and issues highlighted by the officer, such as data and communications for example, are included in this analysis.

5.6.2 Translating and Transcribing

Translation was required because most interviews were conducted in the Malay language. As each recording was transcribed it was also translated into English. Each transcription of a one and a half hour interview took about 8 to 10 hours transcription time. A total of 1000 hours or 140 days were spent translating and transcribing. The number of hours does not include replay which is required to understand key Malay phrases for which there is no direct equivalent in English.

5.6.3 Classifying and Analysing Information Using Qualitative Software

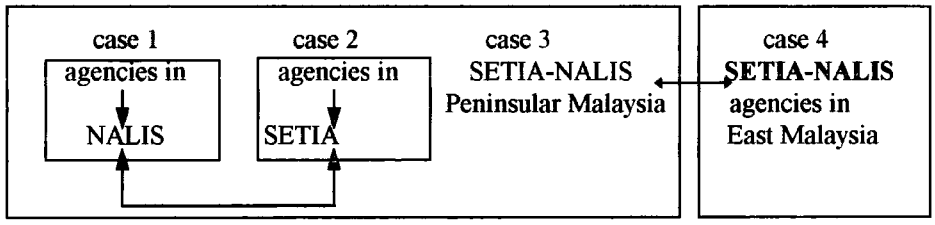
The transcribed information produced about 1.1 million words and about 47 tables of structured information. To help make sense of this information the qualitative data software package HyperRESEARCH was used. As Crang (1997) notes, the time needed for learning a software package should not be underestimated, although this can sometimes form a barrier rather than helping the analysis to progress. In addition, different software packages have their own strengths and weaknesses. For example, Hyperqual, an alternative package, is a simple code-and-retrieve program (Tesch, 1990). HyperRESERACH, Nudist and Atlas provide more sophisticated ways of storing and accessing, exploring and constructing knowledge from the data and HyperRESEARCH takes a specific approach to hypothesis testing. However, in general these packages maintain similar basic capabilities and, they offer assistance in the management of complex data. Crang (1997) argued that:

> "they help speed up sorting through your materials, so instead of piles of paper or coloured pens the computer keeps codes assigned to different sections of text...then allow very quick retrieval of all sections labelled with a certain code" (p. 187).

In this study HyperRESEARCH is used to help analyse information within organisations to make comparison between agencies, and to compare Peninsular Malaysia organisations with those in East Malaysia.

For this research a total of 112 files were created containing interviews and secondary sources, with each file comprising, on average, twelve pages of text (6500 words). HyperRESEARCH suggests organising the documents into a 'case' or 'cases'. In this study four cases were identified. These were: agencies concerned only with NALIS, agencies concerned only with SETIA, a combination of SETIA and NALIS agencies in Peninsular Malaysia and a combination of SETIA and NALIS agencies in East Malaysia (Figure 5.4). Each case was allocated one 'folder' which contains files (documents) from related interviews. For the NALIS case interviews included, for example, those from the Ministry of Land and Co-operative Development (MLCD). Having identified these levels of analysis, the next stage is to identify key common factors within each folder, through the process of 'coding'.

Figure 5.4: Building Cases in HyperRESEARCH



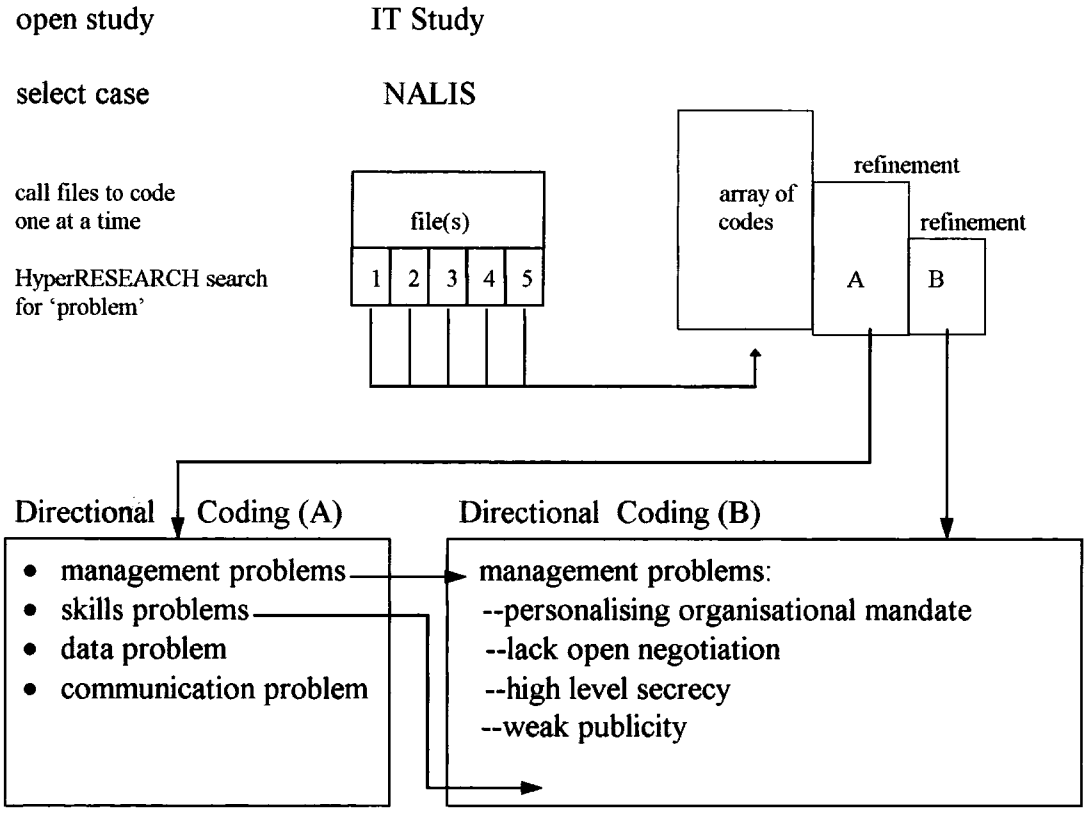
Note: arrow (⟷) indicates cross-analyses between and within cases

5.6.4 Coding

The process of coding takes many forms (Figure 5.5). For this study auto-coding was used as a start to scan phrases and words most commonly appeared in documents. HyperRESEARCH allows codes to contain up to 32 characters. Thus one has the opportunity to make a code as descriptive as possible for easy reference. For example, in this study an auto-code can contain words such as training, skills,

education, etc. For example, in case one for NALIS, HyperRESEARCH was asked to find the word 'problem' as one example. HyperRESEARCH scans the document for every occurrence of the word 'problem[3]' and assigns a code to it. The purpose of auto-coding, then, is to carry out a quick preliminary coding of each document. Many levels of re-coding are necessary to create a better understanding of the codes thus generated. When these auto-codes are reviewed the package allows one to read the

Figure 5.5: An Example of the Coding Process (autocoding - preliminary coding)



coded passage and to refine descriptions. This process is repeated several times so that meanings of themes raised in interviews became clearer. For example, when working with the code 'management problems' there was a generalised issue relating to officers' preference for a top-down approach, because they are unwilling to allow intrusion in their jurisdiction. This behaviour can be attributed to various personal, political, and other broader organisational factors. But after reading and re-reading interviews (from various NALIS participating agencies, for example), and relating them to the broad codes, one sees the need to refine the code because the meaning in

[3] Auto-code only looks for exact matches in words or phrases.

the code is too broad; it was thus further refined to 'officers personalising organisational mandate'.

Other management problem codes included 'discourage open negotiation', and 'prefer high level secrecy'. The final list of codes generated is as follows:

- Common data model and exchange standard
- Lack single common map projection
- Lack local referencing
- Consensus over implementation and integration
- Consensus among organisations
- Consensus of co-ordination between States
- Land surveyors fighting for (co-ordinating) position
- Other technical professionals assuming power
- Public administrators assuming power
- Re-engineering and re-organising
- Importance of hierarchy and power unbreakable
- Personalising organisational mandate
- Lack of open negotiation between operational level and decision-making
- High level of secrecy on non-essential matters
- Weak publicity on organisational goals
- Orders change as flow from top-down and no checking device
- Disagreements are bottled-up
- Severe shortage of applied computerisation skills
- National IT policy too broad for organisational use (no written organisational IT objective)
- Organisational head [depended too much on] vision 2020
- IT standards are manipulated [from others not related to local situation]
- Grass-roots participation is ignored
- Too trusting of vendors
- GIS no data
- GIS no infrastructure
- Necessary to privatise to enhance implementation
- Training, upgrading of knowledge inadequate
- Innovation is secondary, cloning is important
- Felt left out

5.6.5 Analysing and Reporting

HyperRESEARCH was used to explore relationships between codes for the four cases shown in Figure 5.4 and to identify which cases contain certain combinations of codes, helping to draw out themes that are embedded in the information.

5.7 Summary

This chapter has described the main methodological 'framework' adopted in this thesis. The research 'focus' has been explained, differences and similarities between the SETIA and NALIS programmes highlighted, and the need for a multi-method approach outlined. The case study approach has been described and the key methods used to gather information have been discussed.

This chapter ends the first part of this thesis. The chapters that follows concentrate on the evaluation, analysis and findings of the research.

Chapter 6 Evaluation of Information System Programmes: developmental context, process and change

6.1 Introduction

The objective of this chapter is to discuss, explore and evaluate the various levels of information that have been gathered from two information system programmes: the Integrated Project Monitoring System (SETIA) and the National Land Information System (NALIS). The rationale behind selecting these two programmes was discussed in Chapter 2. Briefly, the main reason is to evaluate information system development during both the early stages (NALIS), and the later stages (SETIA), in a computer-based information system's life.

This chapter aims to identify and assess issues related to the focal and broader contexts of these information system developments. The evaluation framework is guided by the concepts of web models, and is committed to the exploration of the intertwining social relationships between participants, the social infrastructure and the history of a programme's previous commitments. Web models suggest viewing the relationships between the focal study's concerns; that is, agencies that are directly involved in IT programmes and the broader contextual boundaries which include the wider political and socio-economic contexts within which the agencies are located. The dynamics of these relationships are expected to help to answer this study's central research questions: first, what is the leader's vision with regard to the use of information systems by public organisations as a means of delivering effective and efficient services to the people; and second, are information systems an effective means of reducing geographic distance between regions.

This chapter is divided into three sections - part one discusses SETIA, part two NALIS and part three summarises issues from both of these programmes. Sections one and two are further divided into two parts. Part one of each section introduces the programme and relates historical accounts to the present context of the programme. Part two expands and evaluates issues related to organisational, technical and institutional factors from both focal and broader contexts into several perspectives. The main objective of part two of each section is to arrive at some understanding of the relationships within the programme's social contexts - participants, the in-

frastructure and the previous commitments to the broader environment, such as social and political elements.

The chapter is guided by the findings from analysing fieldwork materials using qualitative software, as described in Chapter 5. Examination of the four 'cases' identified there highlighted the following broad themes:

- Generally interviewees saw the country moving towards a capitalist system, involving centralised organisations, privatisation and corporatisation. Needs of the organisation based on political appointees and seniority were being replaced by professionals and corporate technocrats.

- The character of some agencies in the Prime Minister's Department is changing. For example, EPU is moving away from handling projects that do not meet their organisation's expertise. ICU, on the other hand has maintained its status quo, with no changes in responsibilities; it is now beginning to lose power to newer agencies who hold the relevant resources and skills.

- There is a conflict over decision-making and power distribution prevalent among Federal agencies, State agencies and between Federal and State. The direct consequences of problems with information co-ordination include disagreement over data models, exchange standards, common map projections and local referencing.

- Top-down decision-making is strongly supported by programme leaders and many Federal agencies. The consequences of such an approach include ignoring grass-roots participation, high levels of secrecy, lack of open negotiations between leaders and subordinates and conflict in development ideology between younger officers and more senior civil servants.

SECTION I: SETIA - Integrated Project Monitoring System

Part I

6.2 Introduction

SETIA is the third management information system programme initiated by the Malaysian federal government, although in the context of integrated computerised information systems, SETIA is the first. Following the main SETIA programme several more management information systems have arisen out of it (Table 6.1). As a result of developmental changes, SETIA is sometimes referred to by different names. In this study, only one name, SETIA is used to denote the main programme and the additional information systems that are attached to it.

Table 6.1: Summary of SETIA's Historical Background

Date		Programme	Information and System Capability
1	1960-1970	Rural Development Plan	rural development only (fully manual)
2	1970-1984	Project Monitoring Systems	4 separate computerised information systems - *ICU, EPU, AGD and the Federal Treasury
3	1984-1986	Integrated Project Monitoring System (SETIA)	rural and urban manual and computerised
4	1987-1997	SETIA/RedBook II	rural and urban fully computerised networking
4a	1991-1994	First addition to SETIA/RedBook II (manual form)	addition of financial aspects and progress problems (manual)
4b	1994-present	Second addition to SETIA/RedBook II (Gantt chart)	addition of financial aspects and progress problems (computerised)

*Note: ICU = Implementation Co-ordination Unit; EPU = Economic Planning Unit; and AGD = Accountant General's Department.
Source: Fieldwork 1996.

6.2.1 SETIA: Historical Account and System Development

The SETIA programme evolved from several generations of management information system initiatives. The first of such initiatives was the Rural Economic Development Plan introduced in 1960. The aim of this plan was to link development information from the District to the Federal level. The operation was based on the distributed authority given to District offices and the State Secretariat, and controlled by the Ministry of Rural Development which is headed by the Deputy Prime Minister. Following the launch of the New Economic Policy and Second Malaysia Plan in 1970,

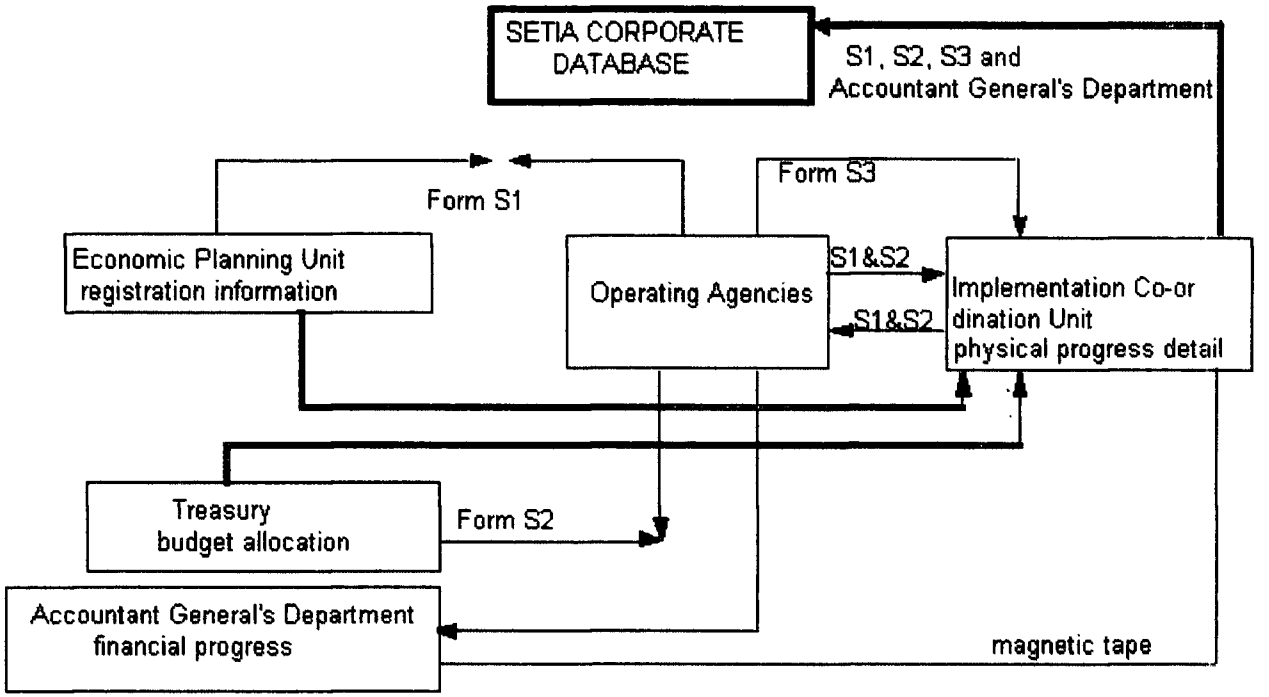
projects and programmes emphasised a change in policy to urban and industrial rather than rural development. The function of monitoring development projects was transferred from the Ministry of Rural Development to the Implementation Co-ordination Unit (ICU), a unit in the Prime Minister's Department. By 1977 due to the expansion of development activities, computerisation of development projects was found to be essential. The activities of four central agencies responsible for national project development, the Economic Planning Unit (EPU), the Federal Treasury, the Accountant General's Department (AGD) and the Implementation Co-ordination Unit (ICU) were all computerised. The separate systems, however, were found to duplicate data collection and were difficult to co-ordinate. ICU suggested that the four systems should be amalgamated. In the broader context the impetus to integrate was driven by new the Prime Minister's[1] administration drive for efficiency and productivity in public administration combined with a climate that promoted information technology as a productivity tool in government.

In 1984, the four separate systems were amalgamated and came to be known as SETIA. The programme became the first integrated development information system in the country. In this new system set-up, ICU remained as the co-ordinator, while the EPU, the Treasury the AGD and operating ministries managed data at their own locations. The processing and distribution of the data and information are carried out by means of three forms, S1, S2 and S3 (Figure 6.1).

Form S1 which is used by EPU, contains details on project number, ministry, department, implementing agency, purpose of development, location, scope, year of initiation and completion, cost breakdown according to land, building, equipment, consulting services, management expenditures, sources of funds and types of financing. Form S2, which is used by the Treasury budget office, contains basic project details as well as specifics on status of implementation, actual and budgeted expenditures for a five year period, current and the next year's budget estimates and expenditure forecasts for the remaining project

[1] Dr Mahathir Mohamad.

Figure 6.1: SETIA Data Processing and Distribution



years. Form S3 is used by ICU to collect data on project progress. This form contains detail on physical projects, disbursements of payment, problems in implementation, date of initiation and completion of project activities. The Accountant General's Department is responsible for making payments and disbursement on projects. Ministries, departments and agencies send in payment and journal vouchers to the Accountant General's Department for payments. These source documents which are captured and integrated by the Accountant General's Department, are sent to SETIA in the form of magnetic tapes. The output of the SETIA system includes general and primary listings from forms S1, S2, S3 (Appendices A1, A2 and A3) contain the content of these forms and expense patterns generated by the Accountant General's Department. These outputs[2] (Appendix A4) are prepared by ICU into three reports for three levels of executives. Report one is for the Prime Minister and Chief Ministers, report two is for management such as Director Generals of Ministries and report three is for project managers such as Public Works Department engineers.

The SETIA corporate centre runs on an IBM 3083 mainframe linked to fifty-five terminals; thirty-nine at ICU, ten at EPU and six at the Public Works Department. The main software package used is CLIO, a database management system with facilities to input, update, process, store, query and build reports. At the operating level a personal computer (mostly ACER 486s designed with a menu driven programme) and a dot matrix printer are provided. At the central corporate level the system is supported by staff from three divisions in ICU; Project Analysis with sixteen support staff, Computer Services with twelve staff and System Development with twenty-one staff. For the purposes of programme review and overall management there is a steering committee, chaired by the Director General of ICU with members including Director Generals of EPU, Treasury and Accountant General's Department.

6.2.2 Implementation of SETIA

SETIA's distributed system as shown in Figure 6.1 was planned to be fully implemented in 1987. The plan was implemented but with minimal support from telecommunication devices such as LANs and WANs. Despite the shortfall with the imposition of mandatory reporting procedures for operating agencies, all agencies did report

[2] Outputs include general and primary listings from forms S1, S2 and S3 information.

as mandated but the information they submitted was often out-of-date for the purposes of decision-making. SETIA was therefore called for revision. A stronger IT base design was re-emphasised to support communication by electronic means through the application of LANs and WANs. The expansion was targeted to be fully implemented by 1997.

This present study traces and evaluates the significant changes which happened during this ten year period. The research has shown that the allocation of IT facilities for SETIA's purposes remained stagnant throughout the period. However, the use of IT among implementing agencies increased quite rapidly especially after 1993 when the administration's drive for the use of IT was combined with a stable economy.

In the following section, field data on adoption and implementation issues are interpreted in the context of the conceptual and theoretical frameworks as outlined in Chapters 3 and 4. This evaluation includes an understanding of SETIA's organisational and institutional contexts, including changes in social and economic factors. This requires identification of stakeholders and their interests along with an understanding of the social context that presents opportunities for conflict. The evaluation begins by identifying works of others that are used to expand and enrich the findings of the present study.

SECTION I: Part II

6.3 Evaluating the SETIA Programme

In the last ten years several studies have been conducted on SETIA (Kaul, et al., 1987; Han, 1991; Rao and Samad, 1992; Masser, 1994) but, apart from work by Han (1991) and Masser (1994) previous research has focused basically on describing the nature of SETIA as a decentralised information system initiative. While research of this tradition helps one to understand SETIA as a programme, it does not elaborate on the issues of importance inherent in large scale information systems development. In contrast, work by both Han and Masser focuses on the dynamic and complex nature of information system use and development in its focal and broader context. While both of these studies complement the present research, the approach taken by these two authors differs from that of this study. Han observed SETIA from a struc-

tural and political basis and developed three main findings. First, that SETIA is a politically motivated programme, initiated for the purpose of safeguarding the interests of poor bumiputeras in urban and industrial projects. The study believed that the success of SETIA relied on the direct involvement and commitment of very powerful politicians. Second, Han believed that success could be achieved through provision of stronger power at local levels (State, District and local authorities) and through a loose co-ordination at the centre (Federal level). This would be, he argued, jointly serve the interests of both the centre and the local levels. The development of SETIA is believed by Han to be constrained by legacy of a previous programme, the Rural Development Plan, which adopted a top-down approach. Han's study suggests that with the growing diversity of interests among participating agencies and with the expansion of SETIA's coverage, the system should be heavily driven from the local level. Third, Han argued that development is mediated by knowledgeable actors at the middle level in the administrative hierarchy; primarily the technically-oriented administrators. Han's study suggests, then, that strategic planning is necessary for information systems, but that generalist administrative officers and bureaucrats cannot be expected to be sufficiently knowledgeable to devise such strategic plans and to make timely tactical responses in technologically sophisticated and rapidly changing areas pertaining to IT.

While Han's study provided useful comparable evidence for the present research, it is concerned largely with political issues of agencies, in particular the focal agency (the Implementation Co-ordinating Unit) and it overlooked the broader organisational and institutional factors (social and economic) that may have caused weaknesses in SETIA's computer use and development. The present study expands on the political factors which Han investigated and also explores other possible constraining and influencing factors for SETIA's development.

The study by Masser took a more generalised approach. SETIA was chosen on the assumption that it provides an example of a well-established monitoring information system. Masser evaluated this assumption against three conditions, that, he argued must be present for successful information system development:

> [First] "There must be an overall information management strategy based on the user needs of the agency and the resources at its disposal; [second] There must

be personal commitment of individuals at all levels of the organisation with respect to overall leaderships, general awareness and technical capabilities; and [third] There must be organisational and environmental stability of personnel, administrative structure, and environmental considerations" (Masser, 1994, p. 438).

Overall, Masser's study revealed that despite SETIA's well established monitoring and evaluation procedures, there are areas which need improvement. For example, Masser argues that there is no balanced strategy that ensures continued participation from agencies. The role of some agencies was found to be restricted to preparation of input data, with SETIA's data itself having no direct benefit to their operation. On the other hand, some agencies were not producers of data yet were dependent on the availability of such (SETIA's data) for their monitoring purposes. Agencies with limited use of SETIA's data could in the long run refuse to support SETIA's development. In the light of such issues, Masser proposed the following questions for further research:

"How far, for example, could the three conditions used to evaluate the achievements of the system be relaxed without jeopardising the chances of successful utilisation? To what extent should the development of a system of this kind be regarded as an organisational learning process in the management of complex information? To what extent might the existing achievements of the system be threatened by a substantial increase in complexity?" (Masser, 1994, p. 439).

The present research, though not directly working to answer Masser's questions, has produced a number of findings which help to move towards addressing these issues. Answers to these questions are therefore arranged both as a means to support the present study and to enrich previous findings.

6.4 Evaluating SETIA's Development - Organisational and Institutional Contexts

At the beginning of 1983, a year before the initiation of SETIA, the continuing slowdown in economic growth and growing external debt pressure meant that government expenditure was undergoing severe reductions. Privatisation policies were introduced in 1993 to scale down public sector expenses. The government kept public sector growth at around 1.1% per year between 1983 and 1986 and this was further reduced to 0.8% in 1987 (GOM, 1981; 1986). Government and semi-government projects were also badly hit by slow economic growth. In the mid 1980s, two out of nine

federal agencies incurred negative net profits, and of sixty-eight companies under federal agencies, twenty-two or about one-third suffered losses. A similar situation was faced by companies under semi-government agencies, where 83 of 201 companies incurred losses (MPE, 1984).

SETIA was introduced, then, at a time of poor economic performance. The suggestion to amalgamate systems from the Economic Planning Unit (Project Planning System), the Accountant General's Department (Federal Accounting System) and the Treasury (Computerised Information System) with the Implementation Co-ordination Unit (Project Monitoring System) was believed to be critical in reorganising the distribution of government money that was 'wasted' through project losses. Constraints imposed by the overall economic situation of the time deterred the development of an ambitious public programme. Planning for the amalgamation of the four subsystems was made under very stringent budget conditions. The system obtained assistance from foreign consultants only through the supply of the software package[3]; other aspects of the system were developed in-house by computer experts at ICU. Staff training on system applications was co-ordinated by local training centres and was administered by the Malaysian Administration, Modernisation and Manpower Planning Unit (MAMPU) of the Prime Minister's Department and the National Institute of Public Administration (INTAN). According to the then[4] Director of the Division of Information Systems for SETIA:

> "SETIA already had most of the hardware and manpower required for the development of the system. The only additional items that needed to be acquired for the development and implementation of the system were terminals, PCs and other peripherals for the distributed system as well as software. The cost for these additional items was about US$800,000. If we were to start the system starting from scratch, a reasonable estimate for the system budget would be US$3 million" (Information Division, MLCD, fieldwork, interviewed November, 1996).

Three years after implementation (1987) data submission to SETIA remained slow and a proposal was made by the Director of the Division of Information Systems (the head of SETIA) to computerise the whole system. However, the Director was subsequently transferred to the Ministry of Land and Co-operative Development (MLCD), Information System Division and SETIA was left with a temporary unit head for

[3] The CLIO Database Management System (DBMS) was supplied by Group Syseca of France.

some time. This change in leadership, in combination with pressure to compete for resources and a poor economic situation, worsened SETIA's performance. Personal computers and other peripherals were not delivered on time to operating agencies. Operations were carried out manually by most offices and due to a restriction on staff recruitment, most had to work with fewer staff. As a result monthly updating schedules were consistently not met. Scarce resources also reduced site visits by federal officers. In 1990 when the financial situation finally recovered SETIA's progress remained and continued to be slow.

6.5 Effect of Organisational and Institutional Changes on SETIA

The present study found SETIA's inability to supply the necessary computer facilities and infrastructural support to be a primary reason for implementing agencies lessening their support of SETIA. This weakness, however, was further exaggerated by other changes: the first was when leadership within SETIA was changed; and secondly, the three central agencies (EPU, AGD and the Treasury) began to place less attention on SETIA due to other major commitments. Similar changes occurred within the participating agencies. These processes are discussed in the following sections.

6.5.1 Changes in Leadership

SETIA's operation exists within the Computer Services Division, one of thirteen divisions[5] belonging to ICU. The director that originally headed SETIA was considered one of Malaysia's leading supporters of computerisation. The transfer of this Director to MLCD marked the loss of SETIA's main power-broker. The first programme initiated in his new position (at MLCD) was the National Computerised Land Registration System (CLRS) and seven years later the CLRS was expanded to the National Land Information System (NALIS). SETIA's newer leadership lacked the ability both to make critical decisions at different phases of SETIA's development and to measure programme progress and identify potential risks in time to mitigate them. For exam-

---

[4] At the time of the fieldwork interview (November 1996) he was Secretary of Information Division at the Ministry of Land Co-operative Development).

[5] The 13 divisions are the Administrative and Finance; Computer Services; Communications; National Action Council Secretariat; Agriculture and Rural Development; Commerce and Industry; Corporations; Bumiputeras Coo-ordination and Participation; Education and Human Resources; Health and Welfare; Security and Information; Infrastructure and Public Utilities; and State Development Offices. The ICU is headed by a Director General assisted by two deputy directors and State Development Offices.

ple, between 1987 and 1995 federal expenses on departmental computer purchase and upgrading increased from US$15 million to US$189 million (MAMPU, 1993; 1995). The ICU, however, was not one of the agencies involved in this purchase and upgrading. During this period almost all agencies at every level of government were planning and building computerised information systems. Managers of SETIA failed to evaluate these developments in relation to SETIA's expansion, and data transfer continued to use manual approaches.

6.5.2 Changes in Responsibility at Co-ordinating Level

As separate departments the four central co-ordinating agencies are each affected by their own organisational goals. Differences in these agencies' goals have made it difficult for the four systems (Project Monitoring System of the ICU, Computer Based Information System of the Treasury, the Project Planning System of the EPU and the Federal Accounting System of the Accountant General's Department) to be realistically integrated. For the planning and financial agencies in particular - EPU, AGD and Treasury- although servicing SETIA's database is seen as important, it is secondary compared to meeting their individual agency's obligations. Obligations to SETIA changed drastically when the privatisation programme began to gain momentum in 1990. The EPU, AGD and the Treasury were made key agencies for managing giant privatised projects such as the new Kuala Lumpur International Airport, Malaysia Airline System, Telecommunications Malaysia Berhad (Limited), and the National Car Project. As of 1996 (when fieldwork for this study was conducted) the list of projects had grown to include joint-venture international projects carried out, for example, with Vietnam, China and Indonesia. The Secretary to the Budget Office, Ministry of Finance (interviewed November, 1996) explained as follows:

> "The recession has exposed the weaknesses of many public enterprises. Government has to bail them out when they get into difficulty. We [Treasury and EPU] have to step in to oversee management of these enterprises. This office (Finance Ministry-Budget Division) is currently enforcing this mandate on public enterprise - to operate on fully commercial lines and maximise profits. Our office is made responsible and accountable to their success. Currently we are monitoring public enterprises which are based on multi-billion dollar capital and which are operating in many parts of the world. Our responsibility has certainly tripled since 1990. Our operation is directly related to the data that we keep. Simplified versions of data transfer from us to them [ICU] is no longer possible for our databases are becoming too large and complex. Special efforts are required to separate information for SETIA's purposes and general needs. I find this effort is becoming more and more cumbersome. SETIA should be overhauled completely

to be more in-line with us" (Secretary to the Budget Office, Ministry of Finance, fieldwork, interviewed November, 1996).

Public officials from the central planning office of EPU and the accounting office (AGD) expressed similar points, that is, the need for SETIA to be restructured in the face of changing development strategies and the responsibility of organisations. A re-engineering of the SETIA system was suggested by the Assistant Director, Infrastructure and Utilities Section, of the EPU. SETIA no longer is seen as appropriate to the controlling agencies or the participating agencies.

6.5.3 Changes at Participating Agencies Level

Changes in national development strategy have affected support by the implementing agencies. Since the initiation of privatisation and contracting-out, all ministries and departments at State and District levels have been working with one or another type of privatised venture. This change has affected both the situation with regard to data processing and the role of agencies. The present study found that with the introduction of privatised schemes and contracting-out, commitment to SETIA has become more blurred because participating agencies have no clear guidelines with regard to data responsibility. Operationally, due to the system of financing accorded by privatised agreements, raw data and detailed information on projects are most often kept by private companies. Information kept by government organisations are in the form of reports, that is, with information that has been finalised. In other words, to write up SETIA's report an agency has to call out information from private companies. This extra effort was found to be beyond the specified official duties of agencies. For example, one agency explained as follows:

"Within this office we have our own major objectives. Presently, the information requested by the programme is not related to our main operation and management needs. I find it difficult to allocate staff to punch in the information when we are much too busy with our own routine duties" (Assistant Director, Department of Works, fieldwork, interviewed January, 1997).

Another common view is expressed by one Director for Ministry of Works as follows:

"We have our own format for data collection, and we do not use the ICU's prescribed format because our Director General requires detailed information on certain aspects of the project. Our office therefore has drastically lessened its contribution to SETIA because we simply could not meet the pressure of our

own work load and SETIA's requirements"(Assistant Director, Regional Development Authority Division, Kuala Lumpur, Ministry of Works, fieldwork, interviewed January, 1997).

6.6 Administrative Constraints and Change

The necessity for SETIA to change was apparent from views gathered at the Treasury, AGD and EPU. Yet, there were no creative improvements taken towards change. The Director of Research of the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) commented as follows:

> "In general these leaders have their own beliefs about what SETIA should be. We meet and discuss but somehow it is so difficult to come to a resolution because each is holding to their own rationale. After a while the issue discussed is forgotten for we are facing too many critical issues as it is. For example, now I talk about SETIA because you [interviewer] brought the issue up. After this meeting I have an entirely different problem to face" (Director of Research, MAMPU, fieldwork, interviewed January 1997).

This view indicates that SETIA is failing to make itself prominent among emerging new programmes and that the main co-ordinator, ICU, is not playing a sufficiently stronger role to make this happen. The ICU co-ordinating partners (the EPU, AGD, and the Treasury), despite having the same status appear to have reservations about interfering with ICU's judgement for SETIA. The present study found that even the implementing agencies (other participating agencies) were not committed to SETIA's improvement. There are several administrative reasons for these attitudes which are explored in the following section (Section 6.7).

SETIA's organisation is designed in such a way that decisions ultimately come from the very top of the organisational hierarchy. This comprises a steering committee made up of ICU's Director General as the chairman, and Director Generals of EPU, AGD and the Treasury as committee members. The rationale for having these senior policy-makers was because they could be helpful in co-ordinating staff across agencies. Nevertheless, this study found that these organisational leaders in fact represent the reasons that limit 'open suggestions' for SETIA's improvements. Some of these reasons can be explained by understanding the in-built social-administrative tradition of these policy makers.

This tradition can be expressed in the form of two sources of constraint. The first constraint relates to decision-makers bound by their professionalism (trained public administrators) and social class. They adhere to certain unwritten rules (based on friendship) which are not open to the understanding of others outside the social group. This reflects the situation described by Lindblom (1965) as *deferential adaptive adjustment* in which, in a given decision situation, a decision-maker takes care to make no demands on the other decision-maker and to impose no losses or deprivations on them. A non-intrusive view provided by one Director General was as follows:

> "Unlike other agencies, offices in the Prime Minister's Department are accountable directly to the Prime Minister and Deputy Prime Minister. Each of us has our own duties and responsibilities. For example, ICU is answerable to SETIA, I have [another system] my programme to answer to. The complication I am facing is not that dissimilar to ICU...They are better informed of their duties and problems than us. My role in SETIA is to assist, not to overrule ICU's decision..." (Kuala Lumpur, fieldwork, interviewed January, 1997).

Viewed from another perspective one can argue that the head of each of these organisations is busy guarding their own 'territory'. An explanation of this position is succinctly provided by Power and Urban-Lurain (1989) with reference to their experience of United States programme initiatives. They argue that:

> "We have all heard the cry of the bureaucratic jungle ...My programme; my money; my clients...Agencies come to assume that if they are not sole service providers for a client population, they will lose programme funding; if they lose their money, they lose staff positions; if they lose staff, they lose status; if they lose status, they lose future funding. Therefore, bureaucracies naturally tend to spend their time and attention building and defending turf, not in managing well" (pp. 4-5).

The second constraint relates to the bind that these decision-makers have to political leaders. At all times the decision-makers have to maintain the 'correct' balance between public needs and political needs. Failure to attain such a balance may well result in resignation or dismissal. A case in point is found in the dismissal of the Lord President of the Supreme Court in 1988. In order to avoid 'mistakes' SETIA leaders have taken the 'middle road' which "*reinforces the powerless, 'office boy' image of the bureaucrat that is destructive of self-respect so necessary for mature moral growth*" (Rohr, 1978, p. 54).

Thirdly, constraints to change could also be attributed to one or more forms of barrier. SETIA's administrators make up the controlling 'offices' that receive grievances or complaints for action or in-actions of public services. As an illustration the Public Complaint Bureau falls under the Prime Minister's Department; and enforcement is handled by the Economic Planning Unit. Similarly the Committee on Government management which enforced internal control and accountability in public administration is headed by the Minister of Finance, and enforcement is handled by the Minister's executive. The Auditor General, which audits and reports on the accounts of government, though, is an autonomous body, its members being made up of staff from the Accountant General's Department. As Rourke (1978) notes:

> "Democracy assumes that citizens can hold government officials accountable for what they do and can expel them from office when their policies do not meet with public approval. By shielding official action from public knowledge and review, secrecy makes such accountability impossible" (p. 361).

Although SETIA has had many reviews, all have been conducted internally, and have been managed and controlled by ICU staff. Rationally, as Caudle (1989) explains, internal evaluators in certain circumstances can be useful for they are likely to be more familiar and sympathetic with the practical accommodations of policy implementation and programme operations. At the same time, however, internal evaluators are clearly less likely to be critical than external evaluators.

6.7 Constraints and 'Real' Issues

The constraints discussed above have restricted SETIA's capacity to be part of Malaysia's dynamic IT development initiatives. The present study found that decision-makers within SETIA are 'uncertain' of SETIA's prospect in comparison to newer IT development programmes. SETIA's objectives and goals have generally remained unaltered despite changes in development issues. In addition despite the fact that certain issues that previously restricted SETIA's development (such as supply of basic computer and staff shortages) no longer exist, SETIA's staff persist in retaining these matters as important. Based on nationwide counts of information systems that are already in use or are at the stage of development and planning. Current staff shortages in IT relate mainly to the operation of advanced programmes. Tables 6.2 and 6.3 show the major existing computerised information systems that are operational or are at various stages of development.

Table 6.2: Existing Major Computerised Information Systems at National and Federal Levels

Information System[1]	Organisation
Chief Executive Information System (SMPKE)[1]	Prime Minister's Office
Klang Valley Information System[2]	Klang Valley Development Authority, Prime Minister's Department
Planning, Mapping, and Infrastructural Information System [2]	Public Works Department
Islamic Information System[1]	Islamic Religious Affairs, Prime Minister's Department
Local Network Management System[1]	Telecommunications Malaysia Berhad
Image Processing System[1]	Malaysian Centre for Remote Sensing
Census Information System[1]	Department of Statistics
National Forest Information System[1]	Forestry Department
Agricultural Information System[1]	Agriculture Department
Landed Property Information System[1]	Valuation and Property Services

Note: GIS operations not included;
1 operational
2 development
Source: Fieldwork 1996

Table 6.3: Existing Computerised Information Systems at State Level

State	*Information System
Penang	SPHT and SIB
Perak	SMP, SPHT, SIB, SPBT, WPIS and PELTANAM
Johor	SMAT, SPHT, SIB, PIS, AIS, FRIS, SPJ and WPIS
Selangor	SMAT, CIS, SIB, LAPIS and SFIS
Terengganu	SPHT, STAR, SIB and SISMI
Pahang	SPHT, SIB, SMAKP and FRIS
Kedah	SPHT, SIB and SIMKET
Melaka	SPHT and SIB
Kelantan	SPHT, SIB and AIS
Negeri Sembilan	SPHT, SIB and NFIS
Perlis	SPHT, SIB and SISMI
Sarawak	CPFS, SMART and FOMISS
Sabah	SPNSA and SFMIS

*Note: GIS operations are not included; all systems are at operational level.
See pp. xiii-xiv for list of abbreviations
Source: Fieldwork 1996

With regard to general computer use, all agencies, even those at District administrative level, have access to computers. One IT related issue which participants highlighted was the need to up-grade telecommunication facilities, namely through installation of LANs or WANs to enhance communication within and between agencies. With regard to skills, the results of this study show that all agencies that maintain

computers are equipped with supporting staff, such as programmers and systems analysts, and in general other officers and general staff have various levels of computer knowledge.

Another of SETIA's goals which has remained unaltered despite changes at national level is that regarding participation of bumiputeras and eradication of poverty. These issues have faded in significance through time, as participating agencies no longer considered data on bumiputeras' projects as significant to the SETIA database. One officer from a State Economic Planning Unit explained:

> "To my knowledge in terms of project participation it is no longer necessary to monitor projects according to ethnic groupings. In one project, for example, GAPAM,[industrial project in Melaka] the land belongs to several groups - companies with a mixture of representation - nationals, foreign companies and about 30% owned by the State. Factories and other development on the land belong to many owners as well. There are no exact percentages. Currently this system is our [Malaysia's] trend towards development. We can monitor development but it is no longer practical and possible to monitor information on equity by race" (Director, State Economic Planning Unit, Melaka, fieldwork, interviewed August 1996).

Another Assistant Director from the State Development Corporation even commented as follows:

> "Currently we are facing the reverse form of development. We no longer need to be concerned with bumiputeras' projects. Most projects our office handles belong to bumiputeras [companies or individuals] or foreign expatriates with bumiputeras holding large shares. This is no longer a mystery or secret affair. I think most people involved in development know it" (Assistant Director, Pahang State Development Corporation, fieldwork, interviewed September, 1996).

This study finds that SETIA is a programme which has matured through time and which has become an appropriate information system for Malaysia. 'Appropriate' in this context means that SETIA's technology requirements met skills availability and institutional factors such as rules and regulations between and within organisations. Participating agencies are well aware of SETIA's difficulties and incrementally have developed the means to overcome these issues. Similarly committees that are set to oversee SETIA's overall development now consist of members that are knowledgeable in terms of IT.

However, these advantages have not been effectively used to promote SETIA's development because SETIA's leaders are being attracted (and diverted) by other lucrative assignments handled by the Prime Minister's Department (which includes SETIA's main co-ordinators the EPU and ICU), namely mega-scale privatisation projects. This diversion has been further reinforced by policy changes initiated by the

Prime Minister, which emphasised advanced IT ventures[6] and closer relationships with the private sector. Policy changes affect participating agencies as well and officers that are assigned to manage private programmes often leave the public sector to join the private programme that they managed. A similar situation exists in agencies where management's main interest is to expand services which could bring in profit. For example, local authorities focus on activities such as parking services and garbage disposal, and the Ministry of Public Works concentrates on a toll road bypass. Since the promotion of a new policy for development beginning in 1990 SETIA has been left to operate without co-ordinated effort even among the co-ordinating agencies. This discussion is further evaluated in Chapter 7. The following section examines the second main national information system - National Land Information System - and makes comparisons with SETIA.

SECTION II: NALIS - National Land Information System

Part I

6.9 Introduction

The SETIA study provides one example of understanding aspects of a large scale information system in the post-implementation stages. The NALIS programme is used here as a means of evaluating an information system in the early stages of its life. This section is divided into two parts. The first part summarises the historical development of NALIS. It provides a brief description of several computerised land information systems' activities that are associated with the establishment of NALIS as well as a discussion of the NALIS programme itself, its developmental requirements, system architecture, technology and problems related to these factors. In part II evaluations

[6] Malaysia has had many examples of successful migration to advanced IT ventures including networking. Agencies which have successfully implemented networking concept include the Immigration Department, the Inland Revenues Department, the Royal Malaysian Police Department, the Road Transport Department, the Employee Provident Fund, the Ministry of Education and all major universities.

are made based on these issues. The key issues are discussed from three perspectives; organisational, technical and institutional. Pertinent to the discussion are the findings and recommendations of the feasibility study conducted by Renong Berhad on behalf of the Ministry of Land and Co-operative Development as the co-ordinator of NALIS (MLCD, 1995). Renong's study came about as a result of several key developments.

Following the decision of the Cabinet in 1987 to establish a Land Information System in Malaysia the Ministry of Land and Co-operative Development was assigned the task of establishing the System (MLCD, 1994; GOM, 1997). Subsequent to this decision at the Training Workshop on Urban Land Information System for Human Development in June 1992 a suggestion was made toward establishment of NALIS. In March 1994 the need for an integrated land information system was fomalised in two reports by the Ministry of Land and Co-operative (MLCD, 1994; 1995). These reports highlighted the major components which would form NALIS; existing land components that were available in the country; a proposed NALIS hardware configuration; proposed corporate data model and the proposed implementation concept. At the same time a task force was formed which consisted of members of 36 land-related agencies (Task Force Report, 1998). The framework was endorsed by the participating agencies whereby in November 1994 a consultancy, Renong Berhad, was appointed to carry out a national scale feasibility study. The objectives of the feasibility study were: first, to evaluate all relevant issues related to the setting up of NALIS. This included analysis of participating agencies, the design and function of the proposed System, and the implementation of the System; and second, to propose recommendations for the development of NALIS to be used by land-related agencies in order to effectively support land use and land related management functions (MLCD, 1995; Renong Berhad, 1998). A total of 355 agencies at Federal, State and local authority levels was covered by the study making use of two major methods of information collection: questionnaires and a desk-based assessment of secondary sources. Information was categorised into three broad categories: Information Technology, administration and development, and legal issues. The Consultant's study was submitted to the MLCD in December 1995 in nine volumes (MLCD, 1995; Renong Berhad, 1998). The key findings and recommendations of Renong are summarised below.

Data availability and common reference systems:

The lack of adequate digital maps for both topographic and cadastral data was found to be most critical. The consultancy therefore recommended that the land custodian agency (the Department of Survey and Mapping) should accelerate the digital mapping programme. The lack of common reference systems was also regarded as weak and, as such, Renong suggested that the Department of Survey and Mapping should work towards developing the necessary references.

Communications:

The consultancy stressed that the success of NALIS would require an adequate communication infrastructure for inter-and intra-information exchanges. The consultancy therefore recommended that co-operation with the telecommunication agencies be increased to accelerate the upgrading of existing communication systems between agencies, and to install local and wide area networks.

Funding for NALIS:

In building up NALIS the consultant's study highlighted various areas that required extensive, upfront financial support. Among these were communications, hardware, software and data conversion (a breakdown of these costs is provided in Section 6.12.3. The consultancy therefore recommended three options for NALIS funding: full government funding, increased use of franchising and full privatisation. The second and third of these options were rejected by the participating agencies because of issues related to classified data (GOM, 1997). Some of the difficulties of enforcing Renong's recommendations, as well as the links between Renong's findings and those of the present research are discussed below.

6.9.1 NALIS: Objectives and Approaches

The objective of the NALIS programme is to provide government with an information and technology infrastructure to support interrelated aspects of strategic planning, land and land-use management, resource management, environmental management, and physical infrastructure planning management (MLCD, 1995; Task Force Report, 1998). NALIS was proposed to support these integrated uses through computer hardware, software, communication networks and standards. Specific emphasis was given to the application of Geographic Information Systems.

At the operational level, the programme is designed to function on a single window concept, that is, an electronic information sharing architecture that allows users access to land-related data in government agencies, regardless of where the data are located. Broadly the system is designed to function as follows. Access to the data is provided through user software: interested users can browse through and search a central directory to identify which data are available for a specific geographic location. On recognising the data that are required, users instruct a purchase order by means of specific regulations. The purchase order is then routed through a gateway to the data repository (data custodian). On approving the purchase, the custodian sends the data back through the gateway to the requester or purchaser. With regard to restrictive data, such as titles and revenue information, there is a screening device to limit open access (MLCD, 1994; Task Force Report, 1998).

6.9.2 The Establishment of NALIS

In actual terms the planning for NALIS has taken seven years (1987-1994). In 1994 the NALIS steering committee gave their final endorsement based on two understandings: first, that the major building blocks for NALIS, the baseline information systems, were believed to be ready; and second, the availability of a wide and diversified technology base within land-related organisations in the country. The programme is planned to progress in phases of five years, beginning in 1995 and scheduled to be completed by the year 2020 (MLCD, 1995). When fieldwork for this study was conducted, the NALIS programme was at its earliest stage of development. The approach and design were at the first stages of conceptualisation and a pilot study was being developed. In order to move towards an understanding of the processes of NALIS's development this thesis focuses on three major aspects: first, land-related information systems support that forms part of NALIS; second, the conception, design, adoption and proposed implementation coverage; and third, the perspectives of land-related agencies towards NALIS. The findings of the investigation are discussed and evaluated in the following sections.

6.10 Basic Land-Related Information Support for NALIS

There are three systems that are considered by the NALIS committee to be of major significance in providing initial support. The first is related to land parcel information; the second is related to building up cadastral base information and the third focuses on building up topographic base information. The Computerised Land Registration

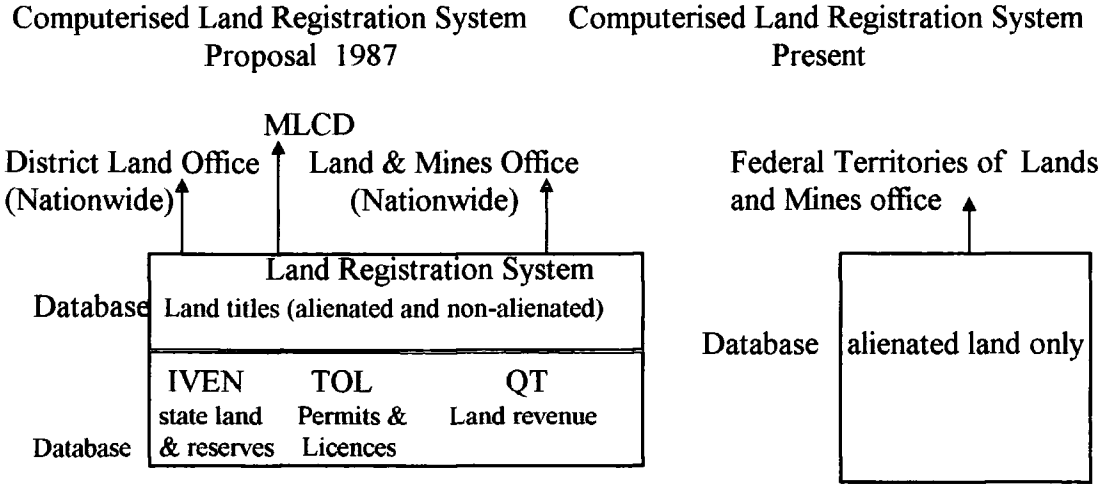
System (CLRS) is the main system for computerising land parcels and holding land transaction databases. The Computer Aided Land Surveying System (CALS) is used mainly to create a cadastral survey database and to produce cadastral base maps, while the Computer Aided Mapping System (CAMS) is used for the creation of topographic databases. The following discussion evaluates each of these systems.

6.10.1 The Computerised Land Registration System (CLRS)

The CLRS is the first national land-based system developed in the context of NALIS. The main objective of the system was to enable on-line access to land records both by other State government departments and the Federal government for the purpose of effective planning. Four subsystems were proposed; an Inventory System (IVEN) for State land reserve information, a Temporary Occupancy Licence (TOL) for permits and licences, Quit Rent Titles (QT) for land revenue and a Land Registration System (LRS) for alienated and non-alienated land. Development of the system did not, however, progress as planned (Figure 6.2).

Within the proposed schedule (1987-1993) only the QT subsystem has been implemented nationwide. The IVEN and TOL subsystems have been postponed indefinitely. The fourth subsystem, the Land Registration System, has undergone several phases of change. In 1990 the Ministry of Land and Co-operative Development decided to build up the LRS database to follow through the development of the 1987

Figure 6.2: Computerised Systems of Land Parcels, 1987 to the Present



Source: Fieldwork 1996

proposed computerised system. The programme began with a pilot, with a scheduled completion date of 1993. At the time of this study's fieldwork the LRS (presently

called CLRS) pilot was still in progress at the Federal Territories of Land and Mines Office, Kuala Lumpur, in combination with a NALIS pilot project.

According to the CLRS pilot office there are three major areas of difficulty. First, in computerising the land parcel information there are several problems related to data conversion. As an example, it takes an average of 12 minutes to convert each land record (title) from a manual to a digital format. With an estimated 145,000 land records, the pilot office does not expect conversion to be completed in the foreseeable future. The second major problem is related to land administration. First there are anomalies in the subdivision of lots and boundary disputes, which defer the presentation of qualified titles. Second, there are difficulties in the conversion of qualified titles to final titles. In qualified titles, the information regarding the lot is not finalised, that is, it has not been officially surveyed by a license authority. Information at this level therefore cannot be placed in the cadastral map and has thus resulted in further delays in the conversion to a digital format. Currently, from the estimated 11.8 million lots in Malaysia, only 50% (about 5.9 million lots) have been issued with final titles (MLCD, 1994; 1995). The remainder are still at various levels of designation. The third major problem highlighted by the pilot project is that related to legal land matters. There are many old land titles which have not been changed to new land code titles. For the purposes of computerisation, old titles have first to be transferred to a new titles format before any conversion can be carried out. The process of change from old to new title has been very slow, resulting in subsequent delays in mapping and computerising.

6.10.2 Computerisation of Maps and Map Databases: CALS and CAMS

The main custodian for the production of digital maps and map databases is the Department of Survey and Mapping Malaysia (DSMM). As noted earlier, two systems are currently used by the department for the purposes of digital map creation. The first system, the Computerised Assisted Land Surveying System (CALS) is used to create a cadastral survey database and to produce base maps both in graphical and digital forms. Currently, only two States are using the system, namely Johor and Pahang. The State of Johor has been able to produce a 100% digital cadastral database although Pahang's is only about 20% complete (DSMM, 1994; MLCD, 1994; 1995). This study finds that the operation of CALS in other states in Malaysia is at various

stages of planning, which implies that current cadastral databases are maintained in a manual (textual) format.

The second system, the Computer Assisted Mapping System (CAMS), is used to capture raw map data to create a topographic database. According to the DSMM, from the total land area for Malaysia, 377,858 km^2, only about 50,000 km^2 or 13% have been converted to a digital form. The remaining area for Peninsular Malaysia was scheduled to be completed by end the of 1996, while for Sabah and Sarawak, no specific time frame has been given (DSMM, 1994; MLCD, 1994). By the end of the fieldwork period (January 1997) for the present study the status of the digital topographic database for Peninsular Malaysia remained unchanged. Based on interviews with the Secretary of the Information Division (head of Division), at the Ministry of Land and Co-operative Department (also the technical chairman of NALIS) progress is expected to continue to be slow, for variety reasons including difficulties with staff support and delays in data collection due to environmental reasons such as cloud cover in remotely sense images. As the Secretary explained:

> "In the area of mapping we also have problems with time...when aerial photographs are to be taken is not fixed. In aerial photography they have to wait for the cloud to clear. In addition to this the aerial photographs need to be verified by ground checks and this also depends on the weather. These are the main barriers to upgrading" (Chairman of NALIS technical committee and Secretary of the Information Division, MLCD, fieldwork, interviewed October 1996).

The factors indicated above show that there is still much to do with respect to baseline information. For land parcels (land records) and maps, the area within the country that has been provided with digital information is still very small. Digital land records are available only for the Federal Territory of Kuala Lumpur. Cadastral digital databases are available only for the State of Johor and some parts of the State of Pahang. With regard to the topographic digital database, the area covered is only a small portion of the area of Johor. In terms of baseline information for networking communications, in particular land records, the system remains separately operated as an agency-based system.

6.11 NALIS Design and Methodology

According to Eason (1993), *"The dominant method by which major information systems are designed and implemented in organisations has been characterised as*

rational and technocentric" (p. 29). Eason argues that this approach has four major characteristics:

The first is that of 'technology push' when a technology is selected before the nature of the problem is fully appreciated and understood; second, there is waterfall or sequential model development, when development is taken through a series of steps, generally, "*analysis precedes design which precedes implementation*" (p. 29). Eason argues that this approach has serious disadvantages because users' requirements could not be assumed rather, especially with new technology, their requirements can be known only after having had the opportunity to access the technology, observe it or learn it. The third characteristic is described as the 'dominance of technical specialists', or system development that is controlled by technical specialists; and fourth, there is a rational technical language, when development programmes use language that can be understood only by technical people or specialists. Eason argues that these are the characteristics that make it difficult for general users to participate in the design process and to participate effectively in the implementation process.

These characteristics fit well with the design and implementation methodology drawn up for NALIS. NALIS' design is based entirely on an approach adopted from a foreign context, that was believed to be able to fit into a Malaysian context. The design was made by a few selected land custodian organisational heads who acted on the advice of a consultant group. In other words, these organisational heads lack in-depth knowledge of the design which they adopted. The approach to implementing NALIS has been based on the 'waterfall or sequential model'. Agencies participating in NALIS have therefore been identified and each of these agencies' technology and related requirements have been carefully organised. All of this planning was carried out by consultants.

The planning stages for NALIS then, were principally managed by consultants with the assistance of a NALIS technical committee, comprising one officer from each of the major land-related departments (State Land and Mines, Survey and Mapping, Valuation and Property Services, Agriculture, Geological Survey, City Halls and other local authorities, Forestry, Malaysian Centre for Remote Sensing, Town and Country Planning, Environment, Drainage and Irrigation, Klang Valley Development Authority, District Office, Land Office and Telecommunications and Energy Compa-

nies. Of other potential users of NALIS (government agencies and departments at Federal, State (including District) and local authority levels, a total of 356 were informed of NALIS activities and objectives by way of briefings and demonstrations after the design and implementation approaches were endorsed by the Cabinet) (GOM, 1997).

In the following sections the background to the design and method of NALIS is discussed along with exploration of the resources needed to support the NALIS design (technology, data and human support). Following that, in Section II, the discussion turns to organisational, technical and institutional problems and issues related to development and implementation of NALIS.

6.11.1 System Development

NALIS's development is based on the concept of an 'information community' (MLCD, 1994; 1995). This concept, which involves the grouping of organisations with related functions and business areas, is based on existing practice among organisations, that is, organisations using similar types of data and information co-ordinated among themselves in conducting their daily business. The difference between the community concept and existing practice (sharing of information across and within land-related agencies) is the addition of electronic media as a means of communication between the related communities. The building of information groupings forms the basis of the NALIS corporate data model; this is to be the standard referencing and cataloguing system. The results of this study show that the process of identifying the various data groups has currently begun in five agencies at Federal level only - the Departments of Survey and Mapping Malaysia, Valuation, Agriculture, Environment and Forestry.

Management and administration of data transactions within and between particular information communities placed under the responsibility of a central body or clearinghouse. Clearinghouses are planned to closely approximate the administrative levels and machinery of government in the country. The NALIS committee has proposed the establishment of several levels of clearinghouses at each administrative level: Federal, State and District (MLCD, 1995). It is clear from the findings of the present study that there is no consensus on clearinghouse status. Some agencies, namely the Department of Survey and Mapping Malaysia, and District Offices and local authori-

ties, proposed that the clearinghouse should be placed in the office with the highest level of administrative authority; in other words an office which can command power. However, some felt the management of the system to be at risk under such circumstances because in most cases the highest level administrative office lacks the technical understanding of a sophisticated information system. These agencies proposed clearinghouses to be placed at a central computer unit, such as the State Information Technology Centre, local authority information technology centre or District Information Technology Centre. As explained by an officer from the Penang GIS centre (PEGIS):

> "At present, to view or obtain data, the PEGIS centre must receive permission from the relevant Data Custodian, although no formal guidelines exist for this procedure to take place...Our experience with land data management [in particular GIS] places us as the best choice for the NALIS clearinghouse. Our existing function perhaps needs only to be ratified to provide the necessary support, that is, to ensure that various State departments and agencies concerned accept the authority and advice of the PEGIS centre" (Project Manager, PEGIS, fieldwork, interviewed October 1996).

A similar explanation was provided by an officer from the Sarawak Information Systems Centre:

> "We are establishing a State GIS centre to undertake the role of the State clearinghouse. The clearinghouse will be run by highly skilled IT personnel to ensure efficiency in running of our data sharing within the State" (Director, Sarawak Information Systems Centre, fieldwork, interviewed July 1996).

6.11.2 System Architecture

NALIS's system architecture is based on a client-server framework. The basic requirement of this system is directly related to a LAN and WAN. The results from this study show that only about eleven agencies (from a total of sixty-eight which this study investigated) have LAN capability. This implies that many organisations have no central information management unit to handle and administer the flow of data to and from agencies, and between divisions within the organisation (Table 6.4). With regard to WAN only two agencies have this capability: EPU and ICU, but it is not used for data transfer purposes.

Table 6.4: Communication Framework

Communication	Number of agencies from a total of 68 investigated
Back-up	21
LAN	11
WAN	2
Leased line	0

Source: Fieldwork 1996.

Most agencies maintained that inadequacies with respect to WAN or LAN have not been a significant drawback because many agencies still maintained restrictive information access to outside users (Table 6.5).

Table 6.5: Network Access Capabilities

Access	Number of agencies from a total of 68 investigated
Department Use	32
Inter-agency	10
Semi-public	4
Public	2
Top secret	1
Intra-agency	0
Others	4

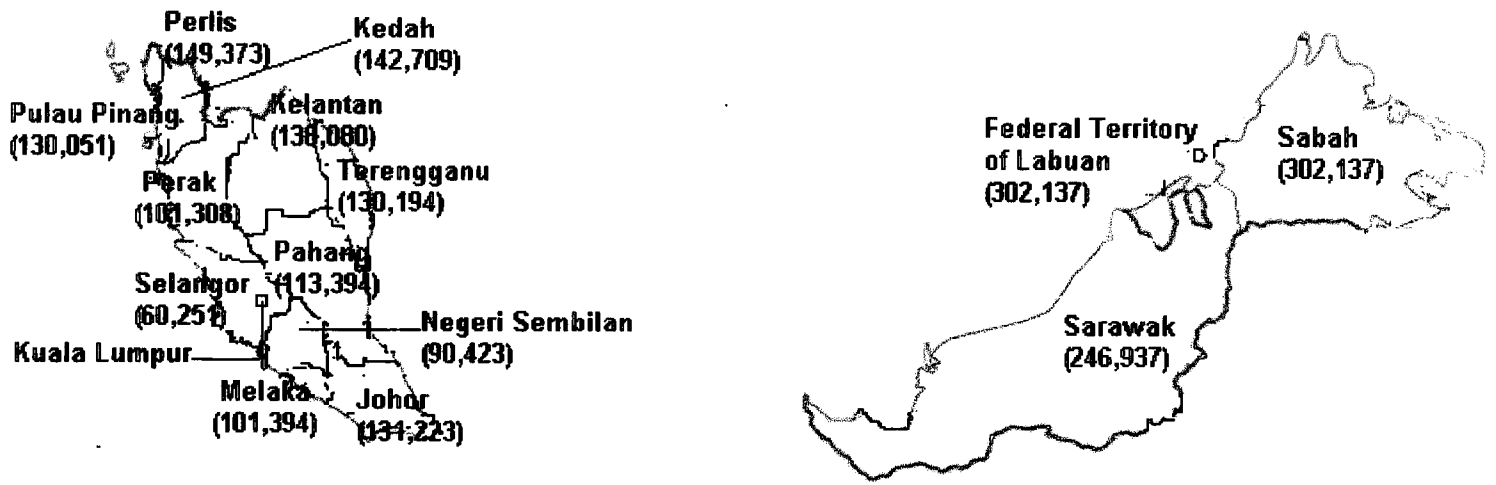
Source: Fieldwork 1996.

Nevertheless, to have local area or wide are network facilities will be an advantage but since the costs of installation and maintenance are high, many agencies felt that it would be wasteful to pursue the idea. There are at least two costs which an agency has to meet up-front for LAN or WAN installation: equipment rental and line rental. Equipment rental is estimated at over US$12,000 per annum (1996 prices) and line rental rates increase by distance from the main communication line. In other words, the costs for an agency in Kuala Lumpur will be less than those agencies at State level. Figure 6.3 illustrates an estimation of line rental cost per annum (from the main point of communication) for each State in Malaysia.

6.11.3 Software Technology

Geographic Information Systems (GIS) represent a key technology for NALIS because the linking of databases - combining textual and digital geo-spatial information - across the boundaries of different organisations, is the programme's main objective. The basic requirement to incorporate GIS handling capabilities into the proposed

Figure 6.3: Line Rental by Distance Per annum (Rates US$)



Note: Line rental rate reflects distance between two points: Kuala Lumpur to State, and State to one point.

Source: Telecommunications Malaysia Berhad, Fieldwork 1996

NALIS design was, however, found to be quite difficult. As Sahay and Walsham (1996) argue:

> "Although there are similarities between IS and GIS, there are also important differences; for example, while they both deal with the computerised handling of data, spatial and non-spatial data are central in the case of GIS, as compared to primarily non-spatial data in most other information systems" (p. 388).

In line with Sahay and Walsham's argument, this study found that collecting and organising data appropriate for GIS purposes has been one of NALIS' major problems. For example, with the exception of the Penang Centre for GIS, all other states and agencies currently implementing GIS have proceeded to collect data without first constructing the prerequisite data model. By doing so, individual agencies have effectively taken an approach which neither clearly identifies the intended usage of data being collected, nor establishes what linkages and data exchange standards are to be adopted between different databases. The absence of a data model and common data exchange standard for the implementation of NALIS causes ongoing difficulties in data sharing between agencies. In addition, information systems implemented by many agencies are not accompanied with proper data documentation or metadata. This creates difficulties for data users in determining the accuracy and currency of data obtained from other government agencies. The following sections explore these issues in further detail.

6.11.4 Current Status of Geographic Information Systems (GIS) Facilities

Based on a total of forty-nine[7] land-related agencies investigated in the present study there are thirty-two GIS/LIS users (Table 6.6). This is small in comparison to the potential total number of NALIS participating agencies (356 agencies). The major GIS users are agencies at Federal level and these make up about 80% of the total thirty-two. Of the remaining land-related agencies the majority are at the stage of planning for GIS installation. Within organisations that are employing GIS, the findings from this study show that GIS are used for eleven main types of application (Table 6.7), with Land Information Systems being the most widely used form of GIS especially among agencies at State level. Eleven main types of GIS software are used to support the above applications (Table 6.8). Among agencies that manage complex databases there is a trend to own more than one GIS product. For example, the

[7] For a detailed breakdown of agencies interviewed see Chapter 5.

DSMM uses SysScan, Intergraph, Arc/ INFO and System 9; the Agriculture Department uses Arc/INFO, Terrasoft and Intergraph; the Forestry Department uses ERDAS and Intergraph; and the Valuation and Property Services Department uses INFOMIX, UMAX and Arc/INFO.

Table 6.6: Operational GIS/LIS in Malaysia

State	Agency	Operational GIS/LIS
Johor	State Survey and Mapping	CALS
Kedah	State Survey and Mapping	Mini CALS
Kelantan	Town and Country Planning	GIS (Terrasoft)
	State Survey and Mapping	Mini CALS
Kuala Lumpur	Economic Planning Unit	GIS (Pilot-Arc/INFO)
	Statistics Department	GIS (Arc/INFO)
	Department of Agriculture	GIS (ArcINFO, Terrasoft and Intergraph)
	Survey and Mapping	GIS (SysScan, Intergraph, Arc/INFO and System 9) CAMS and FMS)
	Department of Environment	GIS (Environmental Decision-Support System)
	MACRES	GIS (ERDAS, Arc/INFO, Map-Info)
	Public Works Department	Local Network Management System (Pilot) and CAMS
	Valuation and Property Services Department	GIS (InfoMix, UMAX, Arc/INFO)
	Forestry Department	GIS (ERDAS and Intergraph)
Melaka	Town and Country Planning	GIS (Terrasoft) and Mini CALS
Negeri Sembilan	Town and Country Planning	GIS (Terrasoft)
	State Survey and Mapping	Mini CALS
Pahang	State Survey and Mapping	CALS
Perak	Ipoh City Council	GIS (Arc/INFO)
	Taiping Municipal Council	GIS (Arc/INFO)
Penang	State Computer Centre	Penang GIS (PEGIS)
	State Land and Mines	GIS (Terrasoft and Arc/INFO
	Town and Country Planning	GIS (Terrasoft)
Sabah	State Agriculture Department	Land Information System
	State Survey and Mapping	Cadastral Information System and LandUse Information System
	State Forestry Department	Forestry Management Information System
Sarawak	State Planning Unit	GIS (Pilot Intergraph)
	State Agriculture Department	GIS (Intergraph)
	Forestry Department	Forest Management System
	State Land and Survey	Land and Survey Information System
Selangor	State Survey and Mapping	Cadastral Information System
Terengganu	State Survey and Mapping	Mini CALS

Source: Fieldwork 1996.

Popular GIS uses are to process transactions and support simple queries related to location and condition of geographic features. This study found that among the 32

Table 6.7: GIS Applications

GIS Applications	Percentage (from a total of 32 agencies)
Land Information Systems	21.6
Planning Information Systems	7.8
Transport Management Systems	7.8
Socio-economic Information Systems	7.8
Geological Information Systems	7.8
Other Environmental Information Systems	7.8
Facilities Management	6.0
Agricultural Information Systems	3.9
Automated Mapping	3.9
Forestry Information Systems	2.0
Public Policy Information Systems	2.0
Others	21.6

Source: Fieldwork 1996.

Table 6.8: GIS Packages Currently in Use

GIS package	Agencies from a total of 32 investigated
Arc/INFO	17
Terrasoft	8
SPANS	6
Genasys	4
ERDAS	4
Intergraph	4
MapInfo	3
SysScan	2
ArcCAD	1
GDS	1
System 9	1
Others	25

Source: Fieldwork 1996.

users of GIS and LIS only three departments, namely, the Agriculture, Environment and Forestry Departments use GIS for modelling, simulation and forecasting. Most agencies explained their lack of adopting GIS in terms of difficulties in recruiting GIS support staff. This study found that even in major land-related organisations, such as the Departments of Survey and Mapping, Town and Country Planning, and Public Works, on average only two officers have formal GIS qualifications or skills. Improvement in the supply of GIS skilled personnel is expected to be slow because of a

lack of institutions that can provide GIS training. Basic short-term training is normally carried out by software companies and although government training centres, universities and a few private colleges have recently started to initiate training courses for GIS, entry to these institutions is limited by a number of conditions.

Training offered at higher learning institution is not open to mature students such as government personnel, for example. Training at government centres also has its limitations. Since there is only one centre, application for admission is very competitive, and selection is normally based on criteria set by the head of the agency. The following sections examine GIS-related issues in those agencies that have adopted GIS.

6.11.5 Using GIS: technical issues

Selection of specific GIS packages by an agency is related to the individual job functions of that agency. In the case of NALIS, since data sharing within and across agencies is the objective, differences between packages have given rise to a number of problems. Different types of GIS software use different data structures and store the data in different ways. The results of this study show that at individual agency level, for example, as highlighted by the Department of Environment, Department of Agriculture, Department of Valuation and Property Services, and Department of Survey and Mapping, this incompatibility was solved by designing a computer program to group data specification from separate packages under one common record. The same approach, however, could not be applied when data needed to be shared across agencies.

Another key issue indicated by users relate to difficulties in determining a co-ordinate system, since most GIS packages offer a range of co-ordinate systems. Therefore, integration is possible only after transformation to a common projection system. One example of this problem was illustrated by the Department of Survey and Mapping (DSMM). The department explained that major problems arise when there is a need to convert cadastral basemaps to topographic basemaps. The topographic basemaps use a Rectified Skew Orthomorphic (RSO) for their referencing system while the Registry Office (producer of cadastral data) uses a Cassini Soldner Projection for its referencing system. The State Survey and Mapping officer argued as follows:

"We are aware that presently the work of one body are not officially transmitted or referenced by others. But there is nothing much we can do because there exists no requirement for us to communicate with one another" (Director State Survey and Mapping Department, Terengganu, fieldwork, interviewed September 1996).

Presently therefore, there is a variety of systems used by departments and agencies for referencing geographical data (Table 6.9). The Rectified Skew Orthomorphic (RSO) is the most popular system for topographic data and this is used by land supplier departments such as Survey and Mapping, Valuation and Property Services, Town and Country Planning, Geology, Drainage and Irrigation, Agriculture, Public Works and Forestry. The Cassini Soldner Projection is popular among State Land and Mines Offices and State and Survey Mapping Departments for cadastral survey. Other less popular referencing systems, such as Latitude/Longitude and State plan projection, are used by minor agencies at State Offices, District Offices and local authorities.

Table 6.9: Locational Referencing Systems in Use

Referencing Systems	No. of agencies from a total of 49* investigated
Rectified Skew Orthomorphic	20
User defined	18
Cassini Soldner	14
State Plan	14
Latitude/Longitude	13

*Note: Some agencies use more than one type of referencing system.

A further issue highlighted during the course of interviews with the Public Works Department, Department of Agriculture and Department of Environment was that of GIS data structures. Different types of GIS package adopt different data structures (vector or raster or their variants) and data conversion is generally necessary before data exchange can take place. These departments argued that to come to an agreement regarding data exchange has been difficult since various users utilise data for different applications and depending upon their interests data representation is viewed differently. For example one senior officer in the Public Works Department explained that:

"Whenever one tries to compare data from different sources there are differences in terms of the data types on which the data is based. A road in one data-set may have the schema *road* [*name, surface, type, number of lanes*], while in another it has simply *road* [*name, type*]. Furthermore even where the attributes have the

same name we find that they do not take on the same range of values. In order to effectively share information we need some means by which we can agree on some common types [for example, road or surface type] which can then be used at least within some specific community" (Senior Engineer, Public Works Department, Kuala Lumpur, fieldwork, interviewed January 1997).

6.11.6 Standards for GIS Use

With an increasing need to share spatial digital data most agencies indicated their concern over ways to enhance co-ordination among various user communities. In 1992, a proposal was brought forward by the land supplier community to the Council of Standards and Industrial Research Institute of Malaysia (SIRIM) to introduce a standard data exchange format. In 1994 the Malaysia Standard 1074 (MS 1074) was introduced but was based on customised Computer Aided Mapping System (CAMS) output. In other words, the standard does not meet the requirements for GIS operations. One major weakness of the MS 1074 standard for the purposes of NALIS (GIS operations) is its rigid description of features and feature codes. Topological properties of spatial features are not defined, and thus relationships of geometric primitives (points, lines and areas) are not provided. In addition, only basic attribute descriptions are supplied. Finally, relationships between spatial features and their attributes are not supplied and thus GIS users are not able to query such data in any meaningful way. At the time of this study standard agreement on exchange standards has still not been reached. The responsible co-ordinating institutions, in particular the National Mapping Committee, National Remote Sensing Committee, Military Mapping Council and the Standards & Research Institute of Malaysia, have not been able to bring together provider and user communities to agree on feature and attribute interpretations, and feature and attribute definitions. Even the key land data custodian agencies - the Department of Survey and Mapping Malaysia and Land Registry Offices - have not been able to solve basic problems with projections, as alluded to earlier. Conversion of spatial data to a digital form is also slow because the work is done in-house for 'security reasons'. Any involvement of the private sector in the acquisition, conversion and production of data on behalf of an agency to spread costs and utilise existing expertise is not possible because all data are classified.

In the light of the above issues, one could argue that current GIS users are aware of the problems intrinsic in GIS use. However, levels of awareness and knowledge of GIS problems can not be generalised to all technical and professional staff in the user

agencies. For example, the Town and Country Planning Department at the Federal level, a typical technical agency, with a total of about 500 staff of which 40% are technical (technicians, semi-professionals and professionals[8]). From this total only about 1% have technical skills in GIS. This situation is likely to be worse among agencies that are yet to install GIS. Section II explores these issues further and considers further possible impediments to the effective use of GIS and its implementation in NALIS.

SECTION II: Part II

6.12 Evaluating the NALIS Programme

Issues regarding the adoption and implementation of information technologies such as GIS may be conceptualised in technical, organisational or institutional terms (Dunn et al., 1997). Technical perspectives generally deal with impediments related to system design and components such as hardware, software and data. Organisational perspectives focus on structural and human related issues such as staff relationships with technology and their attitude and beliefs about computing and the use of computers. Finally institutional perspectives generally relate to factors external to an organisation such as political and economic factors that have the ability to influence an organisation's capacity to adopt or use GIS. Of these three frameworks, an organisational perspective is perhaps considered the most meaningful in providing explanations in information systems implementation (Kling, 1980; Kling and Scacchi, 1982; Campbell, 1991; Masser and Campbell, 1991; Obermeyer and Pinto, 1994). Obermeyer and Pinto (1994) suggested that paying close attention to organisational behaviour or human factors can greatly facilitate success of information system implementation. This assertion has been found to apply here in the case of NALIS. However, though less prominent, institutional and technical factors cannot be undermined here because they also appear to influence the implementation of NALIS. The discussion in this section explores these perspectives in turn.

[8] Professional workers possess a degree or equivalent higher qualification in a specialised field, for example Town Planning. Semi-professionals are educated to diploma level . Technicians possess certification in drafting, for example.

6.12.1 Organisational Issues

Onsrud and Pinto (1992) reviewed over thirty factors that might influence the adoption of GIS within organisations. Incentives and barriers to changes in organisational practices included personal factors, real and perceived costs and benefits, intra - and inter-organisational communications, organisational decision-making structure, methods of technology introduction and training, and many others. Organisational issues found in the case of NALIS appear to be similar to those identified by those authors. Willingness to change, for example, was found to be lacking due to individual attitudes towards new technology. As highlighted earlier, limited facilities for training form one impedance towards knowledge upgrading. Beside this, however, the present research found other barriers. Some professionals (surveyors, planners and engineers) for example, argued that to study a new set of skills is difficult for them because of time and other official and social priorities. The Deputy Director of the Sarawak Land and Survey Department explained:

> "We have so much work to attend to daily, as such we have no time to learn anything new in line with advancement of IT. At home we have our family, they are our first priority" (Sarawak, fieldwork, interviewed July 1996).

Similar opinions were expressed by general staff and some were reluctant even to discuss GIS issues.

A further reason which emerged related to the way in which GIS is introduced to an agency. In many agencies GIS hardware and software are situated in a separate room controlled by selected staff and this approach acts as a physical barrier for staff (even senior managers). Thus although GIS has been adopted by a number of agencies, in practice the system is monopolised by a small number of staff.

Similar behaviour was also found to operate in terms of sharing knowledge within NALIS. In every agency only one officer is assigned to attend NALIS meetings or briefings. The findings from this study show that in almost all cases (forty-nine land-related agencies) information obtained from meetings was not shared in an official manner (for example, by briefings to other staff) but rather was kept as individual knowledge. So- called 'participation' then, operates at the level of the individual.

Notwithstanding the attitudes of the officers it is proposed here that lack of information sharing results from low levels of knowledge amongst individual officers. Of forty-nine land-related agencies which made up this study about 50% of officers interviewed could not explain the design and methodology of NALIS and almost the same percentage was still vague about the programme itself. The findings of this study show that the officers who were most knowledgeable about the NALIS design and methodology come mainly from technical agencies such as Survey and Mapping Department, Town and Country Planning Department, Public Works Department, Agriculture Department, Malaysian Centre for Remote Sensing, Land and Mines Department, Department of Environment and major local authorities such Kuala Lumpur City Hall, and local authorities in Perak, Pulau Pinang and Kedah. Even so, most of these agencies, an average of only two officers were knowledgeable of NALIS in terms of the design and methodology involved in NALIS.

Agencies in management/monitoring roles such as the Local Housing Department, State Secretariat Offices and District Offices are aware of NALIS but could not explain what NALIS is about. As stated by a senior administrator and system analyst in the Local Housing Department: *"We have heard of NALIS. But we are not sure what actually it is"* (Kuala Lumpur, fieldwork December 1996). Another category are those agencies such as the Urban Development Authority, Federal Land Development Authority and many local authorities that have not heard of NALIS. In fact, some of these agencies were surprised that they were not informed of the NALIS undertaking. One planner at the Urban Development Authority explained:

> "We are regular customers of the Department of Survey and Mapping. And we share our information [housing and commercial development information] with various land agencies particularly Town Planning and City Hall. I don't understand why we were not called to participate" (Senior Planner, Operational Division, Central Zone, Kuala Lumpur, fieldwork, interviewed November 1996).

As might be expected, those staff with only very limited knowledge of NALIS are also those that are unaware of the capabilities of GIS.

Awareness of GIS and NALIS was further explored by attending two briefings (at the Federal Territories of Lands and Mines Office and Ministry of Land and Co-operative Development) and one demonstration (at the Melaka Land and Mines Office). These were official events where permission to observe had to be requested from the or-

ganiser (department director) where the briefings and demonstration were carried out. Problems of access were, in fact, minimal since I used my desire to learn about NALIS (rather than to observe NALIS development process) as a reason for my presence. The key issues stressed in these meetings were allocation of budget and IT peripherals. Issues such as data sharing and exchange, compatibility, standards and costs of conversion which were already revealed at the pilot project level were not brought to light by the presenter. Perhaps the action was intentional because among the participants many were not aware of the said issues since many were unfamiliar with electronic data sharing in general and GIS in particular. These meetings looks similar to other meetings that author had participated at structure and local plan levels, where minimal questioning from participating communities could be expected because proposals presented were broad and inclined towards picturesque presentation rather than emphasising on issues.

It appeared that there was an obvious lack of 'capability' on part of the professionals (for example, the surveyors who were the co-ordinator of these meetings) in delivering and clarifying the programme's intended goal. With the NALIS promotion it was obvious that the co-ordinator's main interest was to 'impress' user communities with new technology rather than to explore users' understanding and needs on new IT. This study found that since many participants were not able to question the impressive IT proposal, professionals regarded them as 'disinterested' with the undertaking. The promoters of these meetings failed to realise that there were gaps of 'information' and 'skill' between co-ordinators and participants. The case highlighted here where users (or the general communities) were 'catching up' with development ideas is typical in the Malaysian planning context. The Multimedia Super Corridor is one example of a project where only a handful of Malaysians understood its purpose.

It appears from the findings of this research that the approach to the development of NALIS has not always included formulation of realistic goals. In the following section, a facet of reality is discussed through analysing current information sharing issues within and amongst land-related agencies.

Information Sharing Issues:

Since the establishment of computerised information systems has been approached individually and independently, information sharing amongst agencies still largely fol-

lows a manual protocol. This is because many staff view data to be proprietary (restricted to individual agency use). Secondly, inter-departmental system linkages have not changed from the traditional pattern of information exchange. That is, information exchange is restricted under a set of organisational rules which directly discourage an agency from data sharing, especially across agencies. Thirdly, co-ordination across jurisdictional boundaries remains strictly determined by administrative and political differences. In the three tiers of government departments, State, District and local authority offices are closely linked, whereas links between Federal and State departments are not well developed. Rather, Federal departments play the role of advisor to the State departments but have no real jurisdiction over the State, District or local authority level agencies. The initiative to change from the current situation is perhaps difficult because, as the findings of this study show, there are diverse and opposing interests among participants in the direction towards general co-ordinated goals. The following section explores these issues.

Professional Issues and System Control:

Professional disagreements were found to be related specifically to issues of control over NALIS. Land surveyors, in particular, perceived the administrators to have a poor understanding of NALIS, particularly in terms of data and technology. They believed that NALIS should be managed and controlled by surveyors, as the staff most knowledgeable in terms of land and technology (GIS) matters. As one surveyor commented:

> "...all over the world the land surveyor is the one that is given the mandate to handle land data; not the administrator. For example, they can't even interpret the co-ordinate system of this country" (State Director, Survey and Mapping Department, Kelantan, fieldwork, interviewed September 1996).

The land surveyors' perception of their own professionalism appeared to dominate over all other NALIS participants. They often disagreed with other professionals, not only from other organisations, but also within their own institution. Some surveyors argued that even though the role of managing NALIS has been given to their Ministry (Ministry of Land and Co-operative Development), since those actually controlling NALIS are not land professionals, many intrinsic GIS and land-related matters issues are likely to be overlooked. One senior surveyor from the Ministry of Land and Co-operative Development stated that:

> "they [NALIS administrators] are still ignorant about computing...Actually they installed a powerful network. They did not even realise that they do not have people to do the work. Anyway, even if they have the people they do not know what is needed" (Director, senior surveyor, MLCD, Kuala Lumpur, fieldwork, interviewed November 1996).

Another officer from the same Ministry, but operating at State level, expressed a similar view:

> "These administrators depend so much on us. I am not putting them down, but generally they do not know what they are talking about. But most of the time they would not tell us they do not know...But we know. Once we leave they are lost. This is what happens now...most of our directors are leaving to join the private sector. Now the co-ordinator is worried. They do not have a strong backing to translate NALIS requirements. The co-ordinator has lost his support and does not know what to do" (Director, Melaka Land and Mines Office, fieldwork, interviewed August 1996).

The administrators believe that NALIS should be managed at the policy level rather than by technical staff. They argue that even though NALIS is technically oriented, its implementation deals with land. Land is a policy matter and decisions regarding access and operation of land-related matters rest with administrative offices. The administrators argued that supervision of NALIS should be placed at the highest administrative authority to ensure both co-operation and that operations follow the regulations set forth by individual State controllers. The NALIS Central Council, for example, was proposed to consist of the following: the Prime Minister as chairman, the Deputy Prime Minister as deputy chairman and with other administrative members to include the Economic Planning Unit, Attorney General's Office, Standard Industrial and Research Institute of Malaysia, Malaysian Institute of Microelectronics Systems, and Malaysian Administrative Modernisation and Manpower Planning. Two major technical departments included are the Department of Survey and Mapping and the Malaysian Centre for Remote Sensing.

The arguments put forward by the administrators seemed to support a 'top-down' approach. The rationale is that power to effect change rests with the highest authority. With regard to computerised information systems some authors have argued that characterisation of computing as either 'top-down' or 'bottom up' is meaningless (Kraemer and Dutton, 1979; Kling, 1980; Kraemer and Danziger, 1984). The context in which computers are used appears to be a much stronger influence than is the tech-

nology itself on whether organisations centralise or decentralise. Technology supports either arrangement, but the traditions of the organisation determine which arrangement will be followed. Taylor (1991b) for example, argues that:

> "In some instances, a decentralised approach to GIS will be the most effective solution, especially...where a micro-based system in the hands of the individuals directly involved makes a great deal of sense. In others, such as the need for...control over vast areas, then a 'top-down' national approach is required" (p. 81).

Similarly Dunn et al. (1997) argue that successful implementation of GIS depends on *"appropriate control and with informed use"* (p. 157). Introduction of technology should, therefore, be accompanied by education and training, not only on technical factors, but also through exposure to the *"thorny questions of geographical information for development* (p. 156). The authors' key point is that GIS for developing countries should be given time to mature. They emphasised that:

> "A GIS should never be used as a 'quick fix' strategy; rather its introduction should be slow, with long-term or medium-term training programmes, directed at real needs, and the design should be relevant to local conditions..." (p. 157).

The points highlighted by Taylor (1991b) and Dunn et al. (1997) are all critical issues pertinent to NALIS. However, as the findings of this study show many of these factors have been overlooked because of the programme decision-makers' (technical and steering committee members) focus on control over the system rather than on commitment to the user community. To be in a position of control over NALIS means power or an increase in status. As one director explained:

> "My department [Land and Survey] does not allow me to continue servicing the MLCD co-ordinating office...because according to him [the Director General] why should I give them [MLCD co-ordinating Office] expert advice ...and make people think that they [MLCD co-ordinating office] are the one capable of undertaking NALIS" (Director, Melaka Land and Mines Office, fieldwork, interviewed August 1996).

Jealousy among top-ranking officers is apparent and one consequence of this seems to be a lack of understanding of the user community's needs. Instead, responsibility for evaluating user needs was left in its entirety to the discretion of a group of consultants. As a result a design was introduced which was totally incompatible with lo-

cal users' capability. From a total of 356 agencies, only 32 use GIS and 95% of staff in these 32 agencies have no hands-on experience with GIS or with the operation of large scale information systems. NALIS decision-makers perceive GIS simply as a collection of hardware and software.

Successful implementation of GIS *"depends on who constructs and analyses the information and who controls the GIS"* (Dunn et al., 1997). In the case of NALIS, the large number of agencies, in particular heads of agencies, wanting to be in a controlling position has meant that implementation planning has been highly disorganised. This environment of chaos is partially explicable by the fact that GIS is a new field (for Malaysia) which has not been fully explored and developed. An individual or agency who is in a position to control NALIS, as a large scale GIS operation, could therefore dictate the path of GIS development in Malaysia. Power struggles in the venture of new development undertakings are common in Malaysia. For example, in the area of IT research there is the Malaysia Institute of Microelectronics Systems (MIMOS) and there is Malaysia Science Information Technology Centre (MASTIC) both of which lack respect of the function of one another. MASTIC officers believe that MIMOS staff have no special capability other than duplicating ideas from other countries. MIMOS officers on the other hand contend that they are the leader for Malaysia IT research and development. This research, however, finds that there is some truth in MASTIC's view. However, thusfar MIMOS has not been disturbed by criticism rather it has remained one of the favourite agencies of the present administration. Rourke (1978) notes that: *"a single agency may draw power from several different sources, and there is no way of telling how much of an agency's success should be attributed to bureaucratic expertise, constituency strength, organisational vitality, or skilful leadership"* (p. 225).

One can argue that NALIS decision-makers have underestimated the complex nature of agencies as adopters of new technologies and the operation of large scale information systems. To centre interest and awareness of NALIS and GIS among only a few users and decision-makers is a clear recipe for failure, for the development and implementation of NALIS is dependent on many agencies, both technical and administrative. It appears that, thusfar, decision-makers have not recognised the importance of understanding the different types of user, with their different ways of interacting

with the programme, different levels of technical understanding and different reasons and purposes for using the programme.

6.12.2 Institutional Issues

For the purposes of the present study, institutional issues are taken to be those issues external to an agency's environment that influence the agency's ability to adopt or use technology. The external environments of an agency include intergovernmental relations, and the political and legal environment in which the agency functions. Intergovernmental relations affect the operation of NALIS at two principal levels; between State and Federal agencies, and between agencies at Peninsular Malaysia level and those on the Island of Borneo - Sabah and Sarawak. Issues highlighted at these levels concern the question of who gains and loses with the implementation of NALIS and there are many tensions between State and Federal level officers. There has been some reluctance at State level, for example, to fully support NALIS since it is a Federal programme. Some State agencies (Terengganu, Johor, Sabah and Sarawak) rationalised this perspective through previously bad experiences with Federal initiatives. This demand for support is not, in most cases, because they (the States) are incapable of making their own purchase of IT facilities; rather it was to ensure that the States are not being 'used' for Federal benefits. One officer from a State office described the situation as follows:

> "...we couldn't tell Federal everything. Like valuation information for instance, we can't devolve all our findings to them. If they know we have lots of income (revenue) they want more...The very top, [the State Secretary] dictates what we show..... In our State case, when we prepare a budget we always make sure we have a deficit every year..." (Senior System Analysts, IT Division, Terengganu State Secretariat, fieldwork, interviewed September 1996).

Correspondingly, one officer from the Federal Treasury office commented that it is not uncommon to find State unwillingness to supply effort or money to support Federal initiatives. A senior Federal officer working at State level discussed one of his experiences with his State office as follows:

> "We [Federal officers working in a State office] are not treated as equals. As an example, I submitted a proposal to buy software and hardware for this project [NALIS pilot study] but they are reluctant to help because according to them NALIS is a Federal initiative programme. Therefore it is a Federal responsibility. We are sent here to help them but they think otherwise. They are very sceptical about our request ...the proposal is still sitting in the State Economic Planning Unit. It has been six months now...and I am due to report back to the Federal

office. The next person taking my place has to do the work all over again" (Director, State Town and Country Planning Department, fieldwork, interviewed October 1996).

The situation on Borneo Island is somewhat different in nature. Due to their physical distance from the Federal office, officers in Sabah and Sarawak believe that they are being left out of matters concerning NALIS' development. The Deputy Director of Sarawak's Department of Land and Survey, portrayed his frustration over NALIS as follows:

"With regard to NALIS, it is confusing to me...from what I see, it seems NALIS covers only Semenanjong (Peninsular Malaysia)...I don't think I want to comment for the situation is very confusing. At the very beginning we were the only agency invited because we are the land people. After a few meetings we were told that we are no longer the co-ordinators for Sarawak State. Instead we are told the correct representative body is Sarawak State Planning Unit (SSPU). So we are no longer invited to subsequent meetings. But lately we have been invited again. The SSPU on the other hand has not been invited. This puts us in a very difficult position because we have been told again that we are no longer the official co-ordinator. If NALIS wants to do anything in Sarawak we cannot help in an official capacity any longer" (Deputy Director, Sarawak Land and Survey Department, fieldwork, interviewed July 1996).

These findings reveal that intergovernmental relations require careful understanding in order to implement NALIS successfully. NALIS being new in every aspect, (technology, concept and approach) has created high levels of anxiety and curiosity among agencies. These feelings increase as the agencies are further from the project head office in Kuala Lumpur.

Successful implementation of NALIS requires what Goodman (1993) has termed an "*appropriate social system*" which "*identifies the targets for socialisation*" (p. 51). Goodman argues that different targets in the social system require different attention (knowledge) through different socialisation actions. In the case of NALIS this refers to differences between agencies at State and Federal levels and differences between technical and administrative agencies. Applying the idea to NALIS means that the Federal office should view the State as a group with varying motivations towards NALIS as an initiative (especially for politically sensitive states[9]). Each State in Malaysia has a quite different view of managing land and of the level of 'intrusion' which

[9] Politically sensitive States refer to Sabah and Sarawak which have been part of Malaysia only since 1963; and States that are administered by the opposition party - namely Kelantan and Sabah.

is allowable from the Federal authorities. Because of specific historical influences (Siamese and Arabic), the State rulers (Kedah, Perlis, Kelantan and Terengganu, (Unfederated Malay States) uphold a different culture. Penang and Melaka, being British Straits Settlements, are oriented to yet different rules. Similarly, a different orientation again is found in Sabah and Sarawak legal, political, social and cultural differences are more pronounced compared to states in Peninsular Malaysia.

6.12.3 Technical Issues

Technical issues relate not only to system design and components (hardware, software and data), but also to the technical capacity to understand the tools and concepts that NALIS uses. Many of these technical problems are manifestations of underlying organisational and institutional issues.

The findings from this study indicate that a complete assessment of existing systems was not carried out by the co-ordinator. This has led to misidentification of the functional requirements and capabilities of existing hardware, software, and data. Although major departments are steadily revising their data, doubts about data quality, suitability and access are still significant impediments. Lack of official data standards means that documentation of data is still haphazard and incomplete. Disagreements between agencies about data quality and scale have remained typical at operational levels. For example, engineers and infrastructural managers argue for greater accuracy while planners and environmentalists are willing to work with available data of poorer quality. This attitude has discouraged data sharing and instead has encouraged the development of individualised data collection systems.

Many agencies have proceeded to collect data without first constructing the prerequisite data model. The rationale behind this was argued by most agencies as the only way since they believed that a standardised approach is difficult where there is a large and heterogeneous user community such as in Malaysia. One project manager in the Sabah Land and Survey Department explained:

> "The adoption of a single common data model over a community as large and heterogeneous as the government of Malaysia is highly unlikely. Furthermore, the adoption of a common data model does not, on its own, ensure data or service interoperability across agencies. For example, take our experience with the common relational data model. Its use guaranteed that all requested data arrived in

the form of tables. However, it would not guarantee that the attributes in tables from different data sources were consistent with one another. An attribute 'parcel' in one data table may not mean the same as 'parcel' in another. Two attributes with different names in different tables may have exactly the same meaning. None of these sorts of ambiguities are resolved by the adoption of a common data model" (Project Manager, Sabah Land Information System, Sabah Land and Survey Department, fieldwork, interviewed July 1996).

In addition, delays in the production of digital topographic and cadastral maps (by the base-map custodian Department of Survey and Mapping - DSMM) has prompted some agencies, particularly the Agriculture and Forestry departments, to produce individualised digital topographic and cadastral maps for their own use and for other interested users. By doing so, Agriculture and Forestry (and other users) have duplicated the production of digital base maps and thus have continued a tradition of incompatible map production.

In general, agencies indicated a lack of shared interest and trust in the objectives and goals of NALIS. This was found to be attributed to two factors. First, many believe that land-related agencies are difficult to co-ordinate because of a diversity in agency requirements. For example, an initiative towards a common map projection for both topographic and cadastral mapping has not come to agreement despite about ten years of negotiation. Second, the operational design of NALIS is too complicated for many to understand and too sophisticated for some agencies to support. The language used to explain the system was 'foreign' to the majority of users. Consultants argue that since NALIS' development will be operated in phases of twenty years it is necessary to ensure that its hardware and software are in line with the latest developments in technology. For example, to transfer datasets of a large scale topographic map sheets (which currently use 2-3 megabytes of storage space), there has been a suggestion to adopt a Frame Relay. Frame Relay is a technology that supports data transmission over a connection-oriented path. The technology was believed suited with land-related applications which requires infrequent intervals of high bandwidth traffic. According to one consultant,

"in Frame Relay the traditional network topology of WANs is modified. Instead of a few LANs connected via routers over dedicated point-to-point lines, each site is connected to a network 'cloud' via an access line. This network 'cloud' consists of switching nodes interconnected via trunks used to carry traffic aggregated from many users. This has tremendous advantages in terms of reduced

numbers of routers and numbers of end to end lines. This leads to an overall reduction in the complexity of network management" (MLCD, 1995).

While this suggestion could be a practical solution for managing land-related datasets it is not practical in the context of NALIS since, as discussed Section 6.11.2, many agencies are still at the stage of assessing the costs and benefits of LAN installations. Since information sharing is restricted by the high level of classified information, installation and maintenance costs for LANs and WANs remain high. Until these basic communication and information sharing problems are met, suggestions for upgrading have been regarded as meaningless by most agencies.

With respect to technical capability, NALIS remains far behind its stated objectives. Many types of GIS/LIS that have been assumed to form the building blocks of NALIS are still at the planning and development stages and established information systems are not compatible with one another. Similar conclusions were reached by the consultancy Renong (MLCD, 1995) and the Chairman of the technical committee:

"At this stage NALIS is not yet in the picture. Now we are still talking about land data. Because we do not have data there is no NALIS...What they [DSMM] are still doing now is converting paper maps into digital form - computer readable. In terms of map sheets they still have lots to do. In Peninsular Malaysia alone they have about 120 map sheets. In Sabah and Sarawak they have another 200 map sheets. We use computers to help us digitise but improvement is still slow. So far they have completed only 10% and only around the Rompin area [remote rural area in south-east of Peninsular Malaysia]....So when you talk about basemaps for Malaysia that is the situation now...In the area of mapping we also have problems with time...when aerial photographs are to be taken is not fixed...I see the 10% level of database completion will remain for some time" (Chairman of NALIS technical committee, interviewed in August 1996).

Since NALIS is at its early stage of development, prospects for improvement are still wide. Many of the technical data issues faced by NALIS are common to most GIS development experiences. For example, Post and McLaughlin (1993), with reference to their Canadian GIS experiences reported that the *"cost of building databases to support GIS applications was often a multiple of 3 times* [$42.3 million] *the cost of hardware and software* [$14.1 million]" (p. 283). Similarly, for NALIS, database building has been proved to be the highest developmental cost. Database conversion expenses as estimated by the consultancy Renong Berhad are ten times the cost of hardware and twenty-four times that of software. In addition, there are communication network costs which are about eighteen times smaller than the costs of database

conversion (MLCD, 1995). The following section breaks down Renong's projection costs in more detail.

Cost of Databases:

1. Topographic data

The total estimated cost for converting topographic data from a manual to digital format is US$148.15 per km^2 (exchange rate of US$1 to 3 Ringgit Malaysia, approximation based on 1996[10] exchange rate). Of the total land area of Malaysia, approximately 13% have been converted to a digital form. The remaining area for Peninsular Malaysia was scheduled to be completed by the end of 1996. However, this target was not met, and, indeed in 1998, the figure of 13% completed remains.

2. Cadastral data

From the estimated 11.8 million lots for Malaysia, only 50% of this total lots have been issued with Final Titles. The cost of converting a lot with final and qualified titles (using key-board entry) has been estimated at US$3.33 per lot. The estimated total cost for conversion of all cadastral data is US$ 39.33 million.

3. Attribute data

The preliminary estimated cost for conversion of attribute and miscellaneous data is about US$89 million and US$63.33 million, respectively.

Hardware and Software Costs:

The estimated total cost of hardware for NALIS is US$27 million. This figure is inclusive of 30 clearinghouses (one at each of national and Federal levels, fourteen at State and fourteen at District levels) with the estimated cost per clearinghouse at US$161,146. The remaining costs cover participating agencies with two types of hardware status: agencies with existing GIS or LIS and agencies without GIS and LIS. With regard to software the estimated cost is US$10.97 million. Software requirements are calculated based on current technology and the preliminary cost estimates of the hardware required by clearinghouses and participating agencies. The preliminary estimated cost of software per clearinghouse is US$68,232 for organisa-

[10] According to a report by MLCD (March 1998) due to the devaluation of the Malaysian Ringgit against US$, the estimate has increased to about six times higher than the 1996 figures.

tions with GIS or LIS it is US$6,840, and for agencies without GIS or LIS it is US$39,312 .

Communication Network Costs:

The preliminary cost estimates of communication networks includes facilities for clearinghouses and participating organisations based on the minimum requirement to facilitate NALIS' implementation. The estimated cost also includes monitoring of network linkages between the clearinghouses and participating agencies. The cost of the communication network equipment per clearinghouse is estimated to be US$73,848. In estimating the cost of the communications network equipment required by participating agencies, two types of agencies are considered; agencies with existing intra-agency linkages and those without existing intra-organisational linkages. It is assumed that each participating agency will require a WAN interface card for connection to the leased line but in the case of agencies without existing linkages additional cabling and hub facilities will be required. The estimated costs of equipment are US$2,875 for agencies with existing intra-organisation linkages and US$4,640 for agencies without.

Post and McLaughlin (1993) argued that the costs of building databases to support GIS applications "*usually killed projects and it remains a major impediment to technology diffusion*" (p. 283). Based on follow-up findings to the present research (early 1997), the costs highlighted above and skills shortages resulted in changes to NALIS planning. It was originally decided that NALIS could cover organisations with databases and with adequate communication facilities. However, since NALIS is still in its early stages of development a change in planning could be implemented over time. But central to this situation is awareness among decision-makers firstly to identify NALIS' current impediments and secondly, to acknowledge the objectives which NALIS is set to achieve. A renewed development strategy is crucial for, it is agreed here, NALIS is beginning to follow the path of a potentially failing programme. Current shifts in planning will have direct impacts on agencies that are without intra-organisational communication facilities, agencies without GIS facilities and agencies with minimal skills support. The consequences of this situation are such that those agencies that are already being marginalised, namely those in poor states, will suffer further. These states are also those that lack skills and infrastructural support. Any improvement to this situation is difficult to foresee since change in the process of de-

velopment is constrained by resources and political factors, and limitations to development in turn constrain organisational improvement. As Friedmann (1966) (in Pred and Tornqvist, 1973) says:

> "A rudimentary pattern of urbanisation and regional development will tend to maintain itself. Such a pattern may be established quite early in a country's history. Subsequent flows of controlling decisions, innovation diffusion, migration, and economic location will tend to reinforce this pattern so that, whatever happens, the future will look very much like the past" (Pred and Tornqvist, 1973, p. 47).

Similarly Feldman and Florida (1994) argued that:

> "innovation in the late twentieth century is unusually dependent on an area's underlying technological infrastructure...innovation is increasingly dependent on a geographically defined infrastructure that is capable of mobilising technical resources, knowledge, and other inputs essential to the innovation process...The regional capacity to sustain innovation is thus embodied in institutions and resources that reflect significant investments over time (pp. 210-212).

Thusfar, it appears that the NALIS programme will be unable to break existing trends of failed 'development' projects. Large and urbanised areas will continue to reap the benefits of infrastructural development at the expense of poor States and geographically remote areas. This chapter is concluded by way of summarising the salient points about SETIA and NALIS issues.

SECTION III

SETIA and NALIS: Conclusion

SETIA was initiated during a period of serious economic cut-backs and continued to progress under constraining economic factors until 1990. During this time major policy changes were being introduced, amongst the most important of which was a privatisation policy. As government became more involved in privatisation investment on an international scale, subsequent changes occurred among three central agencies (the Economic Planning Unit, the Treasury and the Accountant General's Department). These agencies were made accountable and responsible for managing multi-million dollar development projects and SETIA was left as the Implementation Co-ordinating Unit's main responsibility. However, with increasing national development and the introduction of varying types of projects, the duties of managing the system became too onerous for ICU. The situation was further constrained when ICU limited

the evaluation of SETIA's problems to internal reviews only. Based on the findings of this study the major constraining factors to SETIA's progress are administrative issues that are influenced by continued change in external factors (policy and administrative changes). Problems relating to technology and skills were paramount for SETIA's during its very early stages of development. But when the economic situation changed in the early 1990 computer procurement increased and skills steadily improved so that by the time of the fieldwork for this study access to computers and skills were no longer highlighted as problems for SETIA.

In contrast to SETIA, NALIS was initiated when the Malaysian economy was at its peak. In addition, the development of NALIS was guided by detailed IT development policy and a national vision (Vision 2020) which emphasised IT as the main factor towards development. IT use has been widespread among all public organisations. According to the findings of this study, all organisations are using one or more forms of information system. NALIS' initiation came at a time when political leaders were concentrating on the expanding use of advanced technology. The 'Single Window Concept' from the experience of British Columbia, Canada was adopted. Consequently, software and hardware requirements for NALIS were co-ordinated directly with international consultants' offices in Canada (MacDonald Dettwiller and Associates Limited), Sweden (Central Board for Real Estate Data) and the USA (ESRI).

However, many organisations lacked the appropriate skills, technology and infrastructure to support NALIS, and consequently appropriate policies and standards to organise the co-ordination of data were unavailable. In addition, besides lacking organisational and institutional co-ordination, upgrading of technology demanded considerable up-front costs. By 1997, for a variety of technical, financial and administrative reasons, NALIS' area of operation was re-adjusted and participation became restricted to those agencies with appropriate data, skills, technology and related infrastructural support.

Although both SETIA and NALIS claim to be user-oriented, bottom-up systems, the findings of this study do not support this claim. Both programmes were initiated by the Prime Minster's Office; NALIS, however, due its 'technical' nature, was handed over to the Ministry of Land and Co-operative Development. Nonetheless, the handover was not to the Ministry *per se* but to an individual in the Ministry, namely, the

Secretary of the Information Division. The idea for the programme was conceived at this level and involved a very few, top ranking decision-makers. As a result, the programme's approach was large and ambitious. SETIA's design was conceived through the ideology provided by a French consultant and was therefore based on French designer values while NALIS adopted an essentially Canadian design.

The broader participating agencies, normally represented by a director or assistant director were invited to response on programme design after the consultants had submitted their technical findings. The co-ordinators had decided in advance, however, to accept the consultants' recommendations. The rewards for endorsing these recommendations were visits, at Federal expense, to the consultant offices (France, Canada and other related overseas offices) to view examples of such systems in operation. At the operational level, the programme co-ordinators realised that the 'real' issues, namely organisational and institutional, were not anticipated at the programme initiation stage, although at this stage the budget for facilities had already been allocated.

Throughout the fifteen years of SETIA's life staff have tried to resolve some of the key operational issues. However, these attempts have met with little success because the source agencies (State agencies) have not been willing to change their beliefs that the State officers are being 'used' for Federal benefits. It appears that NALIS is suffering the same treatment and the findings of this study indicate that NALIS needs to avoid the mistakes of SETIA rather than sourcing ideas from foreign experiences. SETIA is an ideal education source, has more than fifteen years of experience and operates in similar organisational and environmental contexts.

Nevertheless, bureaucratic inertia looms large in both programmes. Leaders of both have their own logical rationale for their programme. This concords with Osborne and Gaebler's (1992) view of public programmes in the United States, "*Each has its own rules, its own forms, its own hoops through which people must jump.*" Most government offices are not aware that their programmes are failing because they seldom measure the results. Unless there is a financial disaster, "*most programmes keep chugging along, year after year... While the general public remains oblivious, the programme's beneficiaries fight tooth and nail to protect it*" (Osborne and Gaebler, 1992, p. 287).

The issues highlighted in this chapter are an indication of the factors that have impeded geographical, organisational and technological development for Malaysia. Chapter 7 further develops these issues in terms of the theoretical frameworks identified earlier in this thesis. Structuration theory is used as the principal means to reconstruct the social reality of organisational actors. Emphasised is placed on how individual actions implicate development geographically, and how they affect organisational development and technological progress.

Chapter 7 Information Systems, National Policy and Development: an analysis

7.1 Introduction

In the present study evaluation using web models has helped to illustrate that development of large scale information systems is characterised by multifaceted problems which are inter-linked. These problems often arise from poorly co-ordinated action and planning. The findings of this research show that in adopting new technology like GIS, consideration of the requirements of all users is paramount. Sharing of implementation ideas, however, as illustrated by SETIA and NALIS, is not easily achieved since each user agency (the co-ordinator and end-user agencies) has a different interpretation of the benefits of information technology. This finding supports previous studies which have indicated that many failed information systems projects are traceable primarily to human and other non-technical factors (Campbell and Masser, 1991; Croswell, 1991; Garson, 1993; Nedovic-Budic, 1993) and are often enmeshed in a variety of political and organisational issues (Niemann and Niemann, 1994).

Critical in the findings of this research is the dominance of a 'top-down' approach, attributed to a tradition of management dominated by a bureaucratic-elite. Such an approach, especially in the context of development projects that have differentiated interests, as with SETIA and NALIS, has been argued as being fundamental to project failure (Kottak, 1985; Harrison, 1987; Little, et al., 1987; Hutchinson and Toledano, 1993). Despite many development impediments the programmes studied as part of this research are, nonetheless, still accepted as 'functioning'. Difficulties in measuring success or failure arise because SETIA and NALIS are administrative programmes, that is, conceived by government for the purpose of improving government performance. In other words, government is an end-user of these programmes, and thus programme failure is seldom open to public knowledge. Except for inquiries made by external researchers and a few local academicians (for example, see Jomo, 1989; Chee, 1990; Jomo, 1994) cases of project failure in Malaysia tend not to be highlighted. However, it should be stressed that the broad GIS literature also shows a very low percentage of papers discussing failed projects.

In this chapter the SETIA and NALIS programmes are considered in the context of Giddens' structuration theory. As explained in Chapter 4 SETIA and NALIS are considered in the context of this theory because it contains the basic premises which helps in understanding behaviour in the context of social system. The chapter is divided into two parts. In part I, the discussion explains how structuration theory is used to help reconstruct social events or social change. Giddens argues that although generalisation is possible in explaining social change, the explanation will be *incomplete* because there are no *"patterns of universal causation in the social sciences...because all causal connections in human social life are mediated in one way or another by agents' knowledgeability and agents' reasons"* (p. 206). In Part II of this chapter, the insights derived from the analyses in Part I are considered in relation to Malaysia's development and its people.

Part I: Analysis and Insights

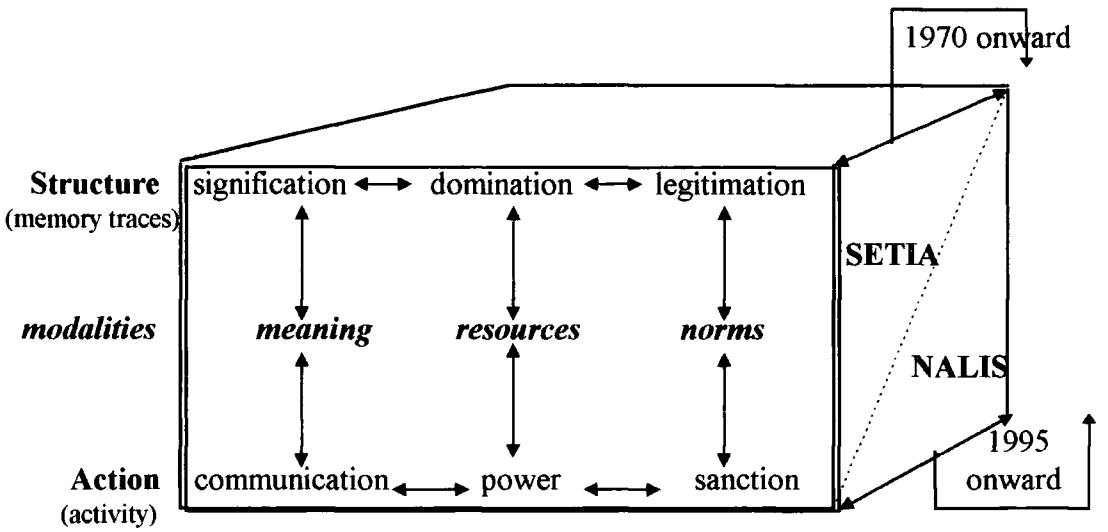
7.2 Introduction

The findings of this study are interpreted and analysed by considering the behaviour of actors at two levels; national policy level and programme level. The two levels are combined in the discussion because the relevant actors operate in the same 'social context' and their actions undeniably intersect with one another, and act as a vital means of social reproduction. In addition, the two programmes are examined together as a single case where the activities of one help to explain the other and vice versa. For analytical purposes, the establishment of SETIA is taken as the start of a large scale IT concern for Malaysia. Significant changes in information system development are explored from this time and are linked to the broader social system. The main concepts of structuration theory have been discussed in Chapter 4 but further explanation is provided here to help clarify the association of Giddens' terms with the present study.

As illustrated by figure 7.1 there are interrelationships between the various dimensions of structure and action (vertical arrows) and between meaning, resources/facility and norms (horizontal arrows). Three analytically separable dimensions of structure (signification, domination and legitimation) and three

equivalent dimensions of action (communication, power, and morality/sanction) are mediated by three 'modalities' of meaning (or interpretative schemes), resources and norms. The implementation of SETIA and NALIS is now considered with respect to these interaction across two distinct periods 1970 to 1980 and post-1980.

Figure 7.1: Dimensions of the Duality of Structure

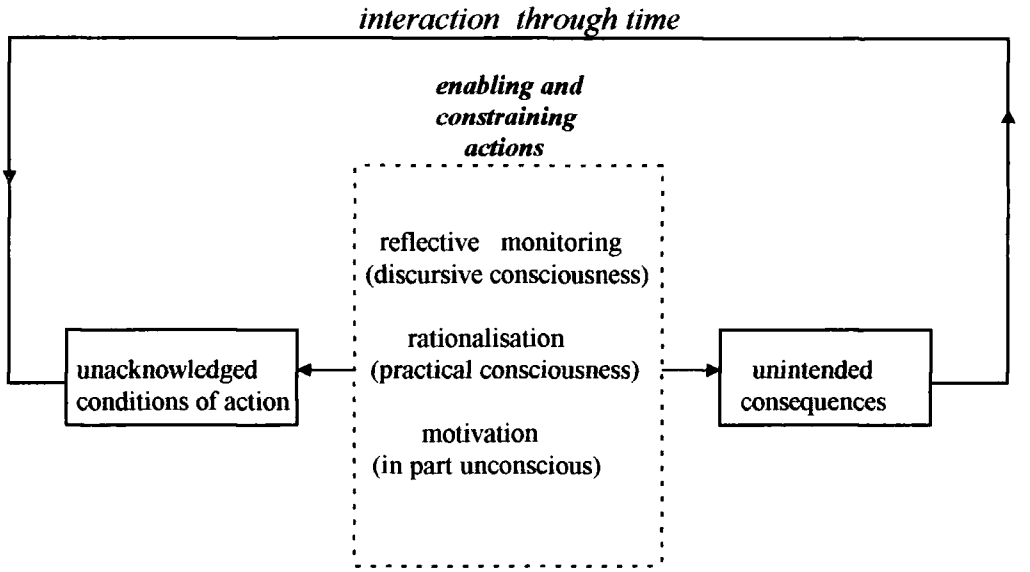


Source: Adapted from Giddens (1984, p. 29).

Structuration refers *"abstractly to the dynamic process whereby structures come into being"* (Giddens 1977, p. 121). Structure involves generative rules and resources produced and reproduce by actors in patterning a social system. Structure is highly dynamic and open to changes through time and space (factors external to the participants' control). For example, if an information programme co-ordinator decides to adopt a new technology, the success of the adoption will depend upon participants' willingness or ability to accept, learn and adapt the new technology. A participant's willingness to accept a new technology is dependent on the time when the technology is proposed. Other external factors, for example, a weakening economy, may directly or indirectly influence decisions regarding acceptance of the technology. Should participants be unable to change, old relationship patterns will be maintained and the intended objective of the co-ordinator will not be achieved. As Giddens (1994) puts it, this is structure as *"external to human action, as a source of constraint on the free initiative of the independently constituted subject"* (p. 16).

The process of production and reproduction of social change can be understood further by referring to elements of 'action' and 'consciousness' which act as constraints and enabling factors (Giddens, 1984). Each of these elements is said to operate at three levels (Figure 7.2).

Figure 7.2: Stratification Model of Consciousness and Action



Source: Adapted from Giddens, (1984, p.5).

The three layers of action (reflexive monitoring of action; rationalisation of action; and motivation for action) are coupled with three layers of consciousness: discursive consciousness (what actors are able to say about the conditions of their own action); practical consciousness (what actors tacitly know about the conditions of their action but cannot articulate); and motives (in part unconscious). The layers of actions and consciousness make clear that in the production and reproduction of a social system the feedback to an action is affected by actors' knowledge; this is despite the existence of unacknowledged conditions and unintended consequences.

The blending of enablement and constraint in the production and reproduction of social change involve the properties of structure: signification, domination and legitimation (Figure 7.1). Structure as signification involves semantic rules. Under the heading of signification Giddens includes all types of rules that actors could draw on to offer reasons for their actions. Structure as domination refers to the facilities (materials and non-material resources) which actors bring to a situation of interaction.

Structure as legitimation relates to moral rules and here Giddens includes all types of rules that actors use to justify their conduct.

The interpretative schemes (meaning), resources and norms are modalities which Giddens describes as the "*mediation of interaction and structure in the processes of social production and reproduction*" (1976, p. 122). Interpretative schemes refers to standardised shared stocks of knowledge that actors draw on to interpret behaviours and events, in achieving meaningful communication. Facility or resources are the means through which intentions are realised, goals are accomplished and power is exercised. Norms are the rules and values governing appropriate conduct, and they therefore articulate and sustain the established normative order. These modalities are drawn upon by actors in their constitution of interaction and also form the media for the reproduction of the institutional properties of social systems. The three modalities provide the linkages between the level of inter-personal interaction and the levels of the organisation and its environment. The findings of the present study are considered below with respect to these interactions.

7.3 An Information System of the 1970s - Integrated Project Monitoring System (SETIA)

The development trajectory of the SETIA information system has been described in this research in terms of two distinct temporal phases (Section 6.2.1). The first phase, from 1970 to 1980, was characterised by a series of administrative circulars aimed at co-ordinating public sector computing, and the second phase, from 1980 onwards, was characterised by the emergence of multiple agencies involved in IT initiatives and various attempts to formulate an overall integrated IT policy. These developments in the two phases are now discussed in terms of underlying social structure and action, and their linkage is elucidated in terms of aspects of meanings, resources (power) and norms.

7.3.1 The First Phase: 1970-1980 National Computerisation and the Beginnings of Computerisation for SETIA

With the rapid increase in the number of tasks taken over by computers government realised the need to gain greater co-ordination in the use of computers. Beginning in 1970 (through Administrative Circular No. 1) (PMD, 1970) an inter-agency sub-

committee was set up to review the acquisition of computers for Federal ministries and departments. In 1973 (through Administrative Circular No. 4) (PMD, 1973) the sub-committee was replaced by the National Data Automation Processing Council (NDAPC), and control was expanded to statutory bodies. In 1976 (through Circular No.1) (PMD, 1976) and Treasury Circular No.8[1] (Federal Treasury, 1976) the council was replaced with the Automatic Data Processing Committee (ADPC). Duties of this committee included prescribing and guiding all agencies in matters related to procurement and installation of an electronic data processing (EDP). In this year serious attempts were also made by the Economic Planning Unit of the Prime Minister's Department to set up an integrated information system for central agencies.

The circulars which established the various committees, however, were not successful in exercising control in the acquisition of electronic data processing (EDP) equipment. Agencies, in particular statutory bodies with their own sources of income, acquired and enhanced EDP equipment without the endorsement of the ADPC. Similar results ensued when the EPU's integrated information system failed to command co-operation and when, at the same time the relevant computing skills to maintain and operate the system were lacking. These actions clearly indicate the limitations of the committee and of a key central agency, like EPU, in exercising control over agencies (ministries, departments and statutory bodies) and highlight the preferences of agencies to act individually.

The shortcomings of the control and co-ordination mechanisms can be explained in terms of the linkage between structures of signification, domination and legitimation. The need to ensure effective utilisation of computing resources in the public sector was not well communicated across the range of organisations, and some computer installations were not aware of the existence of the various administrative circulars. This was compounded by the fact that the committee had no executive responsibility for procurement and development of computer systems in departments, and no authority over personnel matters as these rested with the Public Services Department.

[1] Treasury Circular No 8 (Federal Treasury, 1976) included detailed procedures and guidelines regarding: installation of an electronic data processing (EDP) system; upgrading or improving existing system; replacing the existing system; and procedures for using the electronic processing system at other agencies.

In addition, the secretariats supporting the committee had limited expertise in and experience with IT. The committee also failed to facilitate the sharing of information between departments and thereby did not achieve an effective structure of domination to exercise control and co-ordination. Neither could the committee impose the sanction of accountability for use of funds in statutory bodies having their own income sources, or in departments and agencies with strong political connections. This lower representation in the committee reduced the perceived legitimacy of the centrality of the committee in relation to the control and co-ordination function.

However, despite a lack of support from agencies, the ADPC and other high-ranking central officers were keen to establish centralised computerised control. The ADPC recommended that a computerised system be centrally placed and controlled in the Prime Minister's Department. The committee drew upon various reasons to support their action. For example, the committee argued that with a centralised system all relevant data can be brought together in a single computer installation. This, it was argued, would not only provide opportunities for the use of a richer array of data but would also reduce data duplication. A second reason proposed by the committee related to data confidentiality; central staff could be appointed to be responsible for data access. Thirdly, since Malaysia has limited skills resources, centralisation minimises the demand for skilled personnel. Finally, a centralised system would minimise problems of organising and operating the diversified and specialised needs of various agencies.

7.3.2 The Second Phase: 1980 Onward and the Beginning of SETIA

In early 1980 the Implementation Co-ordination Unit (ICU) was formed and was placed under the Prime Minister's Department. The integrated information system project initiated by EPU in 1976 was revitalised and was placed under the control of ICU. In 1981 a revised interpretative scheme emphasising co-ordination in project management was communicated through Cabinet report on 'Steps to Speed up' implementation of development projects. This was subsequently embodied in the design and implementation of SETIA, and was integrated in the procedures of the Federal government machinery related to the creation, budget allocation, implementation, progress reporting and the financing arrangements of development projects. As the physical embodiment of this interpretative scheme, SETIA drew

upon a structure of signification that was expanded to include the needs for co-ordination of the central agencies handling the separate tasks of development management. This emphasis on co-ordination at the centre made an incremental modification to the preceding structure of signification with its focus on new technology to enhance efficiency.

The communication of this interpretative scheme was facilitated through an authoritative resource - the Director General of the Implementation Co-ordination Unit - who was to elicit the support of other central agencies (the Treasury, the Accountant General's Department, and the Economic Planning Unit) to co-operate in the integration of their existing information systems. However, the power relations of the central agencies and the implementing agencies remained the same, and as there were asymmetries in those relationships, this did not change the existing structure of domination. SETIA, as a facility in development management, reproduced the existing structures of domination in the relationships among central agencies as well as between central agencies and implementing agencies. In addition, in initiating and implementing SETIA, officers in the Prime Minister's Department drew upon the same set of values and norms regarding the central direction and management of development projects and accountability for the use of central funds that governed the institutionalisation of projects before SETIA (The Red Book Plan of 1960-1970). The ideological bases as rooted in the New Economic Policy emphasising poverty eradication and economic restructuring continued to constitute the frame of reference for the moral order of development management.

In 1981 the development scene for Malaysia was generally changing, and this coincided with the election of a new Prime Minister (Mahathir Mohamad) who brought about various social, ideological and economic changes. Social changes were mainly related to his desire to change Malaysians' (especially the Malays') ways of thinking from one of backwardness and complacency to that of being conscious and ambitious. Economic changes were directed towards a business-oriented, outward looking and industrialised country. He reaffirmed this view of Malaysia's status in one of his speeches in 1984:

> "The push towards the development of heavy industries represents another new dimension to national development. I believe heavy industries will bring

> substantial benefits to the economy in terms of technology, skills and the numerous spin-offs, and will lay the foundation for Malaysia to become an industrialised society. We will not give up being producers of various agricultural commodities but we should overcome the mental block which condemns us to being the producers of primary commodities to fuel the growth of the industrialised countries. We must raise our sights and have the conviction that we have the 'dynamic comparative advantage' to sustain the development of heavy industries" (Mohamad, June 1984).

The spirit of development beginning in this period (1981 onward) was towards advancing Malaysia economically and to resisting development intervention based on a colonial discourse. In the early part of Mahathir's administration, apart from the New Economic Policy which was retained, several major policies were written to support the new ideology. One important policy was 'Malaysia Incorporated' which was directly connected to the 'Look East' campaign which was strongly influencing the region at the time. The policy contained a notion for workers to serve their office (companies) as if they were serving the country; and with service to country and company compared to family. The interpretative scheme drew on a broader structure of signification accorded to the need for national unity: a shared sense of national purpose, particularly for socio-economic achievement. This interpretative scheme was communicated through formal channels and extensive publicity through all forms of media. By 1986 (after recovery from the 1984-1986 recession) Mahathir expanded his scheme for national development, and the concept of privatisation was included as a means to generate economic growth. Privatisation increased the number and nature of projects involving government agencies. It also expanded the scope of public projects into the international and arena there was a focus on large scale development with partnership with multinational corporations. These developments resulted in an expansion of the duties of the Budget Office (the Treasury), the policy office (Economic Planning Unit), and the expenditure office (the Accountant General's Department). Accordingly, changes also trickled down to State and Local offices. This produced an incremental revision to the broader structure of signification regarding project management and consequently weakened the structure of domination and legitimation between central agencies and implementing agencies at both State and Federal levels.

SETIA was intended to be fully computerised in order to effectively monitor the growing number of projects. Nonetheless, SETIA's core design which was essentially driven from the centre and served primarily the needs of ICU, was not changed accordingly and thus was not able to fit effectively with the ad hoc systems of the implementing agencies. The difficulty of supplying information to the centre was further compounded by the ad hoc and often manual systems of data processing at the local levels, especially in the Districts and sub-Districts.

As a result, by 1990 SETIA was beginning to lose control over co-ordination between central and implementing agencies. This experience led the Implementation Co-ordination Unit officials to modify their interpretative scheme, specifying that co-ordination should be decentralised at three levels, Federal, State (including District), and local authorities. But SETIA officers drew upon a dated computerised system and operational values of the 1970s, that is, central accountability over project development and ideological bases still rooted in the New Economic Policy. At project activity level, financing lay mostly with privatised schemes. In other words, although central government had a role in project schemes, government control has no longer 'primary'. Rather government was merely the secretariat, and project budgets were not controlled by central funds.

At the national level, a structure of signification was further developed. In February 1991 the Prime Minister announced a new national objective, enforcing activities which were intended to make Malaysia a 'developed' country by the year 2020. Mahathir claimed that:

> "By the year 2020, Malaysia is to be a united nation, with a confident Malaysian Society, infused by strong and ethical values, living in a society that is democratic, liberal and tolerant, caring, economically just and equitable, progressive and prosperous, and in full possession of an economy that is competitive, dynamic, robust and resilient" (NST, 28 February 1991).

Vision 2020 added a new sense of urgency to the tasks that lay ahead requiring a reappraisal of the current situation and a prospective assessment of the needs of the future. It demanded a new approach to planning, aligning socio-political objectives to growth targets and bringing into play all major factors of production. Science and technology were considered the driving forces to target the Vision's economic

growth. As such, following the Vision 2020 announcement, a 'Science and Technology' policy was introduced, envisioning four perspectives:

1 "Technologies for satisfying basic needs such as food and shelter;

2 Technologies for the quality of life such as health care, communication and transport, protection of the environment and stabilisation of population size;

3 Technologies for wealth creation and maintenance of industrial competitiveness; and

4 Technologies for governance appropriate for the needs of government in the high-technology age" (MOSTE, 1993).

The ideological base of the Science and Technology policy was placed in the belief that substantial economic growth is the key to attainment of the objectives of Vision 2020. It was argued that a sustainable economy could be attained by maintaining an average economic growth of 7% per year for the next thirty years. The growth target was to be met largely from manufacturing industries and services.

In its determination to meet these target, government involved itself with Foreign Direct Investment. By 1990, Malaysia became the third most important recipient of Foreign Direct Investment (about US$4.3 billion) in the developing world after China and Singapore (World Bank and UNDP, 1995) and industrial growth continued. An enlarged meaning for development began to emerge that suggested a shift from the industrial sector to services and multimedia.

In the late 1990s SETIA, as a facility for development monitoring, is looked upon by implementing agencies as obsolete and 'traditional' compared to new ideas that now dominate development. Consequently, senior administrators that manage SETIA have undergone several changes. SETIA's new leadership has no immediate plans to expand the programme in line with current development schemes such as joining with existing IT programmes such as NALIS and MSC. The results of this study shows SETIA will continue monitoring development projects based on a combination of manual and computerised systems. A metaphor used by Kling and Iacono (1984) '*drifting along a development trajectory*' perhaps is one way to describe SETIA current situation:

"a CBISs [computerised based information systems] may drift when developers react to somewhat conflicting demands made by users or from a rapidly changing environment over a period of years...CBIS is the by-product of many loosely co-ordinated implementation actions...loosely co-ordination developments (e.g., high staff turnover, rapid technological change, dynamic markets)" (Kling and Iacono, 1984, p. 1219).

7.4 An Information System of the 1990s - National Land Information System (NALIS)

NALIS was developed at a time when computerisation among agencies has reached a level of maturity. Many agencies in Malaysia have surpassed the barriers of basic computer use and are proceeding towards developing individualised information systems (Chapter 6, Part III). Similarly, at the policy-making level there are several IT committees that have developed comprehensive development guidelines for IT-related programmes. Members of IT committees, unlike in the early days of SETIA, are experts in the field, and each committee has a designated role towards an IT development programme. To illustrate the importance of the government's view on IT, a body, the National Information Technology Council (chaired by the Prime Minister) was established specifically to monitor and evaluate the effectiveness of IT programmes. The Automatic Data Processing Committee was reformed, employing committee members who are mostly bureaucrats with IT skills. At the land agency level, major land custodians (the Department of Survey and Mapping and Registry Offices) have started to implement procedures which move towards building an integrated system. Subsequently, Telecommunications Malaysia Berhad has been aggressively promoting the use of Local and Wide Area Networks for intra - and inter- agency communication.

The above factors, combined with the rapid pace of development in Malaysia, and an urgent need to have a better information system to help resolve land use conflicts, all encouraged the establishment of NALIS. The Ministry of Land and Co-operative Development was institutionalised to carry out co-ordinating duties. While NALIS was in its preparation stage, the Multimedia Super Corridor (MSC) was introduced and at the same time government announced a shift in its national development strategy towards services and multimedia or Information Technology. A focus on manufacturing industries was found no longer to help Malaysia's development

towards advanced country status. At the activity level, the Prime Minister himself has used his position to reinforce power relationships over individuals and agencies (private and public) across the country and world-wide, thereby reproducing the resources necessary for implementation of MSC. In order to administer MSC's development, rather than using the regular agencies, that is, agencies in the Prime Minister's Department, a separate agency (the Multimedia Development Corporation) was institutionalised and incorporated under the Companies Act. This agency is legally independent of civil service rules and regulations, yet since it has been established by the government it has the same power as a government body.

Introduction of the MSC saw government outwardly change the existing 'bureaucratic paradigm'. A new 'version' of government was created; government 're-invented' itself, working around the notion of empowering rather than serving; replacing bureaucratic processes with market processes; meeting the needs of customers, not the bureaucracy; earning rather than spending; preventing rather cutting and moving from hierarchy to participation and teamwork (Osborne and Gaebler, 1992).

The co-ordinator of NALIS (Information System Division - ISD - of the Ministry of Land and Co-operative Development), wholly engineered NALIS based on the government's new wave of ideology. NALIS reinforced the use of advanced high technology in its system design and approach with the view that the major part of the duties would be carried out by the private sector. The preliminary cost estimate for implementing NALIS, based on minimum requirements for organisation, communi-cations, hardware, software and data conversion (with some provision for contingencies) was estimated to be US$353 million (1996 exchange rate of US$1 to RM3.00). This expenditure was expected to be supported through a combination of financial support: government, franchising and privatisation. The proposal was as such: central government should supply infrastructure and communication facilities to link participating agencies to the system. Individual States wishing to participate in NALIS should then provide their own funding for the purpose of data acquisition and conversion, purchase of hardware and software, arrangements for staff training and for the necessary communication linkages.

The results of this study show that in order to minimise the overall cost to the government, the NALIS working committee recommended that the private sector should carry out as much of the work of acquiring, and converting and processing data as possible through franchising. Individual States and agencies are encouraged to franchise data acquisition, conversion and processing to private sector. In addition, clearinghouse operations, management and administration[2] could be privatised as could the bulk of converting topographic, cadastral data and associated attribute data.

The NALIS working committee also identified sources of revenue which could be generated by NALIS itself. Among these sources are services, including data exchange services, research and development (R&D) and product enhancement. Data exchange services refer to commission earned by clearinghouses through the management of data exchange. Consequently, data providers can earn their returns from the price charged per transaction based on the cost spent in producing the required data. With regard to research and development, the team assumed that new products developed through R&D could be a source of potential revenue.

However, unlike MSC, NALIS clients are government agencies. Consequently, the NALIS co-ordinator is not mandated with similar resources as the co-ordinator of MSC. In addition, unlike the MSC co-ordinator, the co-ordinator for NALIS has no direct access to the Prime Minister for enforcement. Rather, NALIS faces similar problems to those of SETIA's co-ordinator. These co-ordinators oversee development in a variety of ministries, departments and agencies that have differentiated objectives and differentiated interests and levels of capability in the use of IT. In addition, the co-ordinator has no administrative or budget control over these agencies who are thus able to develop their own systems without the co-ordinator's consent. Control over growth of individualised information systems was exaggerated when MSC announced both the possibility for upgrading of telecommunication and communication services for agencies nationwide and the availability a of large expenditure budget for IT purposes. Within a year of NALIS' announcement agencies at Federal levels started establishing organisational or State level GIS systems. At the time of the fieldwork for this study these agencies and States were at the planning

[2] This includes the necessity to establish procedures for maintenance and updating of the data directory of various information communities.

stage of establishing the following systems: at Federal level, Kuala Lumpur City Hall GIS (KULGIS) which covers Federal Territory and Kuala Lumpur; Geological Survey GIS, covering the whole country with respect to geological data and information; Indah-Water Consortium GIS (GIS-IWK) which covers the country's sewerage system. At State level,[3] major GIS systems included: Kedah GIS; Melaka Land Information Infrastructure; Perlis GIS; Terengganu GIS; and Pahang State Executive Information System (similar to SETIA).

The Information System Division (ISD), as the facilitator of NALIS, was unable to establish co-ordinated working efforts among the individualised systems. This can be attributed to two major factors. Firstly, the committee which was assigned to standards development (common referencing, data exchange and other related standards) was not functioning. Participating agencies were left to develop their systems without any guidelines. The agencies only choice, therefore, was to continue their existing practice of data collection and management, and thereby the problems of data and information duplication have remained. Secondly, NALIS' design and approach were not effectively translated to participants. Many were not familiar with the terms and concepts used in the design and were therefore unable to provide the necessary support to NALIS with respect to data models and standards. Thirdly, the ISD officer lacks the necessary advanced IT knowledge which is desired to manage and co-ordinate the sharing and exchange of land information. The ISD has depended on local experts (officers from major land custodian agencies) and consultants although the ISD was weakened when some of the experts they relied were recalled back by their respective heads of department or agencies. This withdrawal of skilled staff paralysed the ISD which in turn directly affected the implementation schedule for NALIS. The NALIS operational plan was further weakened when the idea of nationwide communication promised by the MSC programme was disrupted due to a lack of resources (financial and skills). The ISD continued with their ideas for NALIS, but the scale of operation was readjusted. NALIS' new operation centred on major producers of land information, covering agencies in the Ministry of Land and Co-operative Development (MLCD), the Department of Survey and Mapping, and Land Offices. NALIS' design was therefore significantly simplified, meeting the needs of several participating agencies. Agencies interested in access to NALIS were

[3] Within a State there were numerous departmental level systems being planned.

required to individually facilitate and finance themselves with the necessary support systems.

The foregoing discussion has attempted to use the themes of structuration theory to highlight how initiation and implementation of information systems in Malaysia have been linked to government policies and organisational behaviour. The discussion has also tried to illuminate how aspects of meanings, power relations and norms were related to the transition to change made on implementation. The initiation and implementation of information systems can be defined as highly vulnerable to the environment in which the information system is implemented. Change in national development strategy helped to change organisational strategy. The interpretation brought to light the idea of duality of structure - change is produced both by action and non-action of participants. As Giddens (1976) argued:

> "The production or constitution of society is a skilled accomplishment of its members, but one that does not take place under conditions that are either wholly intended or wholly comprehended by them. The key to understanding social order...in the most general sense of that term...is not the 'internalisation of values', but the shifting relations between the production and reproduction of social life by its constituent actors" (p. 102).

Social structures built to help development are the same social structures that act as constraints on development activities. Malaysia's information system development is constructed on beliefs which are visualised by policy-makers and organisational leaders. From a structuration theory point of view one could argue that policy-makers carry out actions based on resources and rules they believe conform to the reality of their social constructs. The Prime Minister, for example, believes that Malaysia is capable of undertaking advanced development programmes because:

> "we have an administrative machinery which we can be proud of. It is not only efficient, disciplined and productive, but also provides quality service and is comparable to the administrative machinery found in more developed nations ...Malaysia does not face the kind of problems encountered by many developing nations because its administrative system is well organised and forward-looking. It has succeeded where many countries, which achieved their independence after the Second World War, had failed because the government had a capable and dedicated administrative workforce" (Mohamad, 30 April 1993).

The Prime Minister has been quoted as believing, in 1997 at least, that Malaysia is financially strong and has the political will and power to carry out desired

development programmes (NST, 29 May 1997). Other policy makers generally hold similar views. One example comes from the chairman of MIMOS who supported the notion that Malaysia had been making a successful transition from one phase of development to another (from agriculture to manufacturing industry). He believed based on these past records that the prospect of shifting to high technology programmes "*appears very good*" (NST, 29 May 1997).

At the level of the organisation ministries, departments and agencies constructed different sets of beliefs to fit their own requirements. Many organisational leaders have shifted to advanced IT believing that skills (indigenous) and infrastructure will be forthcoming. The delivery of skills was believed possible because the country had the financial capability to continue training (of local staff) and the ability to employ foreign experts to overcome short-term skills needs. In terms of infrastructural support, activities carried out by MSC were believed to cover every aspect of physical IT infrastructural needs. With regard to management and administration existing IT-related committees (National Information Technology Council; National Land Council; National Council for Local Government; National Remote Sensing Committee; National Committee on Data Processing; National Mapping Committee) believed that 'somebody' was developing appropriate IT standards and guidelines. In reality some of these assumptions and beliefs were naïve since many aspects (e.g. IT training schemes and land-use standards) were still at the early planning stage.

Similar representations could also be observed at the national planning level. The discussion in Part II explores these relationships looking in particular at how policy-makers motivate organisational leaders and subsequently the general level civil servants. It then goes on to explore how actions of government leaders and organisation actors produce and reproduce Malaysia's development pattern. At the same time, the discussion illuminates further the behaviour of key actors (at the policy level and organisational level) who consciously or unconsciously help to generate problems within programme implementation.

PART II: Consequences for Malaysia Development

7.5 Policy and Development

Since the early 1970s computerisation initiatives have been characterised by centralised control and a strong play for power by agencies from the Prime Minister's Department and Federal Ministries in general. However, the Prime Minister's Department and associated committees through the years, had only limited success in gaining co-operation from many Malaysian agencies. Central administrators lacked the relevant computing knowledge to make appropriate decisions although in a sense this was irrelevant since these key actors role were always supported by rulings from the Cabinet. Decisions distributed made by the Cabinet (in the form of circulars) were clear and exclusive in terms of designating power of control but were broad with regard to effective working strategies. Provision of control has continuously disregarded knowledge or understanding of a particular project and has been based instead on seniority. The resulting procedures and guidelines which purported to be a working strategy were, in fact, simply a reiteration of what an agency could and could not do. As a result agencies began to develop their own documentation which in turn produced different styles of guidelines for computer installation and use.

Post-1980 policies for development, which, in a sense differed little from those of the 1970s, were guided by two objectives, both being based on the Prime Minister's world view. The first objective focused on competitive ability and measures to survive competition; the second emphasised the importance of social and economic harmony among all Malaysians. The two objectives are interrelated, in the sense that achievement of the first would demonstrate that despite the complexity of Malaysia's society, a viable economy is achievable.

The Prime Minister's development policies were, however, dynamic and many in Malaysia have opposed the approach of development, arguing that Malaysia is growing too fast and that the shift in economic policy (particularly in the industrial sector) is not supported by a skills base in the majority of the population (see, for example, Jomo, 1989;1994; The Economist, 1995; Bullis, 1997). The present research supports the assertion that Malaysia's ambitious development programme has improved the country 's 'image' in terms of growth and economic achievements,

but has not realistically translated economic achievement into improving the real level of 'development' for many people.

Decisions made by political leaders for national development to be pursued by means of promoting aggressive industrial initiatives increased economic growth from an average of 6.0 % in 1970, to 7.5% in 1980 and to 8.7% in 1990 (GOM, 1991b). Undeniably, all communities and regions have benefited directly or indirectly from the growth of the economy through substantial improvements in income and living standards. For example, the national incidence of poverty[4] at 52.4% in 1970 was reduced to 17.1% in 1990 (GOM, 1991a) and was projected to be 7.2% in 1997 (GOM, 1996). This substantial reduction in poverty was partly due to improvements in productivity and income levels among the target groups such as rubber smallholders, estate workers, paid farmers and fishermen. The main source of progress in reducing poverty, especially during the 1980s, came from the growth of the economy which created expanding employment opportunities in the non-traditional sectors and which enabled the poor to diversify their sources of income, thereby reducing their dependence on traditional low income and low productivity activities. As rural households gained more access to these opportunities and with the tightening labour market, conditions resulting in lower unemployment and higher wage incomes have expanded. The shift towards waged employment among rural households constituted the most important factor accounting for the reduction of poverty in the country.

Some have argued, however, that initiatives taken by Malaysia have failed to encourage independent development (World Bank and UNDP, 1995). This line of argument points, for instance, to the lack of local participation in enhancing Malaysia's development. Rather the development shift from agriculture to manufacturing industry was made possible through assistance from Foreign Direct Investment. Malaysia taps the advanced skills, especially from multinational

[4] Poverty in Malaysia is measured on the basis of poverty line income (PLI). The PLI takes into account the minimum requirements for food, clothing, shelter, and other regular expenditures that are necessary to maintain a household in decent standards of living. The incidence of poverty is directly estimated by observing the number of households whose incomes are below the PLI. For 1990, the poverty line was RM370 per month for a household size of 5.1 in Peninsular Malaysia, RM544 for a household size of 5.4 in Sabah and RM452 for a household size of 5.2 in Sarawak (GOM, 1991a).

corporations, while providing in return, benefits in terms of competitive wages and overheads. Multinational corporations offer capital, technology, managerial skills and access to markets. It has been argued then that Malaysia's impressive transformation has left the country's industrial structure dependent on foreign experts for design, development and other advanced skills (World Bank and UNDP, 1995; Wolf, 1997).

In 1996 a more drastic development shift was introduced to services and to the information technology industry, though preparation in terms of a skilled workforce and a Research and Development (R&D) base related to these industries only took place simultaneously with the construction of facilities for the Multimedia Super Corridor. An educational policy specifically focusing on support for the multimedia service industry came several months after the Prime Minister's announcement for industrial shift. It could be argued that a general development shift by way of the MSC came as quite a surprise even among Malaysia's 'intellectuals' and learned society. During the course of this research typical views expressed by professionals and graduate students included the following:

> "I have heard a lot about the MSC on TV. I don't really know much about it but I think it has got something to do with multimedia. Perhaps there should be more effort to promote the MSC among students in the universities and colleges since it will ultimately affect the whole population. It can also help us to better understand what it really means and the objective" (Graduate student, University of Malaya, fieldwork, interviewed January 1997).

> "The MSC sounds frightfully impressive and I am sure it'll push Malaysia to the forefront of global attention. I guess it's also good for the economy and expansion of new technologies. However, the concerned authorities need to educate and inform the general public on what the MSC actually is and what good it'll do them. The bits of information we get here and there somehow do not suffice. I have yet to meet someone who can give me a coherent explanation of what it actually is all about and how it'll operate" (Lawyer, Dexcell Sdn. Berhad, Kuala Lumpur, fieldwork, interviewed January 1997).

However, there are some[5] in the IT business who are conversant with the Multimedia

[5] Managers from various computer companies were approached when the author attended the Multimedia Asia 1996 seminar held in Kuala Lumpur. Among these were the General Manager of Digital, and Managers from Acer Sales Sdn. Berhad, Accurate Information System, Delta Computers, Sun Microsystems, Oracle, Intergraph, Mesiniaga and IBM. Of these companies, Intergraph and IBM were subsequently approached again for an interview.

Super Corridor approach, and who were sceptical of its success when viewing it from Malaysia's weak R&D and skills base. One executive from IBM at Kuala Lumpur argued that:

> "Transfer of technology is an acceptable start but it must be followed through. We can't expect foreign companies to continuously transfer their technology over now, can we?...One can buy a technology to have access to it but competency in that technology can only be acquired through learning and living it...It is fortunate this country can afford to offer what it is offering to get foreign companies to participate in the MSC. But what will happen if some other country could offer the same...Providing multimedia services and content, I believe, should not be too difficult for locals....But the crucial factor here will still revolve around technology that allows composition and delivery of the content. Malaysians must own that technology. As such the long term solution will still be R&D" (Research and Development Division, IBM Kuala Lumpur, fieldwork, interviewed January 1997).

Abrupt policy decisions and rapid policy shifts have resulted in continued ad hoc planning; this has benefited some quarters but has come as a disappointment to others.

7.6 Policy and Geography

Internal population migration escalated after independence in 1957 and has particularly grown in pace since 1980, with motivations to migrate driven by economic opportunities (Fong, 1989; Chan, 1994). With heavy industrialisation in the west coast[6] of Peninsular Malaysia, Selangor (including the Klang Valley) for example, where many of these industries are located, has experienced a population growth rate of 4.3% per annum continuously from 1980 to 1991. The Multimedia Super Corridor initiative is another incentives for migration towards the west coast, in particular the already highly congested area of the Klang Valley. There have been several government policies introduced in an attempt to alter this pattern. Between the 1970 and 1980 the government introduced regional development schemes, building industrial zones in the east coast and in the economically backward States of the west coast notably the Malay populated State of Kedah. Many of these industries (especially in the Malay populated States of Kelantan and Terengganu on the east coast) could not survive market competition from the highly developed west coast,

[6] Other States in the west coast which have also experienced high growth rates are Pulau Pinang and Johor with, respectively, 3.4 % and 4.6 % per annum from 1980 to 1991 (GOM, 1981; 1991a).

however, and also disagreed with Federal policy[7]. As a result many factories were forced to close. Hence, since 1980 States that are not within the economically viable areas have continued to grow only incrementally or have remained stagnant. These 'marginalised States' are poorly provided with basic services and are given least preference in term of allocation for SETIA and NALIS programme budgets. For example, in 1997 while about 82% of the 'poor' households[8] in Peninsular Malaysia had access to electricity, for Sabah and Sarawak about 47% and 50% of poor households, respectively, had such access. With regard to piped water, the coverage is relatively low, benefiting only about 57% of the poor in Peninsular Malaysia, about 20% in Sabah and 15% in Sarawak (GOM, 1996). Accessibility to educational facilities was similarly unequal; in Peninsular Malaysia 94% of poor households have access to education compared to 85% in Sabah and 64% in Sarawak (GOM, 1996). Selangor, Klang Valley and Johor continue as the most populous areas with the highest population growth rates. This imbalance of development is expected to continue, since new development strategies seem to be changing little in terms of regional inequalities.

7.7 Policy and Public Organisation

Development programmes in Malaysia have been largely driven by a centralised force, with strongly political motives. In Vision 2020 the Prime Minister stated that *"no nation can achieve full progress with only half of its human resources harnessed."* Mahathir emphasised that the Malays should continue their part in the achievement of development goals and he reasserted the imperatives of "*an accelerated industrialisation drive, economic liberalisation and deregulation*" which he believes to be a *"winning formula that had rescued the nation from recession and would safeguard the economic defence strategy*". Privatisation is placed as the *"primary engine of economic growth*". In addition the vision includes the forging of partnerships with international companies *"because a country without strong economic capabilities and the ability to marshal influence and create coalitions in the international economic arena is an economically defenceless nation and*

[7] For example Kelantan and Kedah States require factories to adopt a Muslim law that restricts women employees (Malays) to working at night and that requires women to adopt a Muslim code of dress.

[8] In 1990 the total number of poor households was estimated by the government to be 620,000 (urban poor = 89,100 and rural poor = 530,900 (GOM,1991); in 1997 the estimated number of poor households was 372,900 (urban poor = 80,300 and rural poor = 292,600) (GOM, 1996).

economically powerless State [which] *Malaysia cannot afford to be*" (Mohamad, November 1991).

The findings of this research have demonstrated the adoption of Mahathir's ideology into the practice of organisational leaders on different programmes. But for many organisations this adopted ideology was not translated into a working strategy. Rather the motivation was for the organisational leaders to improve themselves and to increase their individual financial status. In the case of SETIA, many organisational leaders, especially those from the Prime Minister's Department and other major ministries such as the Ministry of Industry and International Trade and the Ministry of Public Enterprises, were transformed through privatisation ventures, from civil servant to corporate executive. Here the boundary between government and private becomes increasingly unrecognisable. With the acceptance of commercial culture in government a more complex bureaucracy was formed; jealousy and competition became widespread not only among controller agencies such as the Economic Planning Unit, the Implementation Co-ordination Unit, the Treasury and Accountant General's Department, but also among other ministries and implementing agencies at State level.

It could be argued that Malaysian organisations in the 1990s are consistent with the postmodernist description of postbureaucratic organisations, involving a sense of paradox, indeterminacy, heterogeneity and disorganisation: a "*general impression of disorientation and chaos'* (Bauman, 1988, p. 793). As Gephart (1996) explains:

> "There is no overriding 'rationality' guiding the postmodern system, only the logic of commodification reproduced in situational forms that themselves are often contradictory. There can be no appeal to powers beyond the organisation because even 'government' control is vanishing. Increasingly, managers and employees may ask 'What's in it for me?' and within the situational controls of their life space, this may be the driving rationality for action" (p. 38).

Differentiated levels of development added to these 'images of commodification' in organisations have made for complex and competitive programme's operating among government agencies themselves. With NALIS, it is evident from this present research that the leadership were more concerned with establishing itself and in spending the allocated budget on high-technology procurements. As expressed by

Cartwright (1991) "*Now in a curious way, the major obstacle is often too much enthusiasm rather than not enough... they want to run before they can walk*" (p. 15) For NALIS, such enthusiasm drives the organisational leaders towards the adoption of sophisticated and extravagant designs: a design (the Canadian open windows concept) which is so obviously different from the Malaysian context, socially, culturally, administratively, economically and politically.

7.8 'Malaysian' Development Character

Organisational behaviour in SETIA and NALIS is not atypical of public programmes in Malaysia. Some of the decision-making issues identified by the present study have also been highlighted for other programmes (World Bank and UNDP, 1995; Jomo 1990, 1994; Chee, 1989; Bullis, 1997; Newsweek, 29 September, 1997; The Economist, March, 1997, 29 March 1997). However, generally views that question government performances are interpreted as criticising the credibility of administrative' leaders and public servants in general. For example, though many outsiders think the MSC project is a bad investment, this view is not shared by most Malaysians, in particular those in government organisations. Similar conceptions apply to other public projects.

These issues can be understood only by exploring the social discourse of 'Malaysian' society in general and public servants (who are mostly Malays) in particular. Malaysia is made up of several communities. Within these communities Malays are the dominant group and are also the principal policy-makers. This dominance of Malays over other communities has not been received favourably by the other communities and arguments against Malay control have prevailed, both before and after independence. Development policy preferences towards the Malays are clearly apparent. For example, Malaysia's economic policy emphasised first the eradication of poverty and second, the restructuring of society. The first refers to providing the Malays (among the poorest group in Malaysia) with economic and educational opportunities and the second aimed to make the Malays 'equal' to other communities in particular the Chinese in terms of social, economic and geographical factors, such as basic living needs; income and moving the Malays to urban environments.

Malays are typified in "The Malay Dilemma" (Mohamad, 1970) as '*laissez faire and tolerant,*' prefer '*politeness and abhorrence of unpleasantness,*' and having a '*fear of anarchy*'. Mahathir argued that these were the cultivated marks of good manners and good breeding, but that in politics, these attitudes were exploited by others and led to the Malays giving up "*apparently, politely, almost every vestige of power and authority in their own land*" (p. 118). In business and commerce, the Malays were felt to be severely handicapped by their "*code of ethics and value concepts*" (p. 116). In other words, they adopted '*fatalism*' (p. 158) an "*inability to accept the inevitable*" (p. 114), and a "*failure to appreciate the real value of money and property*" (p. 169). In contrast, Mahathir sees the Chinese as inherently good businessmen, and hard working. He believes that sympathy and understanding are not strong Chinese traits, and therefore the Malays need to be assisted because when the Chinese conduct business, "*not even the crumbs are left to others*" (p. 56).

The Malays view government policy-makers in a way which is notably different to that of other communities in Malaysia. Malays place more trust in government to provide them with the channels to upgrade themselves and criticisms of government action, particularly on unequal distribution of resources, are often not supported by Malays. A highly criticised programme such as SETIA is one example. SETIA is known as a programme designed to monitor the achievements of Malays. Despite its many problems, decision-makers believe that through its monitoring devices, SETIA has been able to generate and identify more projects for Malays. At the same time though, SETIA has indirectly initiated awareness among public offices towards computerisation. In fact, SETIA is the first programme in Malaysia that has worked continuously towards introducing computerisation at grassroots levels, and towards employing Malay staff in District and even Sub-District areas. Similarly the introduction of NALIS has increased awareness in the use of advanced IT in certain quarters and has reinforced the need for non-IT staff to explore the capability of new technology, such as GIS.

There are numerous examples of projects and programmes that have directly provided for the Malays. In the 1970s and 1980s, there were public enterprise programmes, urban development programmes, regional land schemes and regional development programmes. The post-1980 period saw further increases in projects for Malays not

only in number but also in scale. From this perspective, if anything, the government has succeeded in engineering a Malay class based on the parity of Malay with non-Malay in a capitalist economy.

7.9 Conclusion

Government development programmes in Malaysia have to be considered not only in terms of what may have been intended at the outset, but also subsequently in terms of the objectives, hopes and aspirations hidden within these programmes. At another level, the implementation of a programme, and how this has been perceived, must be taken into account from a similar perspective. Hence, the programme may well mean different things to different people. This is not surprising since different people are differently affected by changing policies which guided the programme. But one trend has been quite clear, that is, of primary, if not exclusive, emphasis on development for Malaysia. The continued commitment to industry and high technology will hardly be de-emphasised, especially by the present government. The same can be said about the intensive privatisation policy currently being pursued, and which include transfer of public monopolies into private hands. This focus on privatisation has the unintended consequence of postponing the urgent need for public sector change. The privatisation of some activities, such as the NALIS programme, has done little to address serious problems such as the duplication of data collection and the pressing need for a co-ordinated management system allowing data access and sharing. Rather it has precipitated animosity within and across organisations. Consequently the direct involvement of government with private ventures has undermined efficiency and dynamism, and has created opportunities for corruption.

To bring about a change from the existing agenda will be difficult. Policy-makers and decision-makers seem to be trapped in a system, partly of their own making, which may well prevent them from initiating and implementing change. The pressure for change will have to come from outside the government system. Unfortunately, however, the limited public discourse on such matters of national importance has meant that relatively few people have been able to seriously consider those issues, let alone develop solutions for them. Rather, the national agenda has largely been defined by the existing limits of social discourse acceptable to the 'coalition in power'. To make necessary headway, it will be crucial that the nation transcends the constraints

in which it is caught. Chapter 8 explores some of the possible turns which Malaysia may take and suggests areas which need further research towards understanding Malaysia's development ideology.

Chapter 8 Discussion: where do we go from here?

> "The state's behaviour, and the consequences of that behaviour, are being scrutinised like never before. The scrutiny might lead to better government. But if states are unable to respond constructively to the challenges they face, the result could simply be further erosion of the state's credibility, as the gap between what the state can do, and what people ask it to do, widens even further" (World Bank, p. 19, 1997b).

8.1 Introduction

Despite efforts to improve social living standards Malaysia's national IT strategy is moving further away from basic societal issues. This thesis has explored the history of two information system development programmes from their early beginnings, and has shown the types of changes which government has produced, how they are produced and why they are produced. The message is clear that government can meet development demands, but only by matching what it tries to do to with what it can do, and by working to increase the number of things that it can do capably.

This thesis has evaluated two information system programmes, SETIA and NALIS, in the context of IT for 'development' in Malaysia. Under this central theme the thesis had five objectives (see Section 1.4).

1. to evaluate the process of information technology adoption in the organisational context and to explore the strategy (if any) of making information technology choices.

2. to identify in detail where significant IT adoption has taken place.

3. to assess adaptation issues, that is, how much the adopted IT has been adapted by the organisations.

4. to explore the broader contextual factors, external and internal to agencies, that may have affected IT programme development.

5. to assess how IT has improved communications within and between organisations; and within areas in Peninsular Malaysia and between the regions of Peninsular Malaysia and East Malaysia.

This final chapter draws together the key conclusions of the research within the context of the above objectives. The first section (Section 8.2) briefly explains the pattern of information strategy as understood through the execution of this research. In Sections 8.3 to 8.6 government's role in the development of information systems is discussed. The chapter ends by evaluating the lessons learned from the implementation of large scale information systems in the context of a developing country. The behaviour of actors, in particular government servants and political leaders, is considered to be a key influencing factor in achieving programme success or failure. Recommendations for future research directions are made in Section 8.8.

8.2 Information Strategy and Development

Malaysia lacks a clearly identified and consistent information strategy. What Malaysia really has are objectives in terms of the intention of policy-makers regarding which programmes should be introduced and why. Definitions of how a specific programme should be implemented or consideration of the real value of an information system to the potential users (Bawden and Blakeman, 1990; Campbell and Masser, 1995) tend to be missing. Factors relating to the function which information technology should play in the overall life of an organisation and users; whether the users are capable of understanding the technology; how integral IT is to the users' objectives; and whether IT is seen as a strategic tool have not been given proper consideration. As Bawden and Blakeman (1990) argue: "*One of the most important roles for IT planners is to see that these factors are decided upon, and clearly stated; otherwise a degree of chaos...is the most likely result*" (p. 157). Campbell and Masser (1995) also find that without clear strategy guidelines "[the] *chances of systems becoming redundant would seem to be high without a widely accepted sense of the information needs of both the organisation as a whole and individual members of staff*" (p. 46).

Difficulties in devising appropriate strategies are compounded when the organisers of a programme themselves seem to be unsure of the prerequisites required in setting up a large scale information system, in particular in terms of the appropriate technology and skills. Generally such decisions in Malaysia are based on a 'belief' of what is needed by the users. This belief is not based on the decision-maker's own understanding of Malaysia's IT needs; rather through knowledge being passed on to decision-maker by consultants.

One key reason for the inability of local decision-makers to make informed judgements for their targeted programme(s) occurs when the operational structure of the programme is imported from another society, usually an advanced country. This approach has led to a continuous process in Malaysia of dependency of the organisers (and, indirectly the users) on consultants - from the inception of an idea through to the design, planning and implementation phases. Typically, although consultants can have expert knowledge of information technology, they are less likely to understand the organisation's (client's) objectives, and its political and economic environment. Indeed this finding is in accordance with the view of many researchers who have argued that lack of attention to political, organisational and psychological issues, is the cause of deficiencies in many information system developments (Bostrom and Heinen, 1977; Mumford, 1981; Zmud, 1983; Freidman et al., 1984; Kumar and Welke, 1984; Campbell, 1991; Masser and Campbell, 1991; Nedovic-Budic and Godchalk, 1996).

Such shortcomings may not be recognised by the consultants nor are these issues often addressed by the clients. Usually in Malaysia a number of committees are established in an attempt to overcome these inconsistencies in knowledge. Typically two levels of committee are formed - steering and technical. The steering committee is made up of policy-makers, usually represented by the most senior members of the programme office. The steering committee, for NALIS, for example, is headed by the Secretary General of the Ministry of Land and Co-operative Development. The committee's role is to monitor the progress of the consultant and to provide the consultant with appropriate assistance. The technical committee is made up of officers with expertise in information technology and their main duty is to assist the consultant in terms of information relevant to their offices and related development factors. This approach in fact relies almost totally on the consultant's professional values; local staff (the technical committee) are merely feeders of information to the consultant. The necessary detail unique to Malaysia's organisations and which could be identified only by local staff, can be overlooked in this process.

As the SETIA and NALIS programmes illustrated, this type of approach may look impressive as a presentation paper to the Cabinet but it is not viable in a long-term, practical context. Consultant input works well at the advisory level, but the broader

planning and implementation arrangements are best understood and decided by local organisers. The consequences of failing to acknowledge the need for appropriate supporting resources were revealed before the pilot study phase in the case of SETIA and during the pilot study for NALIS. With SETIA, programme planning had to be re-adjusted for there were simply not enough facilities to cover all of SETIA's participants and there was insufficient staff to handle data collection, processing and transfer. With NALIS the situation was even worse, with no data for the system to operate on, GIS skills were inadequate and, except for few agencies in major centres, a communication systems for data transfer were lacking.

8.2.1 Policy and Development

Policy guidelines for planning for new information systems are rarely lacking in Malaysian organisations; rather there can be too many. Often the guidelines are vague and changeable and add confusion to a situation. The World Bank outlines the consequences of drawing up uncertain and unclear guidelines:

> "If the state changes the rules often, or does not clarify the rules by which the state itself will behave, businesses and individuals cannot be sure today what will be profitable or unprofitable, legal or illegal tomorrow. They will then adopt costly strategies to insure against an uncertain future..."(World Bank 1997b, p. 32).

A case in point is the Multimedia Super Corridor experience. Financial crises that hit the East Asia region in mid-1997 have affected international interest in the Malaysian market. This has forced the Multimedia Development Corporation to turn to local investors to promote the Multimedia Super Corridor; an initiative which was treated as secondary before the financial crises happened. This approach caught local agencies by surprise, and government suddenly changed its focus of investment towards locals who are not able to support the Multimedia Corridor undertaking and do not fully understand the rationale behind it. Nevertheless, it is unlikely that many projects, whatever the country establishing them, could plan for such cataclysmic events as the mid-1997 economic crises in Asia.

SETIA, since its initiation in 1984, has undergone several transformations to adapt to rapid changes in policy. But modifications to the programme have failed to result in improvements in programme performance which, if anything, has worsened. After a

certain period of time, policy changes became taken-for-granted by the co-ordinators and participants, and policies with slogans such as 'Look East', 'corporatisation' and 'privatisation' gradually lost their appeal. As Cole (1991) argued:

> "A common problem management faces at all levels is information overload... 'More than two objectives is no objective', may be exaggerated, but it makes the point well. Too much information [guidelines] leads to a lack of clarity in priorities. Furthermore, too much information in the form of guidelines for action leads to reduced employee discretion and therefore a loss of employee initiative" (p. 34).

8.2.2 Policy Changes and Organisational Strategy

Notwithstanding the issue of changing policies, government has had a major influence on structural change in the demand for technology. For example, the rapidly growing demand for a wide range of technologies used in information technology production stems directly from major government initiatives to develop that industry (notably the Multimedia Super Corridor). However, although technology objectives are clearly associated with such initiatives, these forms of government policy are primarily concerned with broad issues of information technology development strategy, and they are implemented primarily through aspects of trade policy and the range of mechanisms for information technology promotion. A more specific information technology development strategy should now follow from this general policy.

An organisation should have its own strategy related to its true objectives. In order to avoid unnecessary purchase of technology which does not fit organisational needs and capability, this strategy should then be translated into the requirements of those who will use the systems. This is to overcome unnecessary purchase of technology which does not fit organisational needs and capability. As exemplified in NALIS, in the excitement of establishing a sophisticated system, organisers have allowed themselves to be driven by technology which led to the introduction of a system for the wrong reasons. This study argues that one of the most important duties to those who have to plan for the introduction of an information system is to decide when a computerised information system should *not* be introduced. In some circumstances computerisation can be inappropriate to an agency for many reasons, for example, if the agency is too small to maintain a computerised system, or if staff are unwilling to install it because most information is classified. As exemplified in NALIS, some agencies simply

resisted the installation of Local Area Networks (LANs), not because of maintenance or installation costs, but because they were not ready to share their information with others.

Willingness to develop a clear organisational strategy depends on the behaviour of an organisation's leaders, in particular the programme co-ordinator; how they perceive participation of its members and their task to introduce IT where it is appropriate and not wherever it can be forced in. Successful implementation of IT is a process that works gradually; there must be specific recognition of the potential for interaction and integration between the technology and the people who are to use it. These findings, in the context of the present study, are in line with the approach taken by successful programmes such as the Land Information System for Hong Kong (Yeh, 1990) and the Singapore Land Data Hub project (Tang-Kwong, 1994). The incremental approach has the advantage of taking on smaller staged investments that both bring in a series of new technologies; and allow time for the organisers and users to adapt to the new technology. This process, then, establishes a pattern of continuous technology upgrade, an approach suggested by many researchers as the most appropriate for countries with weak infrastructural support (capital and human resources). Thus, although the process of implementation will be slow it will almost certainly lead to a more measured pace of investment and deployment.

8.2.3 Participation and Expectation

In the cases of SETIA and NALIS, a large majority of the officials interviewed felt that their influence on the choice of technology was minimal. From a typical desk officer's viewpoint, an agency enters the programme cycle, that is, the process of identifying, preparing, appraising, modifying, approving and implementing a programme, when it receives a programme proposal. Most agencies take the view that by then the basic questions of programme design have already been settled, and they can hardly propose substantive modifications, partly because of a lack of information, but more so because of in-built organisational (political) constraints inherent in an 'arm's length' relationship.

In Malaysia, as in a number of other developing countries, provision of true grass-roots participation in project planning is rare. As argued by Thomas-Slayter (1987)

some programme organisers assume that people at grass-roots level know very little and therefore not allowed to have a 'voice'. In the case of SETIA and NALIS, participation was undertaken by a co-ordinating agency but was conducted half-heartedly. For example, from over 356 agencies (and thousands of participants) about 14 major agencies (represented by, at most, one or two officers) were selected to participate in discussion. These agencies are generally categorised as a technical group; their duty is to 'feed' consultants or organisers with their agency's information. The organisers are usually made up of appointed high-ranking civil servants who serve to hold control in discussions and decisions. Discussions are carried out quite regularly but technical representatives usually only listen and follow, in what civil servants refer to as 'monologue meetings'.

Information technology programmes cannot easily be planned based on selective representation. Introduction of new technology depends crucially on the nature of the organisation and agency in which it operates. In most cases representation left to an individual may seem unfair, for the person selected may not necessarily be devoted full-time to this work or may not have the mix of skills required to: understand planning the implementation and use of a large-scale information system; have a thorough knowledge of their agency and its aims; and have a sensitivity to the needs of its users. In an agency it is not possible for one person to have this mix of skills and knowledge (though one can be assumed to have it). It is safer therefore for every agency to form a team with a mix of technical skills and knowledge of the technologies, knowledge of the organisation and its staff, and awareness of the information and communication flows and the management operation.

A programme should be able to maintain its effectiveness if its establishment is supported or needed by the people. A programme which evolves through people's needs will usually need minimal effort to sustain support. On the other hand, a programme that is imposed on people (without first taking into consideration their particular circumstances) may generate scepticism. Essentially the programme organiser or management would benefit from adopting a learning attitude at the outset and from establishing a culture of learning with respect to all aspects of the specific development programme so that participants are included in the whole programme development process. Participation provides a valuable source of

knowledge and insight which can serve as a basis for innovation, and adjustments formulated on this basis will be far more easily implemented. Participation reduces the risk of inappropriate methods being imposed on users, ensures that the agency's resources are a foundation for development and checks that its capacities are expanded to include new options.

In principle, participation involves putting decision-making where the information is. This is in order to reflect the fact that the staff have a lot more information in their heads than management usually recognises. While it is true that staff often have information they do not share with management, the converse also applies. Indeed, a critical objective should be to supply feedback information throughout the organisation, as it relates to the achievement of specific organisational goals. Moving information down through the organisation by a strategy of information sharing is one approach. Clearly, it is also important to move information up.

8.2.4 Participation and Realisation

The process of moving information upward through an organisation could be set-up but how far could it be realised? In other words, how much is information from the grass-roots level taken seriously by decision-makers? This issue was illustrated with the SETIA programme when information gathered from the grass-roots level was translated and manipulated in order to address only those issues which organisers found it fitting to implement[1]. The value of information depends on users' attitudes and behaviour vis-à-vis the information. Its availability alone does not change behaviour. The willingness of decision-makers to change, their ability to interpret information and the credibility of the information are key factors in this respect. Conversely, having information but without the power (voice) to make corrective suggestions is also futile. Realistically, when one closely examines the process of decision-making one finds that the person(s) who makes the decisions may not need the information at all. Rather their decisions are made on the basis of other factors, which are unrelated and foreign to that of Malaysia's context. The design of NALIS, for example, was brought to Malaysia based on decisions made by a few individuals

[1] Products from SETIA are found in the Malaysia Five Year Plan. The plan is used as a base to describe and predict government goals. Generally these goals are remotely approximated and have no or little effect on day-to-day decisions.

prior to a formal decision-making process. Such choices made through informal means are not uncommon practice in the Malaysian government.

8.3 Information and Choice of Information System

Choice of technology and design of information system should involve a clear understanding of organisational structure, information flows and communication pathways, and user behaviour (Bawden, 1989). In order to avoid misjudging potential problem areas recommendations must be tailored to the scale and significance of the technology change proposed. As Goodman (1993) suggests, the goal of such planning "*is for diagnostic purposes. That is, it is the mechanism for identifying impediments to successful implementations*" (p. 50).

The present study discovered that government research for development programmes is often viewed merely as a formality to demonstrate to the general public that the government is 'concerned' about public views. The products of such studies often are vague, and impediments are often not identified. During the development of NALIS, for example, a feasibility study was conducted to identify potential problem areas and to collect information on existing levels of computerisation. But the feasibility study was carried out with pre-set ideas for the design of NALIS. The idea for NALIS had been in the mind of the technical committee's chairman since 1989 when organising the Computerised Land Information System for registry and land officers with the Central Board of Real Estate Data from Sweden. The idea was further developed in 1994 through views provided by various international GIS and LIS experts at a seminar on land management held in Kuala Lumpur. The seminar was followed by field visits by senior members from major land and policy planning agencies to Sweden, the United States of America, the United Kingdom and Canada to strengthen ideas for NALIS. This was followed by a feasibility study led by Malaysian consultants in collaboration with several international consultants, in particular those from Canada and Sweden.

As argued in Section 8.2.3, agencies cannot be treated as objects; they have their own views and objectives. Programme co-ordinators (through the advice of consultants) may be well informed in terms of the latest land-related information technology, but in many instances unless an appropriate feasibility study is made, a co-ordinator may

have little understanding of users' interests and capabilities in a selected information system. Ignoring this issue will result in disinterest and a reluctance to learn and adapt to the new technology. It is in fact, very difficult to make realistic suggestions for major improvements, unless there is shared knowledge among every group about the state of the technology and its practicality. Getting users involved in planning for new information technology systems and in achieving smooth implementation requires very specific skills, which could only be learnt incrementally. Essentially, this involves a sensitivity to the true complexities of users' work patterns, and an ability to match their requirements to the new technologies, rather than to force the users into the pre-conceived idea of a new system.

It could be argued that the approach taken by Hong Kong and Singapore is a good model to be followed by other developing countries especially those of similar social, economic and cultural characteristics, for example, Malaysia. Yet this has not happened. In fact Malaysian programme organisers seem not to have learnt from the mistakes of previous programmes. NALIS, for example, is repeating the very same problems experienced by SETIA, and, to a lesser extent, problems that have been made by previous land-related projects. The reasons for this were explored in Chapter 7; each programme organiser has their own beliefs and generally decision-makers are too involved with national policy and ideology, that is, their desire to proceed as fast as possible towards their goal of reaching advanced country status. As such, many of Malaysia's development strategies and models for information technology uptake are associated with programmes from developed countries, despite the fact that many IT initiatives in developing countries provide valuable examples of successfully implemented programmes (for example, India's GISNIC - GIS National Informatics Centre, the China Agriculture Information System, Singapore's Land Data Hub, the Philippines' Metro Manila Physical Survey Project and Thailand's Bangkok Land Information System Project).

Thus, although there is a clear objective for Malaysia to be an advanced country by year 2020, a balance can be achieved only by understanding the problems within itself and through examples of those most closely related to it, economically, politically and socially. Even though it could be argued that it is fast reaching a developed stage, Malaysia is still susceptible to various factors that are found hampering development

progress, such as a volatile environment including corruption and political instability. The voice of a government may, however, differ. According to the World Bank (1997b) Thailand's government, for example, considered their business environment as generally stable (1995 to early 1996) despite various coups d'état and changes in government. Attitudes in the Malaysian government appear to be not dissimilar. Thus, despite the views of economists and academicians on the weaknesses of Malaysian investment and development strategies, the Prime Minister believes these views to be purely academic and theoretically-based. Rather, the Prime Minister argues that Malaysia is quite capable of reaching its development target because:

> "We have the political will and power to rapidly change any existing laws or policies that impede the ability of companies to capitalise on the benefits afforded by the information age. We will not be bogged down by excessive politicking in Malaysia" (NST, 29 May 1997).

This statement seems to contain an implied understanding that 'the executive body' has the power to change and make laws. The judiciary exists to support sustainable development by holding the executive and legislative branches accountable for their decisions and underpinning the credibility of the overall business and political environment. However, the judiciary can play this role only when it is given independence. A weak judiciary gives the state the power to intervene arbitrarily. This power, coupled with access to information and resources not available to the general public, creates opportunities for government to promote interests based on their own understanding.

8.4 Development, Government and Geography

Since information is power, nations that establish their information infrastructure will have tremendous competitive advantage over those that lag behind (Bangemann, 1994; World Bank, 1997a). Many developed and developing countries are working toward this end. Early beneficiaries are the economically viable areas since these are the group that are able to support development and maintain its services. In the case of NALIS, for example, the organisers were frightened by large up-front fixed costs for facilities deployment and have drastically reduced coverage of the programme. The programme covers major areas such as Kuala Lumpur and Georgetown; agencies that are with support facilities, or areas and agencies which are capable of developing

themselves in the first place. The argument that "*high technology can put unequal human beings on an equal footing, and that makes it the most potent democratising tool ever devised*" (Pitroda, 1993, p. 2) is difficult to justify in the case of Malaysia when distribution of high-technology is concentrated in highly urbanised areas and diffusion of IT to the poorest groups has been slow. This is in line with Harris, et al., (1995) argument relating to issues of access to GIS:

> "The establishment of a GIS database and the acquisition of hardware, software, and trained personnel is an expensive process. These costs usually limit GIS technology to state agencies or large private corporations. The conditions, or preconditions, that regulate access to that information also usually reside with the same agencies...Without equitable access to GIS data and the technology, small users, local governments, nonprofit community agencies, and nonmainstream groups are significantly disadvantaged in their capacity to engage in the decision-making process" (pp. 202-203).

The results of this study show that there is a clear imbalance between the government's IT development vision (that is, equal access to IT services for all areas), and IT support capability. Malaysia's vision for information technology is based on an anticipated supply of IT skills from the foreseeable future (expected to be achieved by the year 2020) and development of infrastructural support from foreign investors. The importation of high-tech design and technology is seen as a way of reaching the desired vision as quickly as possible. This has parallels with the argument put forward by some for India's GIS programme, that is, to demonstrate the use of a certain technology like GIS for its own sake rather than to use the technology to solve real development problems (Taylor, 1991b; Hutchinson and Toledano, 1993; Sahay and Walsham, 1996).

For Malaysia, the government has undoubtedly made substantial efforts to improve access to IT, but for both political and technical reasons, ranging from differences in political ideology to a lack of computer trainers, distribution of even basic computers has largely remained concentrated in urban areas and selected rural areas.

In an economy that still maintains an unequal development pattern (unequal income distribution, and a large gap between rural and urban development) and limited resources, the vision to promote IT use for all areas requires conscious development

objectives, that is, objectives that answer the needs of the majority of the population rather than the selected few.

8.5 Human Resources and Development

When Malaysia made a shift from agriculture to industrialisation in the 1960s accompanying initiatives were arranged for education and training. The failure of these sectors to keep pace with industrial progress was not addressed because a skills base was maintained through foreign expertise. By the 1990s Malaysia began to feel threatened when other developing countries, such as Bangladesh, Thailand and the Philippines were able to produce similar incentives to foreign multinationals. A higher priority was therefore given to IT training and education, including the giving of incentives to the private sector to set up training centres. Nonetheless such schemes take time to mature and there remains a skills shortage in Malaysia.

A focused and coherent R&D programme is clearly imperative for Malaysia, although interviews with officers from Malaysia Science And Technology Information Centre (MASTIC) indicate that there is no definite estimate for Malaysia's R&D level (based on the office's most recent industrial and innovation survey, in 1996). These officers stressed that they found Malaysia's level of R&D to be well below the set target of 1.5% of GDP. The National Council for Scientific Research and Development, as well other public research institutions such as SIRIM and MIMOS, however, has set up working groups to develop specific measures to promote and facilitate the development of indigenous R&D, although their effort's have been fragmented and ad hoc. The MSC programme is one of the ways in which government was trying to encourage foreign R&D staff to co-ordinate with local researchers. But the initiative came too late; the 1997 weakening financial situation has discouraged foreign R&D staff to explore research opportunities in Malaysia.

8.6 Information and Government Institutions

Notwithstanding the many weaknesses of government as a model of resource distribution, government's role is becoming increasing indispensable. When information is treated as a resource, most consider government to be an appropriate choice of manager. This is because information (on individuals and organisations) could create benefits for society but could also introduce new risks should

information be uncontrolled. Quality and technical standards, such as privacy standards and copyright, are examples of areas where government could initiate steps to ensure the protection of society and the markets. However, these standards or laws are not easily drawn, because information as a resource is a relatively new area of concern for many governments; information technology development is growing fast, and governments are losing pace in drawing up and amending the necessary rules and regulations (Archer and Croswell, 1989).

Malaysia as yet, does not have any laws which specifically address the issue of information technology standards and there is also no specific legislative provision which deals with computer-related crimes. The only standard available is the Malaysian Penal Code which is not designed to meet requirements of new tools such as GIS. As illustrated by Archer and Croswell (1989) for the case of GIS products, establishment of good policy as a basis for getting the most access to most people may not be straightforward, since there are generally several different players involved in the production of GIS information. Since the information is a combination of input (data) from various agencies, these agencies are part-owners and therefore have a say in who can and cannot access their information. As Harris, et al., (1995) note:

> "A GIS reflects the mandate of the agency that operates it. Agencies have internal rules and value systems, as well as a stake in self-preservation. The extent to which GIS represents objectivity in terms of what data is used, or how it is classified, or how it is analysed, or the interpretations drawn from it, is clearly highly questionable. Value-neutral GIS simply do not exist" (p. 201)

In the context of NALIS the programme co-ordinator and relevant consultants had proposed the utilisation of the Official Secrets Act, 1972 (OSA) while waiting for appropriate information standards to be established. However, the OSA is generally recognised as a government means of controlling information for specific purposes. The meaning of 'information' under the Official Secrets Act is defined by an appropriate Minister and in the case of NALIS this is the Chief Minister of a State, since land is a State matter. The Chief Minister has the power to add, delete, or

amend any of the provisions of the Schedule of the Act[2]. It is too early to observe the effects of applying the Official Secrets Act to NALIS, but from previous experience, in particular that relating to publication of 'sensitive' government issues, the Official Secrets Act has unbounded authority to limit or deny publication or distribution of information the Minister feels unfit for public viewing. This authority is difficult to challenge because the Act has no 'standard' definition of information and as such, is open to interpretation by the Minister. As Archer and Croswell (1989) suggest in the case where there is no such law "*policy must be designed and implemented...before the wrong precedents are established, either by court or overly conservative managers*" (p. 1578).

A further area in which progress has been slow is that of (geographic) information exchange standards. Two working groups (working group 12 and working group 13) have been set up to develop IT and GIS standards but progress has been slow because information exchange is still a new concern for Malaysian agencies. Indeed, the working groups have been forced to clone[3] standards from advanced countries (in particular the United States[4]). For NALIS, however, cloning has proved to be ineffective due to differences in institutional factors including copyright, security and operating procedures.

8.7 Closing Remarks

Since the introduction of the first computer to the government sector thirty-two years ago, computerisation in Malaysia has continued to grow significantly. In the 1980s computers became commonplace in public agencies and took over traditional application areas such as revenue collection and information management. By the 1990s computer applications had expanded from transaction processing (management information systems) towards helping to improve organisational performance and productivity. Systems Library operated by the departments of Environment,

---

[2] The information schedule currently covers: Cabinet documents (records of decisions and deliberations including those of Cabinet committees); State Executive Council documents (records of decisions and deliberations including those of State Executive Council Committees); and documents concerning national security, defence and international relations.

[3] Cloning of standards, in this way, which is also common for industrial technology, means that standards from another country are duplicated in their entirety.

[4] Spatial Data Transfer Standards - the American Society for testing and materials is suggested as a basis for the creation of NALIS data exchange standards while numeric and alpha-numeric coding was suggested to be used for all textual and attribute data relevant to NALIS.

Immigration, Road Transport and Inland Revenue, as well as the Royal and National Malaysian Police, for example, have all been successful. However, thusfar, success stories have been limited to individualised information systems operating at the departmental or ministerial level. Those systems applying an information sharing approach between departments and ministries have not, as yet, achieved similar success, largely because of difficulties caused by having several different organisational leaders, and because of the needs of multi-level staff and differential end-users. Such problems are not unique to Malaysia; rather problems in integrating isolated systems and in gaining a consensus for sharing information are common to developing and developed countries alike, although, clearly, such difficulties may be enhanced in poorer countries as a result of inadequate infrastructure or less well-developed management systems (Fox, 1991; Masser and Campbell, 1991; Yeh, 1991; Hutchinson and Toledano, 1993; Campbell, 1994; Masser, 1996; Sahay and Walsham, 1996). For Malaysia, such problems are recognised by government and efforts to address system weaknesses began in earnest in the early 1980s. These efforts have been less than successful, however, since the programme co-ordinators themselves (notably the Economic Planning Unit, the Implementation Co-ordination Unit and the Ministry of Land and Co-operative Development) have been unclear of how a programme's objective were to be accomplished. The findings of this study show that such difficulties are less attributable to gaps in knowledge and more explicable in terms of lack of time to carry out realistic planning.

In addition, some programme co-ordinators attempted to fit programmes to political leaders' agendas by adopting policies such as the New Economic Policy and Vision 2020 as programme strategies. Such policies though vibrant in approach, are broad and philosophical and carry no operational practicalities. Many organisational leaders have been unable to separate their professional and politically oriented duties and, indeed, many have similar ambitions to politicians. A speech by the Prime Minister indicates the respect that is afforded to Malaysia's organisational leaders:

> "Malaysia does not face the kind of problems encountered by many developing nations because its administrative system is well-organised and forward looking...It has succeeded where many countries, which achieved independence after the Second World War had failed...Malaysia should be proud of its success and its efficient administrative system. Because of our success in the

administrative system, we have earned the respect of others and are able to stand tall even among the developed countries" (Mohamad, 30 April 1993).

Whether such respect is justifiably extended to IT programme administrators is, perhaps, open to debate. Through the course of this study, but especially from the end of 1997 with the worsening financial situation in the East Asia region, unexpected changes to the national economy have directly affected information systems programme development in Malaysia. With the economic growth rate dropping to 1.8% as of January 1998 from 8% during early 1996 organisational issues have started to become secondary in importance to economic forces and organisational actors have become more minor players. By 1998 the focus clearly turned to political leaders and their development decisions, not only in terms of organisational programmes such as SETIA and NALIS, but also for the destiny of Malaysian development in general. Issues such as plans for a new high-tech capital city, the shift of industrial focus to advanced technology, and continued reliance on foreign aid and experts dominate Malaysia's development debate. Spending on projects through unlimited foreign borrowing was labelled as one of the factors that created Malaysia's economic deterioration.

At the outset of this study the author firmly believed that Malaysia differed clearly from other developing countries, especially in the context of its financial stability. Indeed, many Malaysians (in particular the new generation officers of the 1980s) have had no other reality of Malaysian life because their working life has been conditioned with the development ideology of one Prime Minister and his administration. Malaysians are trained to believe that they are different from neighbouring developing countries because they have the economic strength and political will to be a 'successful' country. This seemed highly acceptable to government servants who, in general, were provided with a comfortable life. Malaysians have, therefore, chosen to leave development strategy to political leaders. For many government servants, the Asian financial crisis has been the first real understanding of Malaysia's development political vulnerability. The crisis clearly revealed that, like other developing countries, Malaysia is highly susceptible to external factors.

This research, however, finds that the Asian financial crisis is but one of Malaysia's development problems. The theoretical context applied in this research has helped

to identify other critical issues, that is, organisational and political issues that have been dampening Malaysian development progress. One of the most important characteristics that this research adopted from Giddens' structuration theory is that there is no universal causation in a certain action. The conditions in which certain circumstances happen are mediated in one way or another by knowledgeable actors. Government actors (political and organisational leaders) generally motivate others to follow their actions. In addition, political and organisational actors, and their actions, have independent influencing power over one another. Although sometimes these actions seemed to overlap with one another, they are analytically distinguishable and have divergent consequences. These concepts helped to illuminate the actions of these actors and showed how they were mediated by aspects of meanings, power relations and norms. The initiation and implementation of IT development programmes in Malaysia can be identified as a continuous process whereby effective development management was progressively enlarged as a result of influence from broader environmental factors, including experience of previous programmes. Organisational leaders in particular and programme participants in general interpret their experiences differently. Each actor uses the horizontal inter-link of rules and resources, and the vertical inter-link of norms and power relations to increase their chances of influencing the outcomes they desire for themselves and their organisations. Similar explanations could be provided for the action and re-action of political leaders in suggesting development strategies for Malaysia. Political and economic criticisms from within and outside the country were taken by government leaders as challenges to their 'competency' to manage the country. The rapid industrial shift form heavy to light industry and services, and then to multimedia industries; dependence on multinationals and foreign aid to assist industrial development; and excessive spending on luxury projects to support multinational infrastructural demands are few examples of development motivated by such challenges.

The Asian financial crisis, however, disrupted the continuation of the leaders' development ambition. In their failure to accept any responsibility for the situation Malaysian leaders argued that the crisis was created by manipulation of the US dollars by advanced countries, a debate which remained open throughout 1998. However, with worsening economic opportunities, the argument put forward by government eventually became unacceptable. To re-establish public confidence the Prime Minister

established a National Economic Action Council, chaired by the former Minister of Finance, specifically to deal with the recession issues. The Prime Minister's strategy was not fully supported by key policy-makers, including the (former) Deputy Prime Minister and many members of the ruling party - the National Front. The disagreement between these leading political figures brought out previously hidden (sensitive) issues such as misallocation of project budgets to selected companies and individuals. The conflict, coupled with the weakening economic situation experienced by major businesses (who are also key political members of the ruling party) resulted in rifts and divisions of trust within the ruling party. The potential effects on sustainability of the Malaysian economy and government remain uncertain[5].

This research began when development in Malaysia was at a peak and ended when national development is at stage of uncertainty. In this way the findings of this study draw attention to the need for follow-up research on the progress of information systems programme development, in particular NALIS since it is a new undertaking. Should the economy recover, will NALIS maintain its conservative approach or begin to start yet another grand undertaking? And will government leaders continue with their currently cautious approach or turn back to old approaches such as pursuing ambitious projects? In the meantime, how competently could organisational and political leaders share the knowledge and hence the capability to keep Malaysia's development programmes going; how could political leaders overcome personal differences for the state of national development objectives; and how far could this attitude be maintained?

8.8 Recommendations for Further Research

The findings of this research highlight points that may help practitioners in developing countries move towards more effective mobilisation of scarce resources in an environment that is fraught with uncertainties. Some of these important issues, however, could not be fully explored in detail because of the time limit afforded for this study. These are in four main areas:

[5] The political environment in Malaysia is currently changing on a daily basis. For example on September 2, 1998 the Deputy Prime Minister was dismissed from office.

- First, the relationship of Malaysia IT programmes to that of other developing countries, notably its closest neighbours, Thailand, the Philippines and Indonesia. The current research only afforded the opportunity to study the process of change brought about by one situation. Although literature provided some comparable information from countries in the ASEAN region it is, however, insufficient in providing 'stories' of the dynamics of IT change. Further research will serve as an interesting comparison of cross-cultural influences in IT adaptation and adoption, and help to unify the findings of previous empirical studies.

- Second, in the context of programme management, different administrative cultures may affect development differently. The current research has explored this in the context of Malaysian's administration which is strongly linked to the traditions and culture of the Malay community. This research believes that with the increasing use of IT for development purposes the normal patterns of dominance and status within the current administration may change. For Malaysia there are significance differences in professional occupations among the communities and in particular in the IT sector. This issue emerged during the conduct of this study where a great deal of IT schools are controlled by the non-dominant community, notably Chinese. Further research is needed to discover how, over time, there could be a change in Malaysia's pattern of administrative control.

- Third, research into management behaviour would be valuable area for further research. The exposition of traditional values in the research findings highlighted issues that are critical for organisational building and for evolving appropriate information systems. Research could be directed towards identifying changes that are needed in the administrative structure in order to harness the broad cultural imperatives of the Malaysian society.

- Fourth, is research relating to the methodology and approach. The findings in this study are not conclusions that can be absolutely verified for it involves subjective interpretation and sometimes since the context is to close to researcher it is difficult to maintain objectivity. Although effort was made to avoid mixing of personal judgement, it is inevitable that to some extent researcher's values will be reflected in the kind of data sought and the sense made of it. This suggests that

further research is needed to formalise some of the main points that this research has highlighted, in particular on the subjects of social, cultural and political influences on development.

Bibliography

Abdul Hamid, A. S. (1994) *The civil service of Malaysia: a paradigm shift*, National Printing, Kuala Lumpur

Allison, G. T. (1978) Bureaucratic politics. In: Rourke, F. (ed.) *Bureaucratic Power in National Politics*, pp. 182-199, Little Brown and Company, Boston

APEC (1997) *http://www.apecsec.org.sg*, as of June, 1997, 1-2

Archer, H. and Croswell, P. L. (1989) Public access to Geographic Information Systems: an emerging legal issue, *Photogrammetric Engineering and Remote Sensing*, 55(11) 1575-1581

ASEAN HomePage, Indonesia big emerging sectors (1995) *http://www.stat-usa.gov/bemse/indobes*, as of January 1997, 1-3

Asiaweek (23 September 1983) A vision of Malaysia, 36

Bangemann, M. (1994) Harnessing information for development: a proposal for a World Bank strategy, *http://www.worldbank.org/html.fpd/harnessing.hid2.html*, as of June 6, 1997, 1-15

Barley, S. R. (1996) Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments, *Administrative Science Quarterly*, 31, 78-108

Bauman, Z. (1988) Viewpoint: sociology and postmodernity, *Sociological Review*, 36(6), 790-813

Bawden, D. (1989) *The Evaluation of Information Systems*, Aldershot, Gower

Bawden, D. and Blakeman, K. (1990) *IT Strategies for Information Management*, Butterworth, London

Becker, H. S. (1967) Whose side are we on? *Social Problems*, 14, 239-247

Bell, D. (1973) *The Coming of Post-Industrial Society*, Basic Books, New York

Bennis, W. (1970) A funny thing happened on the way to the future, *American Psychologist*, 25(7), 595-608

Berg, P. O. (1989) Postmodern Management? from facts to fiction in theory and practice, *Scandinavian Journal of Management*, 5(3), 201-217

Bernstein, R. (1976) *The Restructuring of Social and Political Theory*, Basil Blackwell, Oxford

Best, S. and Kellner, D. (1991) *Postmodern Theory: critical interrogations*, Guilford, New York

Bhalla, A. (1979) *Towards Global Action for Appropriate Technology*, Pergamon Press, Oxford

Bhatnagar, C. P. (1997) The rickshaw: appropriate transport for a new age, *Appropriate Technology*, 24(3), 34-36

Blair, H. (1978) Rural development, class structure and bureaucracy in Bangladesh, *World Development*, 6(1), 65-82

Blau, P. M. (1970) A formal theory of differentiation in organisations, *American Sociological Review*, 4(1), 210-18

Boateng, S. Y. (1995) Relations between social theory and the development process: case study of a technology transformation programme in Transkei, South Africa, *Singapore Journal of Tropical Geography*, 16(2), 216-237

Boje, D., Gephart, R. P. and Thatchenkery, T. J. (1996) *Postmodern Management and Organisation Theory*, Sage, Thousand Oaks, California

Bostrom, R. P. and Heinen, J. (1977) MIS Problems and Failures: a socio-technical perspective: Part I: The causes, *Management Information Systems Quarterly*, 2(3), 17-32

Boulding, K. (1968) General systems theory - the skeleton of science, In: Buckley, W.(ed.) *Modern Systems Research for the Behavioural Scientist*, pp. 1-10, Aldine, Chicago

BRINT-Business Research Interest National Information Infrastructure: myths, metaphors and realities, (1997) *http://www.brint.com/details.htm*, as of September 1997, 1-7

Broadbent, K.P. (1997) International needs in developing countries, International Development Research Centre, Ottawa, Canada, *http:ifs.plants.ox.ac.uk*, as of June 6, 1997, 1-11

Bryant, C. and White, L. G. (1982) *Managing development in the Third World*, Westview, Boulder

Bullis, D. (1997) Why Malaysia's MSC and Singapore One are missing the market, *Asia Pacific Economic Review*, Vol. V(2), 1-4

Burrough, P. A. (1993) Commentary on "implementation of new information technology" by Paul Goodman, In: Masser, I. and Onsrud, H. J. (eds.) *Diffusion and Use of Geographic Information Technologies*, pp. 59-60, Kluwer Academic, The Netherlands

Campbell, H. (1990) *The use of geographic information in local authority planning departments*, unpublished PhD thesis, University of Sheffield

Campbell, H. (1991) Organisational issues in managing information, In: Masser, I. and

Blakemore, M. (eds.), *Handling Geographic Information: methodology and potential applications*, pp. 259-282, Longman, London

Campbell, H. (1994) How effective are GIS in practice? a case study of British local government, *International Journal of Geographical Information Systems*, 8(3), 309-325

Campbell, H. and Masser, I. (1991) The impact of GIS on Local Government in Great Britain, *Proceedings of Association for Geographic Information Conference*, AGI, London, 2.51-2.56

Campbell, H. and Masser, I. (1995) *GIS and Organisations: How effective are GIS in practice*? Taylor and Francis, London

Carter, P. and Jackson, N. (1993) Modernism, postmodernism, and motivation, or why expectancy theory failed to come up to expectation, In: Hassard, J. and Parker, M. (eds.) *Postmodernism and Organisations*, pp. 83-100, Sage, London

Cartwright, T. J. (1991) Information systems for urban management in developing countries: The concept and the reality, *Computers, Environment and Urban Systems*, 15, 7-21

Cartwright, T. J. (1993) Geographic information technology as appropriate technology for development, In: Masser, I. and Onsrud, H. J. (eds.) *Diffusion and Use of Geographic Information Technologies*, pp. 261-271, Kluwer Academic, The Netherlands

Caudle, S. L. (1989) Evaluating programme results and success, In: Cleary, R. E., Henry, N., and Associates, (eds.) *Managing Public Programs: balancing politics, administration and public needs*, pp. 231-254, Jossey-Bass, San Francisco

Chan, K. E. (1994) Internal migration in a rapidly developing country: the case of Peninsular Malaysia, *Malaysian Journal of Tropical Geography*, 25(2), 69-77

Chee, P. L. (1986) Computerisation of land administration and urban planning in Malaysia: a case study of public sector innovation, *Computer Environment Urban Systems*, 11, 65-71

Chee, P. L. (1989) The Proton Saga - no reverse gear: the economic burden of the Malaysian car project, In: Jomo, K. S. (ed.) pp. 48-62, *Mahathir Economic Policies*, Insan, Kuala Lumpur

Chenery, H. B. (1974) *Redistribution with Growth*, Oxford University Press, London

Chorley, R. and Buxton, R. (1991) The government setting of GIS in the United Kingdom, In: Maguire, D. J., Goodchild, M. F. and Rhind, D. W., (eds.) *Geographical Information Systems: Principles and Applications*, pp. 67-79, Vol. I, Longman, London

Chrisman, N. (1987) Design of information systems based on social and cultural goals, *Photogrammetric Engineering and Remote Sensing*, 53, 1367-1370

Chrisman, N. (1997) *Exploring Geographic Information Systems*, John Wiley and Sons, New York

Clark, D. M., Hastings, D. A. and Kineman, J. J. (1991) Global databases and their implications for GIS, In: Maguire, D. J., Goodchild, M. F. and Rhind, D.W. (eds.) *Geographical Information Systems: Principles and Applications*, Vol. II, pp. 217-31, Longman, London

Clark, J. (1988) Enter the cybernauts: problems in postmodernism, *Communication*, 10, 383-401

Cleary, R. E., Henry, N. and Associates (1989) *Managing Public Programs: balancing politics, administration and public needs*, Jossey-Bass, San Francisco

Clegg, S. (1990) *Modern Organisations: organisation studies in the postmodern world*, Sage, London

Cohen, I. (1986) The status of structuration theory: a reply to McLennan, *Theory, Culture and Society*, 3, 123-133

Cole, R. (1991) Target information for competitive performance: the information infrastructure, *Harvard Business Review*, Harvard Business School Publishing, Boston, Massachusetts

Cook, I. and Crang, M. (1995) *Doing Ethnographies: concepts and techniques in modern geography*, CATMOG Number 58, University of East Anglia, Norwich

Copper, R. and Burrell, G. (1988) Modernism, Postmodernism, and Organisational Analysis: an introduction, *Organisation Studies*, 9(1), 91-112

Corbridge, S. (1995) *Development Studies: a reader*, Edward Arnold, London

Country Report (2nd Quarter 1997) Malaysia and Brunei, *The Economist Intelligence Unit*, London

Cox, A., Furlong, P. and Page, E. (1986) *Power in Capitalist Society: theory, explanations and cases*, Wheatsheaf Books, Brighton, Sussex

Crang, M. (1997) Analysing qualitative materials, In: Flowerdew, R. and Martin, D. (eds.) *Methods in Human Geography: a guide for students doing a research project*, pp. 183-196, Longman, Essex

Croswell, P. L. (1991) Obstacles to GIS implementation and guidelines to increase the opportunities for success, *Journal of Urban and Regional Information Systems Association*, 3(1), 43-56

Danziger, J. N. and Kraemer, K. (1986) *People and Computers: the impacts of computing on end users in organisations*, Columbia University Press, New York

Denzin, N. K. (1970) *The Research Act*, Aldine, Chicago

Denzin, N. K. and Lincoln, Y. S. (1994) *Handbook of Qualitative Research*, Sage, Thousand Oaks, California

Department of Statistics Malaysia, (DOS) (1991) *Population and Housing Census of Malaysia: preliminary count report for urban and rural areas*, DOS, Kuala Lumpur

Department of Survey and Mapping (DSMM) (1994) *Annual Report*, National Printing Department, Kuala Lumpur

Dordick, H. S. and Wang. G. (1994) *The Information Society: a retrospective view*, Sage, Newbury Park, California

Dunn, C. E., Atkins, P. J. and Townsend, J. G. (1997) GIS for development: a contradiction in terms? *Area*, 29(2), 151-159

Eason, K. D. (1988) *Information Technology and Organisational Change*, Taylor and Francis, London

Eason, K. D. (1993) Gaining user and organisational acceptance for advanced information systems, In: Masser, I. and Onsrud, H. J. (eds.) *Diffusion and Use of Geographic Information Technologies*, pp. 27-44, Kluwer Academic, The Netherlands

Eckaus, R. S. (1977) *Appropriate Technologies*, Princeton University Press, Princeton, New Jersey

Edralin, J. (1990) Applications for urban and regional planning, *International Conference on Geographical Information Systems:* UNCRD, Nagoya, Japan

Elmer-Dewitt, P. (1995) Welcome to Cyberspace, *Time*, 145(12), 4-11

Escobar, A. (1995) *Encountering Development*, Princeton University Press, Princeton, New Jersey

Esiakor, I. G. (1989) Analysing Third World development: early historical strategies versus contemporary paradigms, *Scandinavian Journal of Development Alternatives*, VII(4), 10

Esman, M. J. (1980) Development assistance in public administration: requiem or renewal, *Public Administration Review*, 40(5), 426-431

Evans, D. D. (1984) Appropriate technology and its role in development, In: Ghosh, P. K. (ed.) *Appropriate Technology in Third World Development*, pp. 7-72, Greenwood Press, Westport, Connecticut

Featherstone, M. (1988) In pursuit of the postmodern: an introduction, *Theory, Culture, and Society*, 5(2-3), 195-215

Federal Treasury (1976) *Treasury Circular No.8: Introducing guidelines and procedures for making applications for electronic data processing system*, Ministry of Finance, Kuala Lumpur

Feldman, M. P. and Florida, R. (1994) The geographic sources of innovation: technological infrastructure and product innovation in the United States, *Annals of the Association of American Geographers*, 84(2), 210-229

Flash, E. S. (1978) The knowledge-power relationship: the Council of Economic Advisers, In: Rourke, F. (ed.) *Bureaucratic Power in National Politics*, pp. 97-100, Little Brown and Company, Boston

Fong, C.O. (1989) *The Malaysian Economic Challenge in the 1990s: transformation for growth*, Longman, Singapore

Fox, C. J. (1996) Reinventing government as postmodern symbolic politics, *Public Administration Review*, 56(3), 257-261

Fox, J. M. (1991) Spatial information for resource management in Asia: a review of institutional issues, *International Journal of Geographical Information Systems*, 5(1), 50-72

Frederickson, H. G. (1996) Comparing the reinventing government movement with the new public administration, *Public Administration Review*, 56(3), 263-269

Freidman, A., Greenbaum, J. and Jacobs, M. (1984) The challenge of users and unions, *Datamination*, 15, 93-100

Friedmann, J. (1966) *Regional Development Policy: a case study of Venezuela*, MIT Press, Cambridge, Massachusetts

Garson, D. G. (1993) Human factors in information systems, In: Golembiewski, R.T. (ed.) *Handbook of Organisation Behaviour*, Marcel Dekker, New York

Gephart, R. P. (1996) Management, social issues and the postmodern era, In: Boje, D. M., Gephart, R. P., and Thatchenkery, T. J. (eds.) *Postmodern Management and Organisation Theory*, pp. 21-44, Sage Publications, Thousand Oaks, California

Giddens, A. (1976) *New Rules of Sociological Method: a positive critique of interpretative sociologies*, Hutchinson, London

Giddens, A. (1977) *Studies in Social and Political Theory*, Hutchinson, London

Giddens, A. (1979) *Central Problems in Social Theory*, California University Press, Berkeley, California

Giddens, A. (1982) *Profiles and Critiques in Social Theory*, Macmillan, London

Giddens, A. (1984) *The Constitution of Society*, University of California Press, Berkeley

Giddens, A. (1989) A reply to my critics, In: Held, D. and Thompson, J. (eds.) *Social Theories of Modern Societies: Anthony Giddens and his critics*, pp. 249-301, Cambridge University Press, Cambridge

Giddens, A. (1990) *The Consequences of Modernity*, Stanford University Press, Stanford, California

Giddens, A. and Turner, J. H. (1987) *Social Theory Today*, Stanford University Press, Stanford, California

Glasser, B. and Strauss, A. (1967) *The Discovery of Grounded Theory: strategies for collective research*, Aldine, New York

Goetz, J. P. and LeCompte, M. D. (1984) *Ethnography and Qualitative Design in Education Research*, Academic Press, San Diego, California

Goodman, P. S. (1993) Implementation of new information technology, In: Masser, I. and Onsrud, H.J. (eds.) *Diffusion and Use of Geographic Information Technologies*, pp. 45-57, Kluwer Academic, The Netherlands

Gortner, H. F. (1981) *Administration in the Public Sector*, John Wiley and Sons, New York

Government of Malaysia (GOM) (1981) *Fourth Malaysia Plan: 1981-1985*, National Printing Department, Kuala Lumpur

Government of Malaysia (GOM) (1986) *Fifth Malaysia Plan: 1986-1990*, National Printing Department, Kuala Lumpur

Government of Malaysia (GOM) (1991a) *The Second Outline Perspective Plan 1991-2000*, National Printing Department, Kuala Lumpur

Government of Malaysia (GOM) (1991b) *Sixth Malaysia Plan: 1991-1995*, National Printing Department, Kuala Lumpur

Government of Malaysia (GOM) (1993) *Ministry of Finance Economic Report*, Kuala Lumpur

Government of Malaysia (GOM) (1996) *Seventh Malaysia Plan: 1996-2000*, National Printing Department, Kuala Lumpur

Government of Malaysia (GOM) (2 January 1997) *Public Administration Development Circular, No. 1*, Guidelines for the establishment of the National Infrastructure for Land Information System (NALIS), Prime Minister's Department, Kuala Lumpur

Government of Thailand (GOT) (1997) Country Report, *http://www.nstda.or.th/index*, as of 6 July 1997, 1-3

Government of the Philippines (GOP) (1997) *http://www.dost.gov.ph*, as of 6 July 1997, 1-3

Greenspan, A. (1998) Federal Reserve Board Testimony, *http://www.stern.nyu.edu/~nroubini/asia/sf0839.html*, as of 30 January 1998

Hague, A. (1998) The village pay phone: an explosion in Bangladesh, *Appropriate Technology*, 24(4), 12-13

Han, C. K. (1991) *Information technology policies and government information systems: a multiple level perspective*, unpublished PhD thesis, University of Cambridge

Han, C. K., and Walsham, G. (1990) *Public policy and information systems in Research* Paper No. 3/89, University of Cambridge

Hancock, L., Wingert, P., King, P, Hosenberg, D. and Samuels, A. (1995) The haves and the have-nots, *Newsweek*, 50-52

Handy, C. (1989) *The Age of Unreason*, Business Book, London

Harris, T. M., Weiner, D., Warner, T. A. and Levin, R. (1995) Pursuing social goals through participatory GIS: redressing South Africa's historical political ecology, In: Pickles, J. (ed.) *Ground Truth: the social implications of Geographic Information Systems*, pp. 196-222, The Guilford Press, New York

Harrison, P. (1987) *The Greening of Africa: breaking through the battle for land and food*, Penguin Books, Middlesex

Hassard, D. (1993) Postmodernism and organisational analysis: an overview, In: Hassard, J. and Parker, M. (eds.) *Postmodernism and Organisations*, pp. 1-23, Sage, London

Hassard, D. (1995) *Sociology and Organisation Theory: positivism, paradigms, and postmodernity*, Cambridge University Press, Cambridge

Hassard, J. (1996) Exploring the terrain of modernism and postmodernism in organisation theory. In: Boje, D. M., Gephart, R. P. and Thatchenkery, T. J. (eds.) *Postmodern Management and Organisation Theory*, pp. 45-59, Sage, Thousand Oaks

Hastings, D. A. and Clark, D. M. (1991) GIS in Africa: problems, challenges and opportunities for co-operation, *International Journal of Geographical Information Systems*, 5(1), 29-39

Hatch, M. J. (1997) *Organisation Theory*, Oxford University Press, New York

Hepworth, M. (1989) *Geography in the Information Economy*, Belhaven Press, London

Hesse-Biber, S., Kinder, T. S., Dupuis, P. R., Dupuis, A. and Tornabene, E. (1994) *HyperRESEARCH*, ResearchWare, Inc., Randolph, Massachusetts

Ho, S. P. S. (1997) Technology transfer to China during the 1980s - how effective? some evidence from Jiangsu, *Public Affairs*, 70(1), 85-106

Hoda, M. M. (1976) India's experience and the Gandhian tradition, In: Jeguier, N. (ed.) *Appropriate Technology Problems and Promises*, pp. 144-155, Organisation for Economic Co-operation and Development, Paris

Hutchinson, C. F. and Toledano, J. (1993) Guidelines for demonstrating geographical information systems based on participatory development, *International Journal of Geographical Information Systems*, 7(5), 453-461

Hyman, R. (1988) Flexible specialisation: miracle or myth, In: Hyman, R. and Streek, W. (eds.) *New Technology and Industrial Relations*, pp. 48-60, Basil Blackwell, Oxford

Institute of Southeast Asian Studies (ISEAS) (1986) *Technology and skills in ASEAN : an overview*, ISEAS, Singapore

International Labour Organisation (ILO) (1972) *Employment, Income and Equality*, ILO, Geneva

International Monetary Fund (IMF) (1997) *World Economic Outlook*, IMF, Washington D.C.

James, J. (1985) The role of appropriate technology in a redistributive development strategy, In: James, J. and Watanabe, S. (eds.) *Technology, Institutions and Government Policies*, pp. 116-133, St. Martin Press, Hong Kong

James, J. and Watanabe, S. (1985) *Technology, Institutions and Government Policies*, St. Martin Press, Hong Kong

Jameson, F. (1991) *Postmodernism, or, the Cultural Logic of Capitalism*, Duke University Press, NewCastle

Johnson, R. A., Kast, F. E. and Rosenzweig, J. E. (1973) *The Theory and Management of Systems*, McGraw-Hill, New York

Johnston, R. J. (1986) *On Human Geography*, Basil Blackwell, Oxford

Jomo, S. (1989) *Beyond 1990: Considerations for a new national development strategy*, Institute of Advanced Studies, Petaling Jaya, Malaysia

Jomo, S. (1994) *U-Turn? Malaysian economic development policies after 1990*, Centre for East and Southeast Asian Studies, James Cook University of North Queensland, Townsville, Australia

Katz, D. and Kahn, R. L. (1966) *The Social Psychology of Organisations*, John Wiley, New York

Kaul, M., Patel, N. R. and Shams, K. (1987) *Searching for a Paddle: trends in IT applications in Asian government systems*, Asia Pacific Development Corporation, Kuala Lumpur

Kay, G. (1975) *Development and Underdevelopment: a Marxist analysis*, The Macmillan Press, Hong Kong

Kessler, C. S. (1992) Archaism and modernity: contemporary Malay political culture, In: Kahn, J. S. and Loh, K. W. (eds.) *Fragmented Vision: culture and politics in*

contemporary Malaysia, pp. 133-157, Southeast Asia Publication, Allen & Unwin, North Sydney

Kettl, D. F. (1995) Building lasting reform: enduring questions, missing reforms, In: Kettl, D. F. and Dilulio, Jr. (eds.) *Inside the Reinvention Machine: appraising governmental reform*, pp. 9-86, Brookings, Washington D.C.

Khoo, B. T. (1995) *Paradoxes of Mahathirism: an intellectual biography of Mahathir Mohamad*, Oxford University Press, New York

Kindleberger, C. P. (1965) *Economic Development*, McGraw Hill, New York

King, J. and Kraemer, K. (1985) *The Dynamics of Computing*, Columbia University Press, New York

Kling, R. (1978) Information systems and policy-making: computer technology and organisational arrangements, *Telecommunications Policy*, 2, 22-32

Kling, R. (1980) Social analysis of computing: theoretical perspectives in recent empirical research, *Computing Surveys*, 12(1), 62-109

Kling, R. (1987) Defining the boundaries of computing across complex organisations, In: Boland, R. J. and Hirschheim, R. A.(eds.) *Critical Issues in Information Systems Research*, pp. 307-62, John Wiley, Chichester

Kling, R. and Gerson, E. (1977) The social dynamics of technical innovation in the computing world, *Symbolic Interaction*, 1(1) 132-146

Kling, R. and Iacono, S. (1984) The control of information systems development after implementation, *Communications of the Association for Computing Machinery*, 27, 218-226

Kling, R. and Scacchi, W. (1980) Computing as social action: the social dynamics of computing in complex organisations, *Advances in Computers*, 19, 249-323

Kling, R. and Scacchi, W. (1982) The web of computing: computer technology as social organisation, *Advances in Computers*, 21, 1-110

Kottak, C. P. (1985) When people don't come first: some sociological lessons from completed projects, In: Cernea, M. (ed.) *Putting People First: sociological variables in rural development*, pp. 176-188, Oxford University Press, New York

Kraemer, K. L. and Dutton, W. H. (1979) The interest served by technological reform, *Administration and Society*, 11(1), 80-106

Kraemer, K. L., Dutton, W. H., and Northrop, A. (1980) *The Management of Information Systems*, Columbia University Press, New York

Kraemer, K. L. and Danziger, J. N. (1984) Computers and control in the work environment, *Public Administration Review*, 44(1), 32-42

Kraemer, K. L., Gurbaxani, V. and King, J. (1992) Economic development, government policy, and the diffusion of computing in Asia-Pacific Countries, *Public Administration Review*, 52(2), 146-156

Kraemer, K. L., Dedrick, J. and Jarman, S. (1994) Supporting the free market: Information technology policy in Hong Kong, *The Information Society*, 10, 223-246

Krugman, P. (1997) In praise of cheap labour, *http://www.mit.edu/krugman*, as of 17 January 1998, 1-18

Kuhn, T. S (1962) *The Structure of Scientific Revolutions*, (1st edition), University of Chicago Press, Chicago

Kuhn, T. S. (1970) *The Structure of Scientific Revolutions*, (2nd edition), University of Chicago Press, Chicago

Kumar, K. and Welke, R. J. (1984) Implementation failures and system developer values: assumptions, truisms and empirical evidence, *Proceedings of the Fifth International Conference on Information Systems*, Tuscon, Arizona, 1-12

Laudon, K. (1974) *Computers and Bureaucratic Reform*, Wiley Interscience, New York

Long, F. A. and Oleson, A. (1980) *Appropriate Technology and Social Values: a critical appraisal*, Ballinger, Cambridge

Lincoln, Y. S., and Guba, E. G. (1985) *Naturalistic Inquiry*, Sage, Newbury Park, California,

Lindblom, C. (1965) *The Intelligence of Democracy*, The Free Press, New York

Little, P. D., Horowitz, M. and Nyverges, A. E. (1987) *Lands at Risk in the Third World: local level perspectives*, Westview Press, Boulder

Machado, K. G. (1987) Malaysian cultural relations with Japan and South Korea in the 1980s: looking East, *Asian Survey*, XXVII, 6

Maddison, A. (1970) *Economic Progress and Policy in Developing Countries*, The Brookings Institution, Washington D. C.

Madon, S. (1994) *Designing Information Systems for Development Planning*, Alfred Waller Limited, Henley on Thames, Oxon

Maguire, D. J. (1991) An Overview and Definition of GIS, In: Maguire, D.J., Goodchild, M. F. and Rhind, D. W. (eds.) *Geographical Information Systems: Principles and Applications*, pp. 9-20, Vol. I, Longman, Essex

Malaysian Science and Technology Information Centre (MASTIC) (1996) *1994 National Survey of Innovation in Industry*, MOSTE, Kuala Lumpur

Manpower Administrative Modernisation and Management Planning Unit (MAMPU) (1993) *Annual Report*, National Printing Department, Kuala Lumpur

Manpower Administrative Modernisation and Management Planning Unit (MAMPU) (1995) *Annual Report,* National Printing Department, Kuala Lumpur

March, J. G. and Olsen, J. P. (1994) *Ambiguity and Choice in Organisations,* Scandinavian University Press, Stockholm, Sweden

Masser, I. (1991) Computers in local government: Malaysia, *Habitat International,* 15 (4), 51-63

Masser, I. (1994) The use of monitoring systems: an evaluation of the SETIA project monitoring system, *Environment, Planning and Design,* 21, 429-440

Masser, I. (1996) National geographic information strategy in Britain, *International Seminar on Strategies for National GIS Development,* organised by Korea Research Institute for Human Settlements, Seoul, Korea

Masser, I. and Campbell, H. (1991) Conditions for the effective utilisation of computers in urban planning in developing countries, *Computers, Environment and Urban Systems,* 15, 55-67

May, T. (1997) *Social Research: issues, methods and process,* Open University Press, Buckingham

Menou, M. J. (1993) *Measuring the Impact of Information on Development,* International Development Research Centre, Ottawa

Meyer, D. (1980) A dynamic model of the integration of frontier urban places into the United States systems of cities, *Economic Geography,* 56,120-140

Miewald, R. D. (1970) The greatly exaggerated death of bureaucracy, *California Management Review,* XIV (2) 65-69

Ministry of Education, MOE (1994) *Education Statistics,* National Printing Department, Kuala Lumpur

Ministry of Finance (MOF) (1983) *Economic Report,* National Printing Department, Kuala Lumpur

Ministry of Finance (MOF) (1984) *Economic Report,* National Printing Department, Kuala Lumpur

Ministry of Finance (MOF) (1985) *Economic Report,* National Printing Department, Kuala Lumpur

Ministry of Land and Co-operative Development (MLCD) (1994) *NALIS 1994: Report of the establishment of the National Land Information System, MLCD,* Kuala Lumpur

Ministry of Land and Co-operative Development (MLCD) (1995) Feasibility study for National Land Information System (NALIS), Vol. 1-9, *http://www.nalis.gov.my/nalis03/nhp051.htm*

Ministry of Public Enterprise (MPE) (1984), *Annual Report*, National Printing Department, Kuala Lumpur

Ministry of Science, Technology and Environment (MOSTE) (1993) *Annual Report MOSTE,* National Printing Department, Kuala Lumpur

Ministry of Science, Technology and Environment, MOSTE (1996) *1996 Annual Report, MOSTE*, National Printing Department, Kuala Lumpur

Mitchelson, R. L. and Wheeler, J. O. (1994) The flow of information in a global economy: The role of the American Urban System in 1990, *Annals of the Association of American Geographers*, 84(1), 87-107

Mody, A. and Dahlman, C. (1992) Performance and potential of information technology: an international perspective, *World Development*, 7(12), 1703-1719

Mohamad, M. (1970) *The Malay Dilemma*, Donald Moore for Asia Pacific Press, Singapore

Mohamad, M. (2 October 1979) speech at the seminar on transnational corporations and National development, Petaling Jaya, *Foreign Affairs Malaysia*, 12, 392-91

Mohamad, M. (June 1984) conference on national economic development, *Foreign Affairs Malaysia*, 17(2) 158-165

Mohamad, M. (30 September 1986) speech at Malaysian investment seminar, New York, *Foreign Affairs Malaysia,* 19(3), 66-69

Mohamad, M. (9 November 1991) speech at UMNO General Assembly, 1991, Kuala Lumpur, Kuala Lumpur

Mohamad, M. (30 April 1993) speech at Home Ministry 'Excellence Service Awards', Kuala Lumpur

Mohamad, M. (1 August 1996) speech at Multimedia Super Corridor launching ceremony, Kuala Lumpur

Mohamed, A. M. (1994) National GIS/LIS framework and infrastructure, *National Land Information System (NALIS) 94 Symposium and Exposition*, Kuala Lumpur

Mohanty, C. (1991) Under western eyes: feminist scholarship and colonial discourses, In: Mohanty, C., Russo, A. and Torres, L. (eds.) *Third World Women and the Politics of Feminism*, pp. 51-80, Indiana University Press, Bloomington

Mohd Zin, M. A. (1994) Towards Malaysian geographic information exchange standards, *National Land Information System (NALIS) 94 Symposium and Exposition,* Kuala Lumpur

Morrison, D. E. (1984) Energy, appropriate technology, and international interdependence, In: Ghosh, P. K. (ed.) *Appropriate Technology in Third World Development*, pp. 205-237, Greenwood Press, Westport, Connecticut

Mumford, E. (1981) *Values, Technology and Work*, Martinus Nijhoff, The Hague, The Netherlands

Nanson, B., Smith, N. and Davey, A. (1996) A British National Geospatial Database: part I What it is and why we need it, *Mapping Awareness*, 10(3) 10-20

Nedovic-Budic, Z. and Godchalk, D. R. (1996) Human factors in adoption of Geographic Information Systems: a local government case study, *Public Administration Review*, 56(6), 554-567

New Straits Times (NST) (28 February 1991) *'Malaysia: The Way Forward'* speech presented at the inaugural meeting of the Malaysian Business Council, The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (1 August 1996), *'Multimedia Super Corridor'* The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (29 May 1997) *Computimes*, The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (1 August 1997) *Computimes*, The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (20 September 1997) The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (2 July 1998) The New Straits Times Press, Kuala Lumpur

New Straits Times (NST) (3 September 1998) The New Straits Times Press, Kuala Lumpur

Niemann, B. and Niemann, S. (1994) *The whole nine yards at the Tennessee Valley Authority*: Bruce Rowland, *GIS World*, 4(4), 47-51

Noland, M (6 November 1997) Marcus Noland before the House International Relations Committee, Subcommittee on Asian and Pacific Affairs, *http://www.iie.com*, as of January 1998, 1-15

Norgaard, R. B. (1988) *Development Betrayed: the end of progress and a co-evolutionary revisioning of the future*, Routledge, London

Obermeyer, N. J. and Pinto, J. K. (1994) *Managing Geographic Information Systems*, Guilford Press, New York

Ohmae, K. (29 May 1997) Multimedia Super Corridor, *New Straits Times*, Kuala Lumpur

Oldham, G. (1987) The transfer of technology to developing countries, *Appropriate Technology*, 14(3), 12-24

Onsrud, H.J. (1992) In support of open access for publicly held geographic information, *GIS Law*, I, 3-6

Onsrud, H. J. and Pinto, J. K. (1992) Diffusion of geographic information innovations, *International Journal of Geographical Information Systems*, 5(4), 447-467

Organisation of Economic Corporation Development (OECD) (1988) *Geographical distribution of financial flows in developing countries*, Paris

Osborne, D. and Gaebler, T. (1992) *Reinventing Government*, Addison Wesley, Reading, Massachusetts

Parker, M. (1992) Post-modern organisations or postmodern organisation theory? *Organisation Studies*, 13(1), 1-17

Pettigrew, A. (1973) *The Politics of Organisational Decision-Making*, Tavistock, London

Pettigrew, A. (1985) *The Awakening Giant: continuity and change in ICI*, Basil Blackwell, Oxford

Pitroda, S. (1993) Development, democracy and the village telephone, *Harvard Business Review*, Harvard Business School Publishing, Boston, Massachusetts

Post, G. and McLaughlin, J. (1993) Developing the spatial information marketplace: a Canadian case study, In: Masser, I. and Onsrud, H. J. (eds.), *Diffusion and Use of Geographic Information Technologies*, pp. 277-291, Kluwer Academic, The Netherlands

Power, M. (1990) Modernism, postmodernism, and organisation, In: Hassard, J. and Pym, D. (eds.) *The Theory and Philosophy of Organisations: critical issues and new perspectives*, pp. 109-204, Routledge and Kegan Paul, London

Power, P. and Urban-Lurain, J. (1989) *Creating a Human Investment System*, Michigan Job Training Co-ordinating Council, Lansing

Pred, A. R. and Tornqvist, G. E. (1973) *Systems of Cities and Information Flows*, LUND, Sweden

Prime Minister's Department (PMD) (1970) *General Circular No.1: Exercise to co-ordinate automatic data processing activities*, Prime Minister's Department, Kuala Lumpur

Prime Minister's Department (PMD) (1973) *General Circular No.4: Establishment of a National Automatic Data*, Prime Minister's Department, Kuala Lumpur

Prime Minister's Department (PMD) (1976) *General Administrative Circular No.1*, Prime Minister's Department, Kuala Lumpur

Pugh, D. S. and Hickson, D. J. (1989) *Writers on Organisations*, Penguin Books, Middlesex

Rao, T. P. and Samad, S. A. (1992) *IT Applications for Decentralised Development in Asia*, Asian and Pacific Development Centre (APDC), Kuala Lumpur

Ratan, S. (1995) A new divide between haves and have-nots, *Time*, 45(12), 25-26

Reed, M. (1993) Departure from postmodernism: organisation and modernity: continuity and discontinuity in organisation theory, In: Hassard, J. and Parker, M. (eds.) *Postmodernism and Organisations*, pp. 163-182, Sage, London

Renong Berhad (1998) Renong Berhad Recommendations, *http://www.nalis.gov.my/nalis03/nhp0523b.htm*, as of November 1998, 1-7

Rhind, D. (1992) Data access, charging and copyright and their implications for geographic information systems, *International Journal of Geographical Information Systems*, 6(1), 13-30

Riggs, F. W. (1970) The context of development administration, In: Riggs, F. W. (ed.) *Frontiers of Development Administration*, pp. 72-108, Duke University Press, Durham

Robbins, S. (1990) *Organisational Theory: structure, designs and applications*, Prentice Hall, Englewood, California

Robey, D. and Newman, M. (1996) Sequential patterns in information systems development: an application of a social process model, *ACM Transactions on Information Systems*, 14(1), 30-63

Rogers, E. M. (1983) *Diffusion of Innovation*, The Free Press, New York

Rohr, J. A. (1978) *Ethics for Bureaucrats: an essay on laws and values*, Marcel Dekker, New York

Rostow, W. W. (1960) *The States of Economic Growth*, Cambridge University Press, Cambridge

Rourke, F. (1978) *Bureaucratic Power in National Politics*, Little Brown and Company, Boston

Rush, H. J. (1984) Source of technology in development, In: Ghosh, P. K. (ed.) *Appropriate Technology in Third World Development*, pp. 102-127, Greenwood Press, Westport, Connecticut

Sahay, S. and Walsham, G. (1996) Implementation of GIS in India: organisational issues and implications, *International Journal of Geographical Information Systems*, 10(4), 385-404

Sauer, C. (1993) *Why information systems fail: a case study approach*, Alfred Waller Ltd., Oxfordshire

Schumacher, F. (1973) *Small is beautiful*, Abacus, London

Shariffadeen, M. A (1996) Paper presented at *Multimedia Asia '96,* Putra World Trade Centre, Kuala Lumpur

Singapore National Communications Board (SNCB) (1997) *http://www.ncb.gov.sg/ncb.it2000.asp,* as of 17 September 1997, 1-3

Singer, H. W. and Ansari, J. A. (1977) *Rich and Poor Countries,* Allen and Unwin, London

Smith, J. A. (1995) Information transfer stations for developing countries in Asia, *http://www.bridge.org/ITS.html,* as of 6 June 1997, 1-6

Spectre, C. (1988) Managing remote sensing transfer to developing countries: a survey of experts in the field, *Photogrammetria,* 43, 25-36

Spectrum (1996) *Development of the Information Society: an international analysis,* HMSO, Norwich

Star (2 February 1982) Star publication, Pulau Pinang

Stevanovic, P., Drummond, J., Muller, J. C. (1989) ITC's response to the need for training in CAC and GIS, IX INCA *International seminar on digital cartography and potential users,* Pre-session proceedings, Survey of India, 450-460

Stewart, F. (1985) Macro policies for appropriate technology: an introduction in developing countries, In: James, J. and Watanabe, S. (eds.) *Technology, Institutions and Government Policies,* pp. 19-46, St. Martin Press, Hong Kong

Stewart, P. D. S. (1997) What is development? In: Kotze, D. A. (ed.) *Development and Administration Management: a holistic approach,* pp. 1-6, J.L. Van Schaik Academic, Pretoria

Stoecker, R. (1991) Evaluating and rethinking the case study, *The Sociological Review,* 39, 88-112

Stogdill, R. M. (1971) Dimensions of organisation theory, In: Thompson, J. D.(ed.) *Approaches to Organisational Design,* pp. 1-56, University of Pittsburgh, Pennsylvania

Sundram, R. M. (1983) *Development Economics: a framework for analysis and policy,* John Wiley and Sons, Chichester

Tang-Kwong, Y. W. (1994) The challenges and returns of establishing the Singapore land data hub, *National Land Information System (NALIS) 94 Symposium and Exposition,* Kuala Lumpur

Task Force Report (1998) NALIS background, *http://www.nalis.gov.my/nalis03/nhp052b.htm,* as of November 1998, 1-3

Taylor, D. R. F. (1991a) GIS in developing nations, *International Journal of Geographical Information Systems,* 5, 1-3

Taylor, D. R. F. (1991b) GIS and developing nations, In: Maguire, D. J., Goodchild, M.F. and Rhind, D.W., (eds.) *Geographical Information Systems: Principles and Applications*, pp. 71-84, Vol. II, Longman, London

Tesch, R. (1990) *Qualitative Research, Types and Analysis Tools*, Falmer Press, London

The Economist (30 September 1995) *Survey of telecommunications*, 23

The Economist (March 1997) *Malaysia's information ambition: virtually fantastic*, 83-86

The Economist (29 March 1997) *Survey of Silicon Valley*, 6-32

The Economist (2-8 August 1997) *Asia meets America in Malaysia*, 50-51

The Economist (9-15 August 1997) *Thailand gets the bill*, 51-53

The Economist (5-11 July 1997) *Next step in Hong Kong*, 65

The Economist (4-10 October 1997) *When the smog clears in Asia*, 85-91

The Nolan Committee (Chairman Lord Nolan) (May 1995) *Standards in Public Life: first report of the committee on standards in public life*, Vol. 1, HMSO, London

Thomas, R. (1995) Access and inequality, In: Heap, N., Thomas, R., Einon, G., Mason, R., and Mackay, H. (eds.) *Information Technology and Society*, pp. 90-98, Sage, London

Thomas-Slayter, B. (1987) *Issues in local institutional management for resource management: Observations from East Africa*, Unpublished lecture for the African Research Programme, Harvard University, Cambridge

Thompson, P. (1993) Postmodernism: fatal distraction, In: Hassard, J. and Parker, M. (eds.) *Postmodernism and Organisations*, pp. 183-203, Sage, London

Tilly, L. and Scott, J.W. (1978) *Women, Work and Family*, Holt, Reinhart and Winston, New York

United Nations (1987) Technology transfer under alternative arrangements with transnational corporations: selected industrial case studies in developing countries, *ESCAP/UNCTC Publications, Series B*, No 3, Bangkok

United Nations Development Programme (UNDP) (1996) *Human Development Report*, Oxford University Press, New York

United Nations Development Programme (UNDP) (1997) *Human Development Report*, Oxford University Press, New York

United States Department of Commerce (U.S. DOC) (1995) *http://www.stat-usa.gov/bems/bemsase/html*, as of July 20 1997

Valentine, G. (1997) Tell me about...using interviews as a research methodology, In: Flowerdew, R. and Martin, D. (eds.) *Methods in Human Geography: a guide for students doing a research project*, pp. 110-126, Longman, Essex

Van Maanen, J. (1988) *Tales of the Field*, University of Chicago Press, Chicago

Van Niman, P. (1997) Telecom in Vietnam, Asia Pacific Economic Review, III, 3, *http://www.moshix2.net/APER*, 16 September 1997

Wallman, S. (1977) *Perceptions of Development*, Cambridge University Press, Cambridge

Walters, S. (1983) Participatory research: theory and practice, *Perspectives in education*, (7)3, 170-75

Watanabe, S. (1985) The patent system and indigenous technology development in the Third World, In: James, J. and Watanabe, S. (eds.) *Technology, Institutions and Government Policies*, pp. 217-256, St. Martin Press, Hong Kong

Webb, E. J., Campbell, D. T., Schwartz, R. D. and Sechrest, L. (1966) *Unobtrusive Measures: non-reactive research in the social sciences*, Rand McNally, Chicago

Weber, M. (1978) Essays on bureaucracy, In: Rourke, F. E.(ed.) *Bureaucratic Power in National Politics*, pp. 85-101, Little Brown and Company, Boston

Webster, F. (1994) What information society? *The Information Society: an International Journal*, 10, 1-23

Wehrfritz, G. (29 September 1997) Jiang's power grab, *Newsweek*, 44-46

Weick, K. E. (1979) *The Social Psychology of Organising*, Addison-Wesley, Reading

Westphal, L. E. (1984) Research on appropriate technology, In: Ghosh, P. K. (ed.) *Appropriate Technology in Third World Development*, pp. 184-284, Greenwood Press, Westport, Connecticut

Willoughby, K.W. (1990) *Technology Choice: a critique of the appropriate technology movement*, Westview Press, Boulder, Colorado

Wolf, M. (7 September 1997) The real lesson from Asia, *Financial Times*

World Bank (1995) Harnessing information for development: what does it mean for developing countries? *http://www.worldbank.org*, as of 16 September 1997, 1-15

World Bank (1997a) Harnessing information for development: a proposal for a World Bank group strategy, *http://www.worldbank.org*, as of 6 June 1997, 1-13

World Bank (1997b) The State in a Changing World, *World Development Report*, Oxford University Press, New York

World Bank and United Nations Development Programme (UNDP) (1995) *Technology Development for Innovation Towards Vision 2020*, Government of Malaysia, National Printing Department, Kuala Lumpur

World Commission on Environment and Development (1987) *Our Common Future*, Oxford University Press, Oxford

Wyckoff, W. (1988) Revising the Meyer model: Denver and national urban system, 1859-1879, *Urban Geography*, 9, 1-8

Yapa, L. S. (1991) Is GIS appropriate technology? *International Journal of Geographical Information Systems*, 5(1), 41-58

Yeh, A. G. (1990) A land information system for the monitoring of land supply in the urban development of Hong Kong, In: Worrall, L., (ed.) pp.163-187, *Geographic Information Systems: development and applications*, Belhaven Press, London

Yeh, A. G. (1991) The development and application of geographic information systems for urban and regional planning in the developing countries, *International Journal of Geographical Information Systems*, 5(1), 5-27

Yin, R. K. (1993) *Applications of Case Study Research*, Sage, Thousand Oaks, California

Yin, R. K. (1994) *Case Study Research: design and methods*, Sage, Thousand Oaks, California

Zmud, R. W. (1983) *CBIS Success and Failure*, Scott, Foresman and Co., Glenview, Illinois

Appendix: A1

Form S1 -Project Creation and Registration

1. Project No:	2. Ministry:	3. Department:
4. Implementation Agency:	5. Vote Head	6. Head
7. Sub Head:	8. Project Name:	9. Project Objective/Scope
10. Project Location	11. Project Area	12. Security Project
13. Year Project Statement/ Expected to Start	14. Year Project Expected to Complete	15. New or Continuing Project

16. Total Cost Breakdown by Type of Development Expenditure:

	Total Project Costs:	Supplementary Project Cost Requested
a. Land acquisition		
b. Construction		
c. Equipment		
d. Consultant Service		
e. Development Operating Cost		
f. Others (explain)		

17. Total Project Cost:

18. Total Cost Breakdown by Foreign and Local Cost:

19. Total Allocation Applied:

20. Estimated Yearly Breakdown for Five Year Plan Allocation:

21. Source of Finance:

a. Federal	b. State	c. Statutory Body	d. Others
i. Grant	ii. Loan		

22. Name of Reporting Officer	23. Address	24. Telephone
25. Date	26. Address of Reporting Officer Filling the Form S3	

FOR SETIA SECRETARIAT USE

Appendix: A2

Form S2 - Project Budget Allocation

1.1 Ministry:	1.2 Department	13 Vote Head	1.4 Head	1.5 Sub-Head
2. 0 Information on Project Allocation:				
2.1 No.	2.2 Project No. Project Name Project Scope Project Objective Progress Project	2.3 Total Approved Project Cost Estimates	2.4 Malaysia Plan Allocation Estimates	
2.5 Total Expenditure	2.6 Current Year Allocation		2.7 Forecast Allocation	
3.0 Verified by Reporting Officer				
3.1 Name	3.2 Date:	3.3 Telephone	3.4 Signature	

Appendix: A3

Form S3 - Monitoring the Progress of Project Implementation

Part A

1.1 Project No 1.2 Component No.
2.0 Project Development Name

3.0 Project/ Component Objective/Scope 3.1 Revised Project/ Component Objective/Scope

4.0 Component Location
5.0 Project/ Component Cost 5.1 Project Component Revised Cost
6.0 Foreign Loan

(a) Source of loan (b) Loan Number

7.0 Project Consultants 7.1 Reason for Change of Consultant
8.0 Overall Status of Project/Component

(a) Physical implementation of project	(b) Users have received benefits of projects	(c) Last payment of project has been settled
(d) Project/component postponed	Reason Postponed	Year project implemented again
(e) Project Abandoned	Reason Abandoned	

8.1 Percentage of Project Completion

9.0 Problems of Project Implementation

Part B

(1) Activity Code	(2) Sub-Activity Code	(3) Date Activity Started	(4) Planned Activity Complete	(5) Revised Activity Complete

Part C

Project Expenditure

1.1 Vote Head 1.2 Head 1.3 Sub-Head
2.0 Last Term Expenditure:
3.0 Current Term Expenditure:

Reporting Officer: Office Address: Telephone: Date:

Appendix: A4

Output Produced from Listings in Forms S1, S2, and S3 for Economic Planning Unit

- List of development projects under a certain plan according to the State, Ministry, Department, Development Objectives, District and Project Identification Number.
- List of development projects with information on expenditure and physical progress by sector
- List of projects after yearly allocations
- List of projects financed by the Federal Government according to State, Ministry, Development Objectives, District and Project Identification Number
- List of projects financed by the State Government according to State, Ministry, Development Objectives, District and Project Identification Number
- Summary of allocations according to State
- Summary of allocations according to the development objectives
- Summary of allocations according to development objectives and urban/rural areas
- Summary of allocations according to sector codes
- Summary of total projects according to development objectives and rural and urban areas