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The Knowledge and Perspectives about Educational Management Information System (EMIS/SMPP) of Decision-Makers in the Malaysian Ministry of Education (MMOE): An inquiry into the implementation of an EMIS



by

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A dissertation submitted in fulfilment of the requirements for the award of the degree of Doctor of Philosophy in the Institute of Education, University of Warwick

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ABBREVIATIONS

CIO	-	Chief Information Officer
DEO	-	District Education Office
EIS	-	Executive Information System
EMIS	-	Educational Management Information System
EPRD	-	Educational Planning and Research Division
FC	-	First Class
FELDA	-	Federal Land Development Authority
HRMIS	-	Human Resource Management Information System
ICC	-	Information and Computerisation Committee
ICT	-	Information and Communication Technology
IT	-	Information Technology
<i>JMPK</i>	-	<i>Jawatankuasa Maklumat dan Pengkomputeran Kementerian</i> (Ministry Information and Computerisation Committee)
<i>JGMG</i>	-	<i>Sistem Maklumat Profesional Guru</i> (Teachers professional Information System)
<i>KPPM</i>	-	<i>Ketua Pengarah Pendidikan Malaysia</i> (Malaysia Director General of Education)
<i>KSU</i>	-	<i>Ketua Setiausaha</i> (Secretary General)
MMOE	-	Malaysian Ministry of Education
MOE	-	Ministry of Education
REO	-	Regional Education Office
SED	-	State Education Department
<i>SMS</i>	-	<i>Sistem Maklumat Staf</i> (Staff Information System)

<i>SMPP</i>	-	<i>Sistem Maklumat Pengurusan Pendidikan</i> (Educational Management Information System)
<i>SSMS</i>	-	Smart School Management System
<i>TKPP</i>	-	<i>Timbalan Ketua Pengarah Pendidikan</i> (Deputy Director General of Education)
<i>TKSU</i>	-	<i>Timbalan Ketua Setiausaha</i> (Deputy Secretary General)

DEFINITION OF TERMS

The following terms are used repeatedly in this study to refer to groups of people involved in the implementation of EMIS. While some are fixed definitions within the MMOE the others are applied strictly for the purpose of this study.

- **Top management:**

The MMOE collective senior managers consisting of the Minister, the Secretary General (*KSU*), the Education Director General (*KPPM*), the Deputy Secretary General (*TKSU*), and the Deputy Education Director General (*TKPPM*).

- **Decision-makers:**

comprises the top management of the MMOE, Division directors/Secretaries and SED Directors

- **Professionals:**

The MMOE Teacher by-profession officials (professional educators)

- **Administrators:**

The MMOE officials who are not teacher-by profession (professional administrators)

- IT specialists/technocrats/technical experts:
Refers specifically to the ISD officers whose job specification deals with the computerisation in the MMOE.
- Grass-roots/data feeders:
SEDs, REOs/DEOs and schools
- Primary data provider:
The schools
- Data
groups of non-random symbols (words, values, figures) which represent things that have happened. Data are facts obtained by observation or research and which are recorded. Frequently they are called raw or basic data and are often records of day to day transactions of the organisation. Data are derived from both external and internal sources and whilst most external data are in readily usable and concrete forms, internal activities require appropriate measuring and recording systems to be developed and maintained so that the facts are recorded (Lucey, 1989).
- Information
data that have been interpreted and understood by the recipient of the message. There is a process of thought and understanding involved and it follows that a given message can have different meanings to different people. It is knowledge and understanding that is usable to the recipient. It reduces uncertainty and has surprise value (Lucey, 1989).
- System
a set of interrelated components described generally as a complex of elements or components directly and indirectly related in a casual network such that each component is related to at least some others in a more or less stable way within any particular period of time.

- MIS

a system using formalised procedures to provide management at all levels in all functions with appropriate information, based on data from both internal and external sources, to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible. It is the combination of human and computer-based resources that results in the collection, storage, retrieval, communication and use of data for the purpose of efficient management of operations and for business planning (Lucey, 1989).

- Information system

A collection of procedures, activities, people and technology set up for the collection of relevant data, its storage until it is required, its processing to help provide answers to a specific set of questions and the communication of the resulting information to the people who need to act upon it (Knight & Silk, 1990).

- Organisations

intricate human strategies designed to achieve certain objectives (Argyris)

a pattern of ways in which large numbers of people, engaged in a complexity of tasks, relate themselves to each other in the conscious, systematic establishment and accomplishment of mutual agreed purposes (Pfiffner and Sherwood).

- Information Technology (IT)

the acquisition, processing, storage and dissemination of vocal, pictorial, textual, and numeric information by a micro-electronics based combination of computing and telecommunication (Department of Trade and Industry in Lucey, 1989).

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These people have helped to shape all that I do.

DECLARATION

This dissertation is presented in accordance with the regulations for the degree of doctor of philosophy. I declare that the work described in this dissertation is original and my own, unless otherwise indicated. I confirm that this dissertation has not been submitted for a degree at any university. The interpretations in this dissertation are the sole responsibility of the researcher, and in no way represent the views of the case study organisation, nor of Warwick Institute of Education.

ABSTRACT

This thesis reports on the implementation of an Educational Management Information System (EMIS/*SMPP*) in the Malaysian Ministry of Education (MMOE) since 1995. An EMIS enables data to be collected, processed, stored and retrieved, and allows data and information to be disseminated to support the main activities and 'business' cycles of educational organisations.

The thesis investigates decision-makers' use of EMIS/*SMPP* and their perceptions as to its value and shortcomings. It highlights issues affecting the development of an integrated system/database in the MMOE from the point of view of decision-makers. It also offers suggestions for improving the implementation of EMIS/*SMPP* and developing an integrated system in the MMOE.

The study involved a literature review, participant observation. Furthermore, interviews with a representative sample of decision-makers, the potential users of EMIS, were held. The relationships between issues raised by the decision-makers were examined and discussed with reference to two multiple cause diagrams. The study found that use of EMIS/*SMPP* was sparse. Several human-, organisational/management- and technological-related issues were identified as contributing to restricting the use and usefulness of EMIS.

Two models of EMIS implementation are presented. The first is the model produced by the EMIS implementation team. This proved inadequate due to unclear specification of stages and identification of management and information integration, system review and management involvement. A second model addresses these weaknesses by specifying activities or interventions at specific levels and building in feedback loops in the system implementation process. A manager of change/technology is seen as a key factor in the implementation of EMIS, the more so considering the constraints on change with the existing organisational culture and structure of the MMOE.

The study provides a unique insight into change in a public organisation in Malaysia. It offers important insights into a range of human-, organisational/management- and technological-related issues associated with change. Additionally, it offers specific recommendations for the development of integrated information systems. Areas for further research are identified.

CHAPTER 1: BACKGROUND OF THE STUDY

1.0 Introduction

This dissertation is a study of the implementation of an Educational Management Information System (EMIS/*SMPP*) within the Malaysian Ministry of Education (Henceforth, MMOE). An EMIS is a formally structured, scheduled, and managed system which enables data to be collected, processed, stored and retrieved, as well as allowing data and information to be disseminated to support the main activities and 'business' cycles of educational organisations. An EMIS supports administration, planning, monitoring and control of project and programme implementations, research, policy analysis, and decision-making (EPRD & HIID, 1997). In the present study, the focus is placed on educational managers and decision-makers within the Ministry, the State Education Department (SED) and the District Education Office (DEO).

The implementation of an EMIS raises a number of pertinent issues, including the need to modernise the management of educational information systems, the need to improve data flow within organisations and the management of organisation, change and technology. The need to evaluate and analyse systems is also raised by the present research. A study such as this, in which the functioning of EMIS is considered, also brings with it the need to consider certain methodological issues, as well as the nature and purpose of the case study research. This study draws on different fields of study, including those of Management Information System (MIS), EMIS, system evaluation, organisational management, and educational change. These fields of study are further discussed in Chapter 2, which constitutes the literature review of this report. Chapter 3 focuses on the methodology adopted in this study. Chapter 4 provides a discussion of the interviews carried out during the main part of the study. The discussion of the findings in relation to previous literature is presented in Chapter 5. This is followed by a consideration of the implications of the findings in Chapter 6. The conclusion, Chapter 7, presents the

literature and methodological contribution of the case study. It recommends solutions for implementing EMIS, and provides a summary of the study as a whole.

This study involves observing participants, as well as discussing with and interviewing them. It also involves visits to different sites, and the study of written records and documentation. The primary method of data collection used in the present research is that of in-depth, semi-structured, interviews. Each interview lasted between forty-five minutes to two and half an hours. A total of twenty-four decision-makers comprising eight top or senior management, eleven Division Directors/Secretaries of the Ministry and five SEDs Directors were interviewed. Detailed information has also been derived from participant observation through the researcher's involvement in the EMIS/*SMPP* project from 1993 up to the time when the present study was carried out.

The aim of this first chapter is to provide an overview of the MMOE, and more particularly, the Educational Planning and Research Division (EPRD) which is responsible for the development of EMIS/*SMPP* within the Ministry. This chapter also includes a brief description of the organisation structure and the education system of the country. In the main part of this chapter, EMIS/*SMPP* is described and discussed. It is referred to in terms of its planning and development, the specific system in use and potential problems in its implementation. These problems as seen by the MMOE decision-makers serve as the main driving force of the present study.

1.1 The Malaysian Ministry of Education

The Malaysian Ministry of Education is responsible for the development of the national education system in the country. It adopts a centralised system of educational administration (see sections 2.2.9 and 6.3), within which there are four administrative levels. These are the Central Education Divisions (CED) which represent the central agencies of the education system of the country; the SED and Regional Education Offices (REO), which represent the states in the West and East Malaysia respectively; the District Education Offices (DEO), which represent the

districts within the states; and finally the schools. The Minister of Education is the overall head of the Ministry. The Secretary-General is responsible for the management of the education system and the Director-General is responsible for the professional aspects of the education system. Figures 1.1a and 1.1b represent the organisational structure of the Ministry and that of MMOE, SEDs, REOs, DEOs and schools in Malaysia respectively.

The CEDs are responsible for managing the national education system, formulating national education policies and plans, establishing guidelines for their implementation and monitoring, and evaluating the outcomes of the plans. There are twenty CEDs, and these can generally be divided into the Professional Education Service and the Administrative Education Service. The former is responsible for professional aspects of the education system such as administration and curriculum development. These divisions report to the Director-General of Education. The latter, meanwhile, is responsible for tertiary education, finance, computer services and the physical developments of schools, and reports to the Secretary-General of Education.

Figure 1.1a: Organisational Structure of the Malaysian Ministry of Education

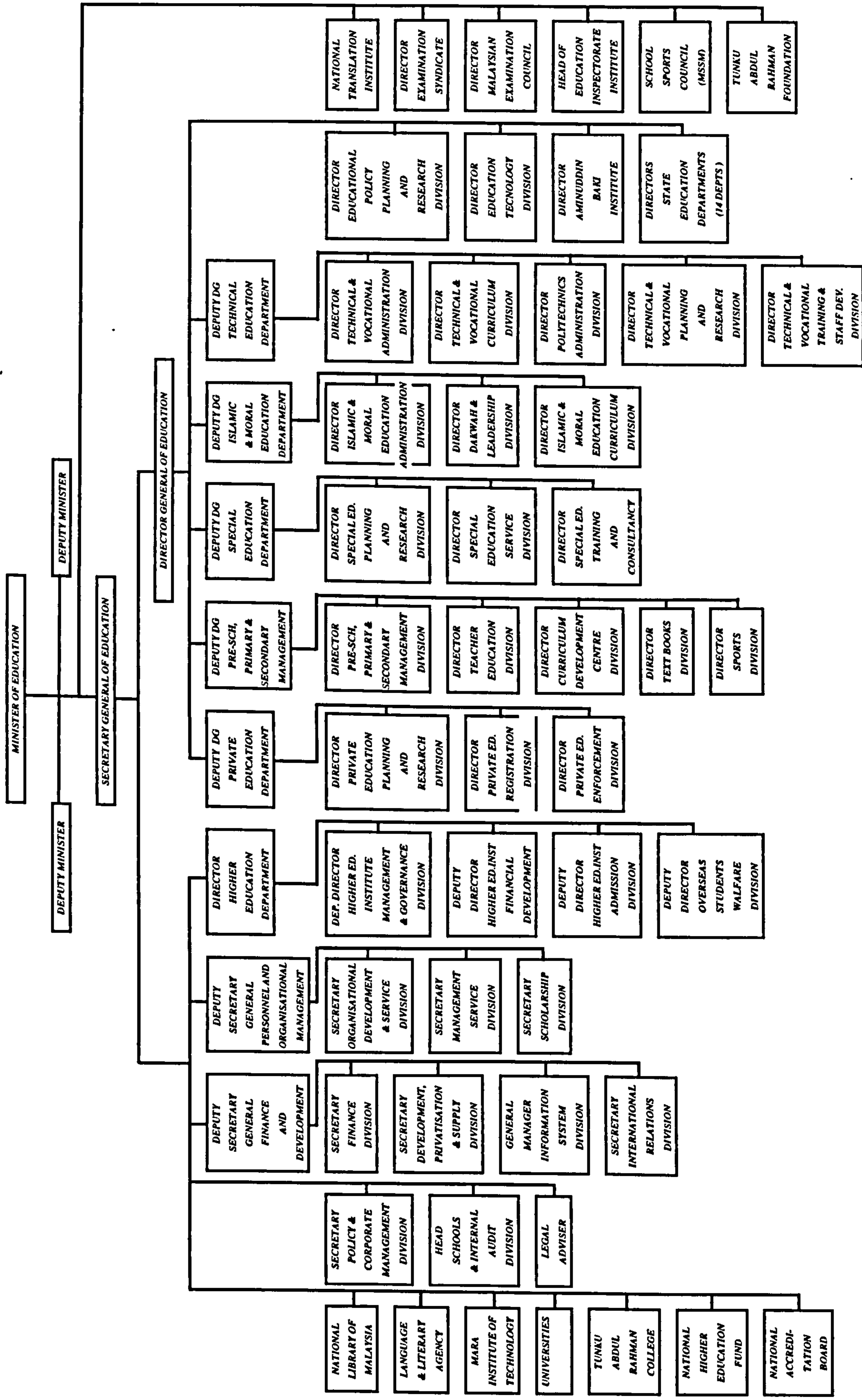
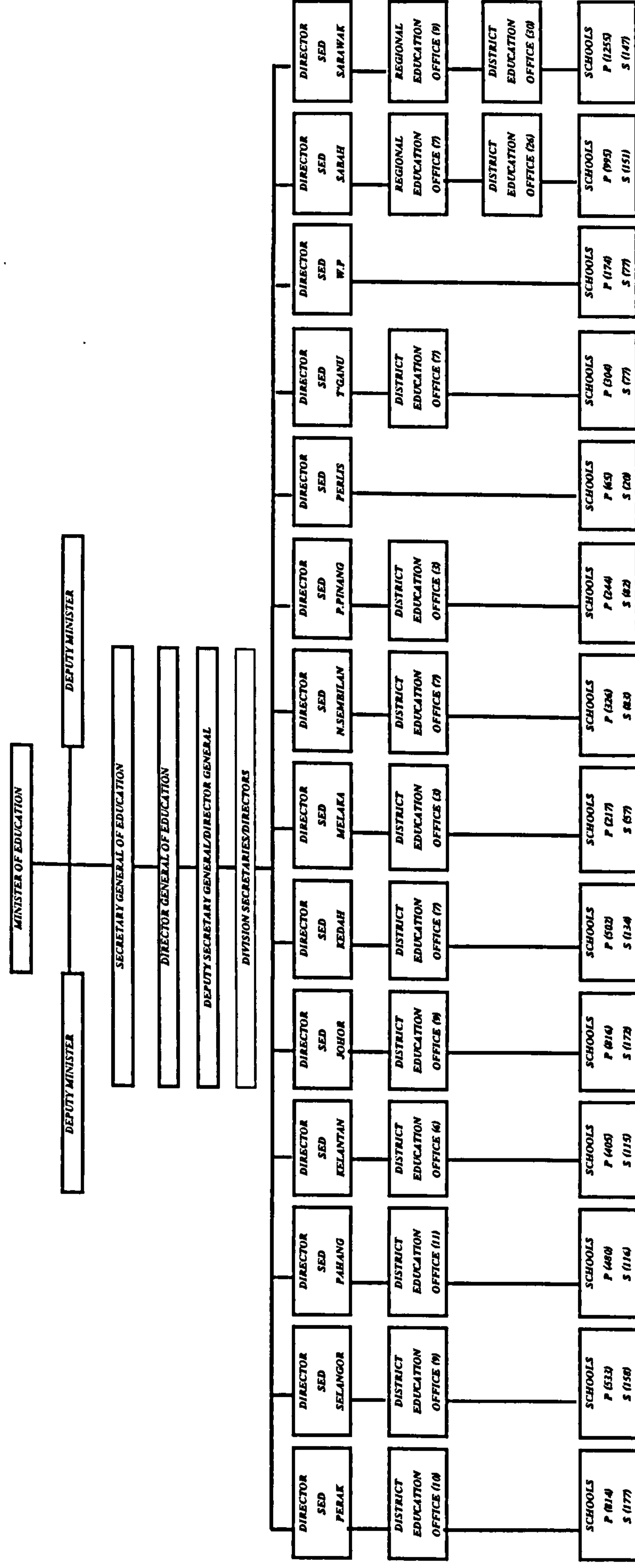


Figure 1.1b: Organisational Structure of the MMOE, SED, REO, DEO and schools in Malaysia



1.2 The Development of Computer-based Information Systems (ISs) at the Ministry

The MMOE has always relied on educational data and information for high or macro level administration and management purposes. This include, among others, staff emoluments, teacher deployment, school development, decision-making, policy analysis and evaluation. The data gathered from either the SEDs or schools throughout the country serves as a primary source of educational data and information.

Prior to 1976

One of the most frequently performed activities of almost all CEDs is the collection of school-based data. For example, the EPRD collects data and uses it to assess the likely number of classes, students and teachers when planning to open new schools and classrooms. At the same time, the Schools Division collects similar data to determine the distribution of teachers to schools within the fourteen states of the country. These Divisions collected the data using collection forms, calculating them manually, and storing the data in paper files. In order to simplify the collection, the CEDs sought the SEDs assistance in collecting data from schools. The CEDs then obtained state-level data, and later, aggregated it as national-level data. On the whole, the CEDs during this period had to depend on data that was too general and simple for the formulation of educational policies for the country.

From 1976 to early 1990s

The Ministry's acquisition of its first mainframe computer in 1976 (BPK, 1989) encouraged other CEDs to plan for the development of computer-based information systems within their own departments. The Ministry set up the Computer Service Division (CSD) and employed systems analysts, computer programmers and other personnel. The EPRD set out to develop an information system database for collecting, storing, processing, and analysing data. In 1981, with the help of UNESCO experts, the EPRD officers developed the Experimental Package for

Relational Database Release 1 or the *EPRDB1*. This was later upgraded to the second release in 1982, the third in 1986 and, finally the fourth release in the early 1990s, known as the *Extended Package for Relational Database 4 (EPRDB4)*.

In the mid 1980s, the Ministry acquired a new mainframe computer and increased the number of CSD personnel in order to expand the development of computer-based information systems. The Ministry also established a wide area network by supplying and installing visual display units to the CEDs, including the *EPRD*, which enabled the CEDs to store and access their data in the mainframe. The *EPRD* also transferred those databases previously stored in the mainframe at the Prime Minister's Department to the mainframe in the CSD, but continued to maintain them using the *EPRDB4*, whilst the CSD maintained their databases using *ORACLE*.

From 1976 to the early 1980s, the CSD was given the task of developing educational programmes and applications for the whole of the *MMOE*. Other CEDs, meanwhile, had to rely on the Division to obtain the required educational data from the database stored in the CSD. The 1980s were a time of transition from a stage of initiation to a stage of expansion, as both the CSD and other CEDs themselves began to recognise more clearly, though from somewhat different perspectives, the potential of computers to support educational information management at all levels. In 1989, the *JGMG*, a database developed by the CSD which contained every teacher's personal details and their professional history, was piloted in one of the *SEDs* and in 1991, it was introduced to other *SEDs* (Aziz, 1992 & Strudwick, 1996). This was thought to be useful to several divisions in the *MMOE* particularly the Schools Division and the *SEDs*. The system was managed by programmers in respective *SEDs*.

The mainframe used in the *EPRD* was important in collecting data, especially for the production of collection forms and the storage and processing of large amounts of data. It enabled the Data Unit in the *EPRD* to facilitate the production of forms for every school in the country and to embark on several collection projects. In addition,

the use of EPRDB4 and Statistical Analysis System (SAS) also allowed the Data Unit officers to speed up and simplify the tasks of entering, verifying and editing large amounts of data into the mainframe. The mainframe enabled the Unit to produce summary tables for distribution to other units and CEDs. The main concern of the Data Unit was completing its data collection within the timeframe and reducing the workload of verifying and editing data.

The existing information systems in the MMOE

In the MMOE, there are now many information sub-systems, which while independent in function, have many common and overlapping areas of activity. This causes a duplication of data, which usually leads to misinformation and disagreement. After 1991, the CSD supplied a mini-computer, microcomputers, and visual display units to the SEDs, as well as microcomputers to all DEOs. It also installed computer networking between the SEDs and the CSD and between the SEDs and their respective DEOs. Later the *JGMG* was introduced to all schools with computer facilities throughout the country and was handled by the school clerk. The system was maintained using ORACLE, which was completely unfamiliar to the school clerks, and hence the programmers at the SEDs were responsible for preparing programmes and queries in order to retrieve data from the database. However, there were conflicts between professional educationists and the programmers at the SEDs concerning time scales. Programmers were seldom able to meet the target date in producing the required output.

There were two possible explanations for the attitudes shown by the programmers. Firstly, the programmers did not see the importance of delivering the output within the stipulated time, as they were not answerable either to top management or the policy makers. The other explanation was that they were not sensitive enough to the needs of political and educational leaders. A further difficulty was that the professionals were often dissatisfied with the format produced by the programmers, since this did not meet the needs of top management. Due to the delay in obtaining

results from the CSD, the EPRD developed its own system, the Basic Education Information (*MAP*), which was able to cater for the demands of the decision-makers at the operational and management levels. Later, the outputs derived from this system were also used by top management for decision and policy making.

Prior to 1995, besides *JGMG* and *MAP*, there were several other systems developed by other divisions. At one point there were three separate databases on teachers within the MMOE, which contained similar basic information, but were used for different functions. The schools, REO/DEO and SED complained about this duplicated collection of staff information and requested that the two main systems, *JGMG* and *MAP*, be integrated into one. The top management then entrusted the EPRD to study the possibilities of integrating the two systems and at the same time lessen the burden faced by the people at the grass roots level.

As a result, the EPRD was intended to be a 'one-stop' information centre and, theoretically, information for decision-makers needs would be provided by the Division (EPRD, 1998b). The EPRD expanded its *MAP* to the EMIS/*SMPP* applications in the mainframe of the CSD, to cater for the needs of all levels in the education system and other government agencies too. However, the mainframe at the CSD was expected to be phased out by the year 2000. The CSD alerted the EPRD to take measures to ensure the continuity of EMIS/*SMPP* applications residing in their mainframe before the end of 1999. Steps were taken to transfer applications in the mainframe to PC using MS Access. Nevertheless there was another concern among EMIS/*SMPP* developers, where the application in MS Access was not stable and was easily corrupted when processing voluminous data, especially national level data. Hence the EPRD, particularly the EMIS/*SMPP* developers, realised that there was a need to migrate the existing EMIS/*SMPP* application from the PC MS Access to a stable and sustainable server database engine.

1.3 The EMIS/SMPP in the MMOE

a. Definition of EMIS

An EMIS is a set of formalised, integrated operational processes, procedures, and co-operative agreements by which data and information about schools and schooling – facilities, teachers, students, and learning – is regularly collected, aggregated and organised, processed, and disseminated for use by those responsible for decision-making, management and administration at each level within the education system, from schools, to districts, to states, and to the Ministry (EPRD, 1997). It contains information required to support the main activities of educational managers at those levels.

b. The EMIS planning

The EMIS plan was concerned with both the sources of information and the way in which the information was used. Attention was given as much to organisational design as to computing system design, as much to human resource development as to application development. The approach seemed complex and multifaceted, and therefore, the planning methods were adapted to the requirements set for the project.

The key methods used were:

- Extensive consultation and participation for both assessing information needs and design of the EMIS components and structures.
- Emphasis on planning and use information to support change, rather than to maintain the status quo.
- Viewing the process of planning as learning, that is adapting both the plan and planning activities to insights and knowledge gained through the experience of pilot testing and initial implementation activities as an integral element of planning
- Emphasis on capacity building, through participation in implementation activities as well as extensive training and human resource development in both the provision and use of information (EPRD & HIID, 1997).

A change-oriented EMIS was concerned with the status of the educational system both in relation to its previous conditions and to changing conditions, as well as to how both relate to projections for the future. This EMIS included attention to trends, which may affect the education system, and scenarios for analysis of alternative future possibilities. It also required an internal design that was flexible and adaptive, that was able to expand, shift, and change continually as issues and conditions change within a larger environment. As an integral part of management and policymaking, EMIS was closely linked to operations and decision making at all levels. Improved information flows and analysis, for example, would have great impact on deliberations at ministerial and other levels. EMIS linkages to the other major divisions, agencies, and levels of the Ministry, and to individual schools emphasised the important role of information in the complex decisions and working relationships critical to the success of an educational system. EMIS/*SMPP* was intended to serve as a key managerial resource to support a larger organisational system of working relationships and executive decision-making requirements.

The general objectives of the EMIS/*SMPP* project in the MMOE were:

- to design a comprehensive EMIS plan for the MMOE;
- to develop an EMIS integrated database;
- to provide a core data set;
- to provide quality data, relevant and timely to meet the needs of management and policy making processes;
- to be responsive to the needs of educators in each level (MMOE, SED, DEO and schools);
- to facilitate accessibility of officers to educational data and producing reports;
- to limit duplication in data collection;
- to permit broad-based access to educational information;
- to ensure protection on sensitive information.

The main objective of the project was to encourage greater utilisation of the EMIS/*SMPP* data in the educational management and policy formulation process, which required the integration of existing databases in the MMOE (MoEM, 1997). On a similar note, the primary operational objective of the EMIS initiative was an improvement in the quality of information that was routinely available to support the needs of educational administrators, managers, planners, policy-analysts and decision-makers at all levels in the system. With this objective in mind, the development of EMIS/*SMPP* began with an assessment of the data and information needs of Malaysian educators, of the goals and objectives of the education system and current programme and project priorities, and an assessment of the perceived deficiencies in the current information system.

*c. The EMIS/*SMPP* development and implementation in the MMOE*

The EMIS/*SMPP* Project started after the Sixth Malaysia Plan (1991-1995), where the education programmes in the plan aimed:

- (i) to promote and improve quality, excellence and innovation in primary and secondary schools;
- (ii) to expand equitable access to quality education; and
- (iii) to improve the cost-efficiency of sectoral management so as to maximise the impact of investments

The World Bank agreed to provide a loan under its Third Primary and Secondary Education Sector Project, 1993-1996 and suggested to the Ministry that one way of achieving the goals of the programmes was to improve managerial efficiency, and this was by improving its computer-based information system.

In broad terms, Malaysian educators, like their counterparts around the world, require data and information to serve a range of policy, planning, management and administrative purposes. That is:

- to describe the education system accurately;
- to monitor the attainment of goals and objectives across the education system;

- to monitor and evaluate the impacts of priority education policies and programmes;
- to assess the overall effectiveness and efficiency of the system education;
- to support the effective administration and delivery of educational; services to schools;
- to support the effective and efficient allocation of resources;
- to support the improvement of teaching and learning at the school level.

In 1995 the MMOE embarked on a three year EMIS/*SMPP* project to strengthen EMIS in the MMOE, to collect and maintain data and disseminate information that covered government primary and secondary schools, DEO/REO, SED and several divisions in the Ministry. An external consultant team, the Harvard Institute for International Development (HIID), based at Harvard University, provided services for the effective design and implementation of the Ministry's EMIS. Nevertheless the project could only take off in September 1996. Thus, the period for the project had to be shortened from three years to 18 months. The HIID consultant team services assisted the MMOE variously in designing and developing a core data set to fulfil basic educational data requirement of divisions, as well as a PC based application for schools in MS Access.

The implementation of data collection using the PC based EMIS/*SMPP* application started in June 1997 (EPRD, 1998a). The collection in West Malaysia was fully computerised, while in East Malaysia, only some districts in Sabah and secondary schools in Sarawak were able to participate. Data from schools without computer facilities were sent using data collection forms and later keyed-in at the EPRD. This caused some delay in the release of information. Problems such as hardware, software, faulty diskettes and personnel responsible for updating data had also delayed the submission of data to DEO/REO, SED and eventually to the EPRD. The PC based EMIS/*SMPP* application was continuously upgraded as soon as feedback on its defects was received from the users at the grass roots level. Specific

requirement of SED levels such as additional codes for certain variables, new reports, computer-generated collection forms and error trappings were built into the 1998 version of the EMIS/*SMPP* application.

The PC based EMIS/*SMPP* application installed at the Ministry, SED, REO/DEO and schools nation-wide allowed end-users to select and print simple reports such as tables and listings. Several SEDs replaced their schools' monthly returns with reports generated from the EMIS/*SMPP* applications. The EPRD conducted several training sessions to train data officers at SED and DEO levels on generating information from the EMIS/*SMPP* application. From the second year of its implementation the EPRD stopped printing and sending data collection forms to schools as the PC based EMIS/*SMPP* application had a built-in facility to generate forms that could be printed by schools.

Schools are provided with distribution computer diskettes containing the EMIS/*SMPP* application and partially completed information for the particular school. School Data teachers are responsible for keying in, updating and correcting all but information such as the name of the school, the school code, its location and the school grade - data provided in the school file. Having filled in all the information, the schools then send the diskette(s) containing data to their respective DEOs. At this level the Data Officer at the DEOs will verify data of all schools under their jurisdiction. Any missing or incomplete data will be gathered from the schools concerned and then completed by the respective DEO Data Officers. The officer in charge has to make sure that information such as the overall numbers of schools by level, session and locality, the number of teachers and student enrolment are accurate for every school in the district. After verifying and validating these data with individual schools concerned, Data Officers in every DEO will merge the data of all schools in the district into one file and send the diskette to the SED. The process of verifying and validating is repeated at this level but this time between the

SED and the DEO. The training of data teachers, support group and necessary hardware is provided by the MMOE.

Data collection is carried out on specific dates i.e. on 31 January, 30 June and 31 October, for specific purposes (EPRD, 1998a). The January data is geared to provide information for budget allocation, as well as for planning purposes such as projection of teachers' supply. The main data collection carried out in June provides information for all MMOE main planning purposes. This particular set of data is considered more stable as the enrolment of students into the sixth form, technical and vocational schools is already finalised. The movement or transfer of teachers would also have been finalised by then. The final data collection of the year in October is specifically meant to serve the needs of Textbook Division to enable them to make an allocation for the textbook loan scheme for the following year.

1.4 Educational issues and change

The immediate, long-term educational strategies in Malaysia are very much influenced by the National Development Policy, particularly the nation's economic and social policies. The government has set its target to become an industrialised and fully developed nation by the year 2020. The 'fully developed nation' status conceptualised by the Prime Minister includes not only economic considerations, but also other aspects, such as political, social, spiritual, psychological and cultural dimensions. However, this status can only be achieved if the nine strategic challenges confronting the nation listed by the Prime Minister in his paper 'Malaysia: The Way Forward' (Mahathir, 1991) can be overcome. One of the challenges, establishing a scientific and progressive society, innovative and forward looking, not only as a consumer of technology but also a contributor to the scientific and technological civilisation of the future, was one of the causal factors in the development of EMIS/SMPP in the MMOE.

Improving the existing education information systems has become one of the most critical issues being discussed, and gained the interest of many educational administrators. Chapman (1990) lists five converging trends resulting in the increasing demand for EMIS in developing countries. The first of these is the explosive growth of the education systems in these countries. This is a reflection of the population growth and subsequently increased participation rate, putting pressure on the provision of qualified teachers and teaching materials. As a result, the developing countries experienced a decline in the quality of education because the resource for educational development becomes limited (Chapman & Mahlck, 1993). The second is the increased complexity of education systems as ministries of education have undertaken more complex programmes and pursued multiple objectives in order to improve the quality of education. Thirdly, the increased financial pressures experienced by many governments have created a demand for more efficient resource allocation procedures. Fourthly, international agencies demand quantitative data concerning the progress of education projects that they funded so as to meet their own pressures for accountability. They demand more and different types of data to evaluate the progress of the projects, which they financed in the developing countries. Finally, there is increasing advance and availability of low-cost information technology for handling the large amount of data.

In the case of Malaysia, besides keeping pace with other nations in the development of modern technology in teaching and learning and educational management, the introduction of technology in the Malaysian education system also had the aim of realising the government's target of setting up electronic government. With the development of multi super corridor highways in Malaysia, one of the tasks of the MMOE is now to enable electronic links between the school and the central agencies to speed up the information flow, which will serve as vital input for the country's social and economic development. On top of that, the government feels that without technological advancement, the country's education system would lag behind when compared to the business and other corporate worlds, and the education system holds

the responsibility of producing quality and skilled manpower for national development as stated in the National Education Goals. The emphasis on electronic government and informed decision-making among the top management in all government agencies has given priority to the use of technology in government offices. More government agencies are now adopting these ideas, keeping their organisations well ahead in technological advancement particularly in the management of information systems. Hence, it can be said that the introduction of *EMIS/SMPP* in the MMOE was as much the result of external forces as internal contradictions, when the MMOE realised that there was a discrepancy between educational outcomes and the needs of the nation.

1.5 The *EMIS/SMPP* in use

The researcher was aware of the difficulties faced in the system implementation and the use of the *EMIS/SMPP* at all levels since her involvement in the project in 1992. Through participant observation at the study sites (the MMOE, and State Education Departments (SED)) and also feedback from grass roots level, some of the difficulties identified were: (i) the *EMIS/SMPP* was not used routinely in decision making processes at all levels in education system (EPRD & HIID, 1997); (ii) insufficient commitment from the top management in the development of the system; (iii) insufficient co-operation and collaboration among the various levels and across divisions in the education system; and (iv) a lack of basic supporting facilities at grass roots level.

Some of the *EMIS/SMPP* problems that the managers of the Ministry were well aware of included: (i) insufficient communication between professional educators and technical professionals; (ii) the system failure to perform up to the expectation of users at all levels; (iii) unavailability of current and reliable data in the system; and (iv) lack of information/IS policy in the MMOE to guide the development of the system.

Likely problems in implementing EMIS/SMPP

There is a continuing need to address the issues of the use of information and IS, since improving both data/information quality and information flow from schools to the MMOE and other agencies assumed the highest priority for the MMOE top officials in the process of decision-making. Until now, the most commonly talked about issue, where EMIS/SMPP data is concerned, is data reliability. As computerised data collection involves the processes of importing, merging and exporting at the SED and DEO levels, factors such as lack of facilities, skilled staff or even data deletion contribute to poor quality data/information output, although schools may have provided complete and accurate data as of the collection date. The other factor that led to the issue of data unreliability is the human factor. Since schools are not accountable to the EPRD, some schools do not regard the task of providing complete and accurate data as crucial. Problems such as submission of non up-dated data to the EPRD led to the need to extend the data verification time at a national level.

During the initiation stage of the EMIS/SMPP in the MMOE, the system development team encountered unexpected internal resistance to change. Members of this team, who wished the change to be successful, often found themselves working long hours, dealing with problems, trying to overcome the doubts of others and doing everything needed to see the changes through, while at the same time keeping up with the time frame given. During the implementation and institutionalisation processes of the EMIS/SMPP the main challenges came from other levels of the system such as SEDs, DEOs and schools. Change became equated with an additional workload, especially for those identified to carry out the new tasks. However, realising the benefit that could be gained through the implementation of the project, schools which until recently were lagging behind in the implementation of technology in their administration and management, are now attempting to close the gap. A massive and rapid computerisation process in schools, DEOs and SEDs throughout the country have made computers an integral part of the

educational management scene. All are now aware that the *EMIS/SMPP* is being implemented with the aim of providing meaningful support for these levels, with the aim of improving their performance, effectiveness and efficiency. Useable and accessible school databases are being established. The *EMIS/SMPP* provides SEDs, DEOs and schools with new tools, which could support them in a variety of activities. Although the pace of their application in schools is still slow, especially in schools without basic facilities, it is reasonable to assume that these tools will eventually become routine in the schools and other levels of the education system.

After two years of implementation, the human factor seems to be less threatening, since those involved in the information administration at all levels of the MMOE could now do away little by little with their normal manual procedures and other smaller collections or information systems. These administrators realised that they could now obtain the educational information required through the *EMIS/SMPP* application and there was broad consensus among the users that an integrated system-wide EMIS could improve the quality, efficiency, and effectiveness of the education system and ensure an equitable distribution of opportunities for quality schooling. Yet the full success of the project still cannot be guaranteed within a short period of time without the high level commitment and continuous support of all implementers.

The two main concerns of the *EMIS/SMPP* developers were the stability of the application in MS Access when processing the national level data and the availability of computer equipment at grass roots level to run the application. It was clear that one of the factors that could ensure the successful implementation of computerised data management was the availability of adequate, appropriate computer hardware and software, and appropriate infrastructure. Most of the REO/DEO and schools in Sabah and Sarawak were at that time using obsolete 486 DV PCs, supplied by the CSD between 1994 and 1996 to maintain the staff information systems, besides being used for daily administrative work, maintaining the *MAP*, disciplinary records,

financial records and examination records. Due to heavy usage, the computers often broke down: it was reported that officers from the MMOE, SED and REO/DEO had to go to schools to monitor, verify data and provide assistance to trouble shoot problems in the *EMIS/SMPP* application. Hence the *EMIS/SMPP* developers felt that there was an urgent need to rectify the problem by migrating the PC-based *EMIS/SMPP* application to run in a reliable and stable server database engine. In order to do this; the *EMIS/SMPP* developers would have to go through some tedious procurement procedures before acquiring such machines.

The issue of procurement of equipment, which is controlled by the central government, and in the case of the MMOE has to be applied through the CSD, is one of the rigid procedures which often delays the acquisition of relevant and more reliable machines for the *EMIS/SMPP* developers. It was not surprising that there were usually a number of other power groups at different levels in the organisation who may have had different perspectives on the priorities of the organisation. It was obvious that any major inconsistencies between the values held by different key people or by different important power groups led to other problems, as forces pull in different directions. The EPRD often found it a tedious and tough task to obtain approval for purchasing necessary, current and relevant equipment either for the EPRD, SEDs, DEOs or the schools. There had always been arguments about wants and the needs for the provision of such equipment. The EPRD strongly felt that as primary data providers and having to maintain two large systems, *JGMG* and *EMIS/SMPP*, schools ought to be supplied with powerful equipment to support these two systems. Similarly, as mentioned earlier, to enable the EPRD to process the national level PC-based *EMIS/SMPP* without so many technical disruptions the Division required a more powerful, reliable and stable server database engine to run the application. It was, indeed, a very challenging task for the EPRD to convince all levels in the MMOE that the use of technology in the education system was crucial and a profitable investment, because it served as a tool to speed up and enhance the efficiency of information flow.

Undoubtedly, at an earlier stage there was a problem that the system was not very user-friendly but it had been improved from time to time based on the feedback given by users of all levels. The task of making everyone in the MMOE understand the value of the information stored in the EMIS/*SMPP* database in the Data Unit was an issue that stimulated enormous effort. In order to overcome or at least lessen this problem, training in the use of the system and seminars on its development were made regular activities in the EMIS/*SMPP* project. At the same time, the training and retraining of Information Officers at the SEDs, DEOs and Data Teachers in schools was carried out as an on-going activity for the EPRD Data Unit. This served to expose these groups of people to the latest development and functioning of the EMIS/*SMPP* application and to create a professional network towards consolidating EMIS/*SMPP* users. In the broadest sense, what was required was an EMIS system into which flow a wide variety of data and information and which made this data and information accessible to a wide range of users at each level in the education system.

For many years, the MMOE had routinely collected a large amount of data from schools and the other sources to support the above purposes. However, the quality of the data had been suspect, and its usefulness limited by the following factors. Firstly, the priorities, goals, and objectives of the government change and shift over time, and the data and information required to monitor the progress of new government initiatives were often unavailable in the existing system. In the current dynamic and changing social and economic environment in Malaysia, the need for new types and forms of data and information had become particularly critical. Secondly, data and information were collected and maintained independently by many divisions throughout the Ministry, and in offices in the SEDs, each of which defined its own data and database structures. Without standardised data structures it was difficult to integrate these independent data sets. Thirdly, a number of divisions collected the same types of data, but at different times during the school year. This resulted in some significant differences in the data collected. Differences were often explainable, but at times it could be difficult to reconcile apparently conflicting data

and information in a timely manner, which led to suspicions about the reliability and usefulness of the data in general. Fourthly, data was often not available when needed, due to the timing of data collection, which was not carefully synchronised with the planning, budgeting, and decision making cycles within the Ministry. There was often a lag between data collection and the processing of data and the production of reports for users. Lags could be significant and as a result the data was not used because it was out-of-date. It was widely accepted that these deficiencies in the existing information system were unacceptable to the decision-makers.

In discussing why the *EMIS/SMPP* database was not used to provide input for decision-making, it is best to first have a look at the *EPRD* data collection schedule. As mentioned earlier, educational data was collected three times a year i.e. on 31 January, 30 June, and 31 October, and the verification process of the data gathered took about three months to complete. During this verification period feedback on educational data requests would rely on data as of the previous collection, which was about five months old at the most. It was rather discouraging, however, that top management considered these data as untimely, and as a result other divisions or even the *EPRD* would be directed to obtain the most current data. Most of the time, the divisions concerned would contact the *SEDs* and *DEOs* for the particular data and all too often, the *SEDs* would provide an aggregated data. Consequently there were always two or more divisions presenting conflicting data for the same purpose. Due to this problem, ad hoc short surveys were carried out in order to validate the data before a related decision was made.

1.6 The research questions

From the above discussion it can be seen that there are several problems faced by *EMIS/SMPP* developers in terms of the implementation and management of the system in the *MMOE*. Specifically, *EMIS/SMPP* was not being used to inform decision-making and there were problems of perception and knowledge about the functioning of the system among its users. The main purpose of this study is to

highlight issues associated with the introduction of EMIS in the MMOE. This study will give a better insight into barriers to the effective working of EMIS in the MMOE from the perspectives of the decision-makers. The decision-makers' views seem crucial, as they will not only be useful as guidelines in the EMIS/*SMPP* developers' effort to improve the system, but will also provide effective explanations as to why the main users of EMIS/*SMPP* were not using the system, and found that it did not fulfil their expectations. The decision-makers' perspectives will also depict their understanding of the system, which could then be used as the basis for solving problems related to EMIS/*SMPP* implementation. This study is based on a case study in which the knowledge and attitudes of decision-makers are seen as a key concern. It sheds light on general issues associated with the implementation of information technology/information systems (IT/ISs) into organisations.

The objectives of this study, namely to examine the problems perceived by decision-makers in using EMIS/*SMPP* data for decision making and in developing comprehensive/integrated database to support decision making, served as the foundation for the following research questions:

- i) How have decision-makers reached decisions?
 - a. To what extent does EMIS/*SMPP* data play a role in educational decision-making?
- ii) What do decision-makers think about the introduction and implementation of EMIS/*SMPP* in the MMOE?
 - a. Does the existing EMIS/*SMPP* database within the MMOE help to provide input for decision-making? If not, why not?
 - b. How could the MMOE ensure a more up-to-date and complete data collection?
- iii) How do decision-makers perceive EMIS/*SMPP* in the future?
 - a. What are the barriers that hinder the effective working of EMIS/*SMPP* in the MMOE?

- b. Is there a need to develop a comprehensive EMIS database in the MMOE? If yes, are there any suggestions as to how this should be done?

1.7 Summary

This chapter described the background of the case organisation, the MMOE and the existing IS within the Ministry of Education in Malaysia. The introduction, implementation and development of the EMIS/*SMPP* were discussed. This chapter also presented the researcher's awareness of the use of, and problems relating to the EMIS, based on participant observation before this study was formally conducted. The awareness of these problems led to the researcher deciding to do this research study.

The next chapter reviews some of the relevant literature from the standpoints of MIS in private/commercial and public/educational organisations, system evaluation, organisational management, and educational change. The focus of the literature will be on factors affecting the implementation of IS in both private and public organisations, and on suggestions for improving the implementation of IS within organisations.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter sets the case study in a wider context by considering the literature associated with the introduction of MIS. There is a very wide body of literature which draws on the implementation of information systems in organisations. This chapter focuses on the literature which has most relevance to this case study, that is: MIS in private/commercial organisations, MIS in public/educational organisations/EMIS, system evaluation, organisational management, and educational change. The case studies in the areas of MIS and EMIS reflect the range which might be consulted in exploring the different facets in the implementation of information systems (henceforth abbreviated to ISs) within organisations. We also look at the wider question of educational change for its relevance in understanding education organisations.

Common issues emerge from different areas in the literature review: presystem planning, the involvement of top management and system users, the availability of system manuals, availability of appropriate machines and supporting facilities, an understanding of the system and its implementation, the management of change, the using of prior experience in new ISs implementation, integrating organisational structure and culture into ISs planning, communication between ISs experts/developers and users, and system evaluation.

This chapter is divided into five sections. The first looks at general commentaries on MIS, the characteristics of an effective MIS, guidelines for successful MIS development, and why MIS might fail. The second looks at case studies in the implementation of MIS from different viewpoints; MIS in private organisations, MIS in public organisations, system evaluation and organisational management. The third section looks specifically at EMIS, and explores educational issues and change, and case studies in the

implementation of IS/EMIS in educational organisations in four different countries. The fourth section compares and contrasts findings from earlier sections. The fifth section is a summary of the chapter.

2.1 General commentaries on Management Information System (MIS)

This section looks at literature which seeks to generalise the development and implementation of MIS within organisations. The next section looks at case studies examining the emerging issues in the implementation of IS in different areas of MIS in private and public organisations, system evaluation, and organisational management.

A management information system can be defined as any system that converts the data collected from routine transactions into information, which directly aids the decision-makers' ability to make decisions. Where the emphasis has been on providing managers with information for the decision-making process, these types of systems have been referred to as management information system, MIS (Thierauf, 1984). Every organisation of whatever size has an information system, and no organisation can operate without one. System administrators and designers first highlighted the importance of MIS in the early 1960s. Every MIS is made up of a combination of human, material and equipment services in fulfilling the information demand of administrative level in an organisation. It could also be a combination of several closely related sub-systems, sharing the same data and processing resources.

According to the MIS concept, MIS activity is part of the on-going activities of an organisation. The main function of MIS is to furnish the top management with general information about the organisation and to facilitate the flow of information out of and into the organisation. In order to achieve this objective, each system in the organisation is regarded as a sub-system whereby the function of each system is integrated, to the extent where the entire organisation becomes a MIS application. In this way, the needs of a sub-system are subsequently met once the needs of the organisation are achieved.

2.1.1 Characteristics of an effective MIS

Over the years, various types of systems have been developed in order to satisfy the needs of managerial and operational decision-making. Because each MIS is as unique as the organisation it serves, one organisation's approach may be unworkable elsewhere (Cassidy and Cresswell, 1997). According to Cassidy and Cresswell (1997) and Thierauf (1984) the information provided can be combined with human intelligence, intuition and judgement to become an extremely valuable tool for any manager. In addition, Cassidy and Cresswell note that an effective MIS should have the following characteristics:

- it should be a forward- and backward-looking system with integrated subsystems;
- it should have the capability to plan and control business activities that are clearly definable
- it should have the capability to prepare reports to assist management in planning and controlling both current and expected business activities;
- it should employ the “management by exception” principle so as to highlight deviations from current plans and objectives via organisation-wide standards and objectives;
- it should retrieve timely information about controlling operations and permits the transactional processing of data;
- it should have interactive, batch-processing modes for a timely response;
- it should use data elements accessible only to authorised users, to store frequently accessed data;
- it should have a random medium for storing data, or direct-access storage, so that the manager can extract information relatively quickly;
- it should enable standard and custom-made models with the storage of on-line data to produce meaningful output for controlling ongoing operations.

2.1.2 Guidelines for successful MIS development

One approach that leads to successful computerisation in an organisation is to lead from the top, but to involve the whole organisation in the process of planning and change.

Knight (1986) suggests that it is of paramount importance for senior staff in the organisation to change their behaviour and learn two skills. The first is an understanding not so much of how computers work, but how they change the work done by people. The second is the ability to build up the strategic capability of the organisation. For these skills to be developed on an organisation-wide basis, it would be insufficient for top management to leave information technology to the specialists or the technical group. New managers, who are anything but IT experts and may even be 'computer-shy', have to set the context of clear goals, support, learning opportunities and monitoring, which are essential if the information technology introduced in the organisations is to function at its full level of effectiveness. This is as valid within the public as it is in commercial organisations, since no organisation can develop without clear guidance from senior staff or top management.

While the divisional heads need to take an active role in IS development, they must also seek the involvement of the entire organisation. This can be done by setting up a committee that will deal with computerisation and its place within organisational development (Thierauf, 1984; Rodriguez-Diaz et al., 1997). The committee should be kept small, and be staffed only by those committed to computerisation as a development programme. Members of the committee should also be selected in such a way that they represent all shades of the approach to computerisation. For instance there should be a representative from the professional and administrator group each, someone with a strategic view representing both groups, and a representative with a communicable knowledge of the technology, preferably from both professional and administrator groups each. Broadly, what such a committee must do is to combine the strategic view and the users' views so that the correct joint approach to defining needs and planning can be carried out.

2.1.3 Why IS fails

In most public organisations, the use of MIS as a decision-support tool is not widespread. Even where the need for MIS is recognised, the difficulty of meeting that need may outweigh the benefits, and problems of IS implementation might go unresolved (Thierauf, 1984). The following factors are found to contribute to failures within ISs in organisations (Thierauf, 1984; Heeks, 1987; Wood-Harper et al., 1985; Rodriguez-Diaz et al., 1997):

- people who understand both the problems and the solutions are scarce. The management understands the problem, while the system analysts attempt to understand the problem, and the programmer and/or the system developer understand the solution but not always the problem;
- there may be lack of communication between management, systems analysts and programmer/system developers;
- there may be a lack of top management involvement in the planning and systems design phase;
- there may be a very costly database management system (DBMS);
- there may be inadequate pre-systems planning, which refers to planning prior to system analysis, design, and implementation;
- there may be inflexible ISs; unless flexibility is built in, the system may quickly become antiquated and unresponsive;
- qualified and committed technical or professional personnel may be unavailable;
- there may be a failure to develop adequate strategies for extending the systems to other divisions/departments of the organisation;
- ISs may be under-utilised and poorly organised due to a lack of understanding of its purpose and product among the management;
- a technology-led rather than needs led approach may be adopted, whereby system developers begin by looking at what equipment is available, or by thinking that computerisation is the goal;

- there may be a lack understanding of the fact that computerisation is only a means to an end and, in some cases it may not be the means that is required;
- simply transferring a system designed for paper across to a computer will not exploit the strengths of the computer;
- the application used may not be accepted by the users, and may not be integrated as a normal management tool in their jobs;
- ISs are too complex and not user friendly;
- ISs do not include all variables for decision-making processes.

Levin (1976) and Hockey and Wellington (1990) argue that decisions on IT policy and practice involve both external and internal constraints. Internally, organisation management in some cases constrains the vision and IT strategy of their own data processing or computer manager. This is especially true in hierarchical organisations. Externally, IT decisions and strategies are often influenced by pressures outside the organisation, for example, the country's political considerations and other authorised organisation in-charge of IT, such as the Malaysian Institute of Microelectronic Systems (MIMOS), in the case of Malaysia.

The following section discusses the major issues in the development of MIS, as highlighted by authors, and also as found in case studies on different areas; private/commercial organisations, public/educational organisations, system evaluation and organisational management.

2.2 Case studies on the implementation of IS in organisations

From the literature available on the subject of IS, it may be seen that no organisation is free from problems in the process of implementing IS. The degree of the difficulty experienced by organisations may vary depending on the size, structure, culture and also the management or leadership style of the organisation. The researcher first had the impression that the main problem hindering the smooth implementation of IS revolves

around matters pertaining to technology. However, this section reveals the key emerging issues in the implementation of IS in organisations from the perspectives of different areas: MIS in private and public organisations, system evaluation and organisational management.

2.2.1 System design

The most fundamental type of information that the system designer should have is the purpose of the system. Issues such as setting priority objectives and the order in which the data should be produced may be considered as essential in helping make the systems to be effective. Systems design is concerned with the construction of these channels of communication and the means by which the information travels along the network. The design and operation of MIS should relate to both the organisation of its own process and the overall organisation of the total system of which it is a part. Ross (1970) suggests that an information system should be organised on an integrated basis, such that levels of information and subsystems tie together into a complete body of information that can serve different levels in the organisational hierarchy, an issue supported by Premkumar and King (1991). It is essential, therefore, that the business of an organisation is analysed to establish the activities, the way they are linked, the information flows, either horizontally or vertically, and the major systems and their sub-systems.

The design of IS call for considerable knowledge and expertise, and is linked to very careful planning and control. It is important to produce a systems framework and identify the key systems and sub-systems in the organisation in order to design effective systems. There are many goals that an information system may aim to fulfil. Schoderbek et al. (1975) cited in Crowe and Avison (1980) point out that it is very important to set goals because if one clearly defines the objectives of the system at the outset, then one can judge whether the objectives are being achieved. This, then,

provides a measure of system performance and a gauge of its usefulness to the organisation.

2.2.2 Pre-system planning

Authors from the four areas; MIS in private organisations, MIS in educational organisations, system evaluation and organisational management agree that proper IS planning will not only improve the top management decision-making processes and resource allocation but also the quality of services rendered by the organisation. The planning process for an IS is significantly influenced by information available within a particular organisation (Premkumar and King, 1991, Millet et al. 1992). Due to the key role played by MIS, these systems should be integrated with the planning system of the organisation (Heeks, 1987). Thierauf (1984) and Heeks (1987) suggest that an effective MIS can only be introduced once the organisation plans are known. Identifying the key objectives points the MIS effort towards developing successful applications and the process of setting these objectives demands precisely the kind of top management interest and involvement that helps determine the success of MIS. This notion is supported by Fung (1996) who stresses that the systems design and development strategy play a vital role in determining system quality. Hence, for a 'tailor-made' system, an IS planner should be able to identify planning outputs critically needed by top management.

Project planning in private and public organisations and in the area of organisational management is considered as a way of 'thinking through' the future course of events, rather than a strict procedure which cannot be changed. In such a way, the master project plan served as a backbone for co-ordinating activities and for dissemination to the people involved (Riss et al., 2001; Rodriguez-Diaz et al., 1997). For Li and Chen (2001) too, careful and thorough steps in the implementation of IS planning process is crucial in ensuring a successful and effective IS project. These authors strongly feel that a planning document is important in the implementation of IS within any organisation as

it provides guidelines for selecting critical applications for implementation. Moreover, it serves as the basis for allocating IS to current and future computer applications, and for expanding the scope of the document in the next IS planning cycle (Riss et al., 2001; Li and Chen, 2001). Similarly, in improving management effectiveness Wingerden (2001) suggests that strategic planning concerns the 'desired future state', and develops strategies and plans to achieve that desired state. Three basic questions that strategic planning process seeks to answer are "Where are we?" (research and analysis), "Where do we want to go?" (objectives), and "How are we going to get there?" (strategic and plans) (p.490). These are similar questions to those posed by Li and Chen (2001) in IS planning.

Aziz (1997) in his study on The Use of Computer-based Information Systems for Policy Development in the Ministry of Education, Malaysia states that the use of computer-based IS in the MMOE lacks co-ordination in data collection and management control over acquisition of computers and software, training and computer skills. These should have been explicitly stated in the pre-system planning and as a result, the lack of these factors has affected the implementation of IS in CEDs, SEDs and DEOs alike.

Visscher and Wild (1997) claim that "for any innovation to succeed, there must be some preconditions that make the organisation or individual susceptible to accepting the innovation" (p.270). These are the required aspects of the organisation and its daily functions at the time the systems are installed and the implementation process begins. The preconditions can be both organisational and the features of the system introduced, and might relate to the organisation as a whole or to individuals within the organisation, or more realistically, a combination of the two. Among the preconditions that need to be taken into consideration prior to implementing a system are:

- easy access to facilities;
- critical mass of IT facilities;
- user acceptance;

- relevant model of learning;
- actual and perceived need;
- relevant training;
- support of senior managers;
- technician support.

In the area of system evaluation, Mumford et al. (1972) point out that planning strategies and system design are rarely evaluated after implementation is completed. Yet this is essential if planning and system design are to incorporate a learning process in which past mistakes are not replicated in the future. It is obvious that planning is not a one-off matter. There is a continuous need to monitor and evaluate new technology and its effects within the organisation.

2.2.3 Top management involvement

The designs of many ISs require management participation at several levels within the organisation. By participating in change, management will help motivate their subordinates (Crowe & Avison, 1980). Both senior and subordinate management must agree on what factors are to be controlled, how performance will be judged, what are realistic reporting periods and so on, before any information system can be designed. Since effective decisions should be based on a good flow of quality, up-to-date information, the need for an effective MIS arises. This cannot be done unless the manager is totally involved with the selection of issues and problems the system addresses, the information content of reports and files and the nature of the models used. In many situations, the manager is the main source of data. He knows the problem and has been given the responsibility of solving it. Accordingly, he must play a key role in devising a system, which will help generate a solution. This not only ensures validity and the practical nature of the system but also increases the other managers', particularly the top management's, confidence in it.

Thus, effective MIS does not just happen; it requires complete managerial involvement with MIS experts. Top management involvement is essential in adding 'weight' to the change brought about by the introduction of IS within organisations. The first requirement for an organisation which hopes to make a successful change into the organisation is the presence, within the top management, of someone who is prepared to examine in detail the problems involved in effecting major changes and exploring the steps which need to be taken if the changes are to achieve acceptable results (Taylor & Singer, 1983). It must be a person who on one hand appreciates the relevance of new innovation and ideas in effecting the transition, and on the other, has the power to initiate and progress any changes which are necessary. That person must also be prepared to be relentless in the pursuit of progress. He/she must, in fact, be prepared to become the major driving force behind any change process. This is consistent with the critical factors in implementing ISs in higher education institutions, as outlined by Rodriguez-Diaz et al. (1997).

The findings of studies by Ross (1970), Baharudin (2000) and Li & Chen (2001) show that the lack of top management involvement in the planning and system design phase were among the greatest problems encountered. Top management should be closely associated with MIS from the start and its involvement is necessary for high computerisation payoff. In outlining guidelines for successful MIS development, the authors above also point out the need to involve top management from the planning phase as well as in the succeeding phases of MIS project. Riis et al. (2001) further illustrate that management should be able to demonstrate involvement and determination to act; yet at the same time it is important that management provides room for creative ideas and initiatives from employees.

Lack of management support and involvement could lead to the failure of many computerised application systems implementations (Davis & Olson, 1985; Further Education Unit (FEU) report, 1987; Baharudin, 2000). This is because management

support and backing ensures that the project implementation receives adequate funds and resources. Moreover, full management support could effectively enforce changes associated with the new system in terms of work habits, rules and regulations, norm, cultures, procedures and any organisational realignments (Carnall, 1995).

Baharudin (2000) considers that the importance of this aspect of top management involvement is consistent with the guidelines laid by Heeks (1987) and one of the preconditions proposed by Visscher and Wild (1997) for the introduction of new technology. From his study, Baharudin found that one of the categories of variables that has significant influence in the success of computerised application systems (CAS) implementation in the Malaysian public sector, including the MMOE, is management support and commitment in the implementation of CAS.

It is stated that top management involvement is, equally, a crucial factor in evaluating systems. It is emphasized by Irani and Love (2001) that IT/IS evaluation is important for many reasons, with organisations needing to justify their investments in IT/IS before committing management's time and organisational resources to experience no doubt considerable procedural difficulty in return. The fact that managers need to understand better the impact of IS on the organisational infrastructure and performance highlighted by Irani and Love (2001) is also mentioned by Rodriguez-Diaz et al. (1997) in implementing MIS in public/educational organisations and by Jones (2002). Irani and Love (2001) further state that IT/IS evaluation remains under-developed and under-resourced by management, yet it is an important activity that managers can ill-afford to neglect if they wish to harness the full impact of the people, system and technology. However, the increased complexity of IT/IS, due largely to the broad scope it adopts from an organisation perspective, combined with an uncertainty and unpredictability of benefits as mentioned by Cassidy (1990) and Irani et al. (2001), point to reasons why management tends to neglect IT/IS evaluation. Managers consider that the process takes

too long, costs a significant amount of money with little visible return, and involves too many people with departmental or individual political agendas.

In successful organisations, Wingerden (2001) stresses that the management team must be committed to courses of action that are intended to ensure that the company is both stable and well positioned today and tomorrow. The author claims that top level management needs to devote a significant portion of their time, planning for the future well being of the organisation and this will not materialise without a systematic process of planning. It is essential that managers strive to develop strong planning skills and adopt approaches that can be used to answer the question *Who should perform the planning?*. In 'Top-Down Direction/Bottom-Up Planning,' the top management team provides the general direction and middle and lower-level people perform the detailed planning, including implementation planning. In this kind of approach, the top management team meets regularly with individuals who have been assigned planning responsibility to direct and co-ordinate the overall planning effort.

2.2.4 Involvement of users at all levels

Having decided to implement a computerised information system in an organisation, the next stage in the development of the system must involve management and users at all levels (Crowe & Avison, 1980; Martino, 1999; Li and Chen, 2001). These systems are too important to be left entirely to the computer specialists to design and install without involvement of potential users (Thierauf, 1984; Wood-Harper et al., 1985). With proper understanding among users, an information system can be developed and may indeed become, by providing appropriate, timely and reliable information, the most powerful management tool developed. The users must be involved in the project from the onset (Management of Information Technology (MIT) report, 1991). The systems staff obviously need the help and co-operation of users affected by the application to be developed. The principal user of the information should be given considerable leeway in

determining the information requirements and the conditions of processing and communication for effective decision making.

Genus and Kaplani (2002) suggest that managers should be able to make staff more sensitive towards the need for change, and encourage them to be involved in prior planning. Although this may lead to an alteration of plans as management may often have initially conceived them it is for a good purpose and must be expected to occur in implementation and innovation. Since technological change takes place in a human context, it is advisable that planners and technology managers consider involving people at all levels the change process (Martino, 1999; Li and Chen, 2001). The people that make up the environment where the change is introduced do have great influence in its development.

According to Riis et al. (2001) it is not easy to implement a vision in practice. In the development or implementation phase of a project involving change, they found that the case study company developed a vision which stressed the importance of learning to work together, and the need for a thorough discussion of the exchange of information between workstations internally. This exercise involved people at all levels in the company. Because of the complex interplay between sections and departments, it is difficult for a single department to initiate a process. Hence, there needs to be collaboration and involvement of people at different sections, departments and levels to make change work in the organisation. The authors, too, believe that implementing major organisational changes often affects people's working conditions, working group behaviour, and social status in the company. Not surprisingly, implementing major changes in companies is often connected with uncertainty with respect to individual employees as well as to the organisation on the whole. This growing uncertainty is bound to develop resistance to change, and this is where the findings of their study show that unlike the top-down approach, dialogues and cross-divisional collaboration achieve more satisfying results particularly between management and the workers.

In the area of public organisations, systems evaluation and organisational management, the authors also seem to agree on the issue of involving users at all levels (Heeks, 1987, Visscher and Wild, 1997; Serafeimidis and Smithson, 2000; Miller and Lee, 2000, Wingerden, 2001). They believe that users, as well as top management, should actively participate in the implementation of the system. Managers must remain informed of the latest developments so that they can make right decisions when implementing IT in their organisations. This can be done by appointing a suitable person or group of people with overall responsibility for IT, and ensuring they set up mechanisms whereby regular discussions can take place and lead to feedback and dissemination (FEU, 1987). In doing so, the implementation of IT requires the involvement of people at all levels so as to avoid the problems of miscommunication, backlog or bottleneck at any point or level in the organisation (UNESCO, 1992).

The findings of Baharudin (2000) support Heeks (1987) and Visscher and Wild (1997) on this issue. Baharudin (2000) shows that other categories of variables influencing the success of CAS implementation in the Malaysian public sector are users' involvement and participation in the design and operation of CAS, and users' commitment and priority to the implementation of CAS.

In common with Genus and Kaplani (2002) and Martino (1999), Serafeimidis and Smithson (2000) also identify the need for cross-divisional collaboration, and extended participation and assignment of ownership and resources for an IS evaluation programme to be successful. The latter highlight that in order for learning to flourish, information feedback loops and dissemination channels are necessary at every management level.

In the area of organisational management, Miller and Lee (2000) emphasise collaboration within the organisation. This refers to the degree to which people in an organisation consult and interact with one another in the process of making decisions.

According to them, “collaboration is a function of the number of individuals and departments involved in making decisions, as well as the scope and intensity of their deliberations” (p.169). Collaboration allows managers to reconcile or creatively integrate diverse perspectives and as a result, it renders decisions more informed and more pertinent particularly among middle managers.

2.2.5 Communication between MIS technicians and users

It is also necessary to improve communications between the users and computer and system staff. Without such improved communication, it is not possible to establish a mutually trusting and co-operative spirit in IS implementation within the organisation. Three groups of people need to be involved in information management. These are the senior managers concerned with the strategy of the organisation, the IT professionals who know about the technology, and the middle- and lower-level staff who are the users of ISs. These three groups do not have the same perspective on the problem, and it is not easy to get them to agree on an effective solution (Knight & Silk, 1990; Ross, 1970; Robey, 1983; Thierauf, 1984; MIT report, 1991). This is due to the fact that the groups have different backgrounds, interests, priorities, and objectives, which later can lead to divergent organisational loyalties, approaches to solving problems, and vocabularies. Because of these differences, these groups of people tend to speak differently.

Thierauf (1984) highlights that in order for the introduced system to function effectively, there has to be a two-way co-operation between the MIS people and the users. The expected co-operation from users then helps to open communication channels between the MIS function and the user group which otherwise would be very minimal. Together, the systems analyst and the user must consider the scope of coverage, degree of detail, and the contents of reports, as well as the frequency of reporting, period of time to be covered, and distribution and communication methods. However, the author expresses concern that the development of ISs in organisations does face failures and it is doubtful

that these failures are attributed solely to the personal weakness or ignorance of individuals.

Similarly in public organisations, it is of the utmost importance that both MIS management and organisation professionals know that they are to face reality and to begin to manage MIS functions professionally, as a team (FEU, 1987). In relation to the issue of communication between MIS technicians and users Aziz (1997) makes it clear in his study that the main problem in managing control in implementing computer-based IS in the MMOE is lack of co-operation between divisions particularly the EPRD and the CSD, which are responsible for the development of IS in the ministry. Aziz found that the functioning of IS in the MMOE will be more effective if the professionals and the computer specialists in the Ministry were to combine their knowledge and skills to develop a comprehensive system which will be useful to all users.

Another precondition identified by Visscher and Wild (1997) that needs to be taken into consideration in implementing a system is the level of technician support, and this is particularly important for management and administrative purposes. The findings of Baharudin (2000) identify another category of variables that has a significant influence on the success of CAS implementation in the Malaysian public sector by narrowing down the users-designers communication gap. This supports work by Robey (1983).

2.2.6 Human resource management

Human resource management includes, among others, recruitment of staff, placement of staff, staff development activities, pay and compensation, health and safety, staff welfare, and maintenance in an organisation (Ross, 1970).

The people element is the least predictable, and the least subject to control. However, it is the most important of all the elements in the management of ISs. Genus and Kaplani (2002) reveal the impact of employee management and behaviour on the implementation

of operational technological and organisational change in support of strategic objectives in organisations. In their study, they illustrate the interconnection between changing operational activities and technology, the management of human resources and organisational strategic requirements and choices.

Martino (1999) and Venkatesh (2000) believe that human context, where technological change takes place, influences the nature, direction, and speed of change. Undoubtedly, the environment where the system is introduced has a great influence on the success or failure of its implementation. It is also mentioned that in the context of workplace technology use, specific issues related to external control include the availability of support staff and users in organisational settings will have general perceptions of external control based on prior technology introductions in the organisation.

On a similar note, Loeffen and Wortmann (2000) argue that today's managers have to provide a working environment that stimulates people to contribute to the organisation they work for. From the human factor point of view, the theoretical, practical and IT-based approaches have one thing in common: they connect teamwork to today's organisational challenges. The two most prominent elements of the approach are empowering the people and making the organisation more transparent because people need a clear as possible view of their current situation

Riis et al. (2001) claim that it is important to acquire a broadly shared acknowledgement of the need for change, and that the early stages i.e. the initial phase of the project, should be seen as an opportunity to establish confidence in what management intended to do. As for Li and Chen (2001), one of the steps they took before beginning the project in their case study was to gain organisational commitment. They met with the top management to discuss their information needs and the possible actions and outputs of IS planning. Co-operation from all employees was solicited, and the IS executive wrote

a memorandum announcing the project and its purpose so that the employees were not caught unaware of the implementation of the project.

Even in a public organisation the factor that influences implementation and institutionalisation of IS most in any educational organisation is the human factor.

According to Visscher, A.J. in Barta et al. (1995):

People variables' proved to be crucial anywhere. Motivation for, and attitude about the innovation were mentioned very frequently, as was the extent to which future users can influence the process of development and implementation. ...Many authors stress that careful management of the innovation process is essential. The procedural side of innovation process is crucial: It is important to establish clear innovation goals and a realistic innovation pace. All levels in the education system need time to learn to appreciate and assimilate an application. (p.21).

A serious consideration in implementing IS in educational institutions is appropriate information system (IS) staff and system managers are important with a need of both technical and professional knowledge (Rodriguez-Diaz et al., 1997).

In their study, Serafeimidis and Smithson (2000) found that the management did not take sufficient care in explicitly reformulating the roles of the people involved, to take account of the proposed changes. Instead, existing procedures continued to be reinforced by repeated action, the lack of 'felt need' for change. Based on the findings of Jones's (2002) study too, it is indicated that there are similar issues such as interpersonal factors that have to be given attention to in the implementation information system.

Irani et al. (2001) agree with Genus and Kaplani (2002), Martino (1999), Riis et al. (2001), and Li and Chen (2001) who also emphasise the human and organisational factors in the implementation of information system in any organisation. Based on their findings Irani et al. strongly believe that the reason for IS failure to function effectively

is attributed to not considering human and organisational factors during the evaluation and implementation processes.

In consistent with Martino (1999) and Genus & Kaplani (2002), Humphreys & McHugh (2001) acknowledge that the most important input into an organisational system derives from its staff, and improved outputs can only be achieved by developing and motivating these inputs. Staff development must be a central theme for the success of organisations operating within intensely competitive operating environments. Using three case studies in three different settings, they see a need to ensure that the activities pursued by individuals contribute to the achievement of organisational objectives and, at the same time lead to personal satisfaction.

2.2.7 Training

Research shows that for organisations needing staff with IT skills, training is an important, although often complex area (Heeks, 1987; Hockey and Wellington, 1990). When introducing a computer-based information system in any organisation, training remains a crucial part of change, and thus, should not be taken for granted. Bentley (1981) comments that one of the vital, if not the most vital, elements of successful system installation is the education and training of users. Good system design considers training aspects at an early stage. The training programme must be planned to cover both knowledge and skills, and has to go through a three-stage process; explanation, demonstration, and practice. Unfortunately, training is often overlooked and underestimated, and this has significant implications for successful installation, no matter how well the system has been designed and built (Bikson et al., 1985).

System analysis and design involves tasks that are sequentially linked, cannot be performed in isolation, and require extensive communications and training (Brooks, 1972). Given the continuing practice of recruiting relatively inexperienced staff from among whom higher-grade personnel can be drawn, there is clearly a need for training.

The training of trainers, i.e. the training of one staff member who then passes on skills to others, though often used as a way of saving money, was felt to be limited in value. If training was not seen as immediately relevant to their day-to-day work, then opportunities to learn, for example, about the wider system within which computerised tills were embedded, would not be particularly welcome. Training must be made available for all users, regardless of what and at which level they are in the organisation. This is emphasised by Fuerst and Cheney (1982), who suggest that user training during the implementation process is important in both general and specific application system use whilst Walker (1968) stresses that managers too should be trained to give them “a knowledge and appreciation of the requirements”.

From his study, Baharudin (2000) found that user education and training correlates directly to the success of computerised system applications in public organisations in Malaysia. The purpose of training is to ensure that end users are comfortable with the new system, and fully understand its potential uses, but it is often sacrificed, or not given serious consideration in systems development projects. Aziz (1997) suggests that the responsibility of conducting training in the implementation of IS in the MMOE should be given to the respective education department, and funds be provided for them to organise the training.

Visscher and Wild (1997) comment that relevant training is one of the preconditions in implementing an IS, particularly if it is intended for management and administrative purposes. One of the three problems identified by the Ireland Department of Education that will hamper IT diffusion in schools is the lack of guidance/advice available to teachers on hardware and/or software (Drew, 1994). According to the International Labour Office of Ireland, the knowledge, skills and attitudes required for operating and maintaining new technology and participating in the innovation process will vary according to different categories of workers. The introduction of information

technology has, therefore, placed new demands on both educational and training institutions in Ireland.

2.2.8 Availability of system manuals/documentation

In general, a computerised information system documentation includes operator and users manuals. The operator manual describes the step-by-step procedure of how to operate the system, and this includes how to execute batch runs, how to key in data and how to react to errors. The user manual tells users how to carry out the data entry process, how to update information and how to delete records. It also describes how to print various reports and how to deal with errors. Indeed the user-manual would serve its purpose best if it were made available during training, both as a guide to the trainee and as a morale booster to show that a comprehensive written document is available as support (Bentley, 1981).

According to Mark & Judy (1994) and Mirel (1998), complete documentation should contain the following:

- overall system documentation;
- programme documentation;
- database documentation;
- system administrator documentation;
- network administration documentation.

Developers must also provide sufficient documentation to users for reference purposes.

Li and Chen (2001) suggest that any system-planning document should contain among others:

- the planning process: Propose a process of IS planning and explain the process steps;
- time table: Use of Gantt chart to show overlapping activities and a flowchart to show the overall process flow;

- actions and outputs: Identify and explain the outputs of the actions at each planning step;
- conclusion and recommendations: based on the planning output and recommend the future actions.

In his study, Baharudin (2000) found that the availability of sufficient documentation for IT staff and users has a significant positive relationship to the success of the implementation computerised systems in public organisations in Malaysia. According to him, designers must provide sufficient documentation, and even more so if the development is outsourced to vendors.

2.2.9 Organisational structure/design and culture

In order to understand organisational structure/design and culture, Li & Chen (2001) conducted organisational analysis and data modelling which involved interviews with executives and carefully observing the organisation's operation. They, too, identified the organisation's business functions: its operations, personnel, administration and services; organisation process model: information flows within and between the organisation's business functions; and the organisation's critical success factor.

With reference to this issue Avgerou (2001) states that "it is of crucial importance that information system (IS) research and practice associates technology innovation with the context within which it is embedded" (p.43) and this is supported by authors in the areas of MIS in public organisations (Visscher and Wild, 1997); organisational management (Wingerden, 2001); and system evaluation (Farbey et al., 1993; Lytinen and Robey, 1999).

On a similar note Rodriguez-Diaz et al. (1997) argue that the nature of executive work has turned out to be an obstacle to the development of IS in higher education institutions. They acknowledge the provision of thorough information for executives and decision-making support tools in low structured and highly unpredictable

environments, as well as an adequate trade-off between model flexibility and individual needs, are some of the challenges in this line of research. Designing an implementation process that can marry a new IT system with an organisation can lead to a remoulding of the overall infrastructure with both implicit and explicit aspects of the organisation being changed to ensure successful outcomes (Visscher and Wild, 1997). Hence, for the system to be successfully implemented, the designer has to take into consideration the existing structure of the organisation and forewarn the possible changes that might take place as the result of the change process. On the contrary, Heeks (1987) reveals that organisational structure is not a major issue in academic computerisation within UK academic departments.

The outcome of an evaluation exercise is likely to have an impact on the various stakeholder groups within the organisation (Cunningham, 1982; Serafeimidis and Smithson, 2000). Particular departments, functions or management levels may gain or lose from any consequent reallocation of resources, or at the very least, their status may change due to the allocation of credit or blame resulting from evaluation. This political aspect of evaluation can be very important in particular cases. These authors further highlight that the size and diversity of the organisation help exacerbate the problem of unsuccessful system evaluation process. Ciborra and Lanzara (1994) note that organisational staff become blinded by pre-existing institutional arrangements and related thinking patterns, as another reason that limits an organisation's ability to learn. This context has far-reaching influences where it forms a background condition that gives action direction and meaning, and it establishes the range of factors impeding attempts to build new cognitive strategies (Lyytinen and Robey, 1999). The findings of study by Hockey and Wellington (1990) show that organisations with steeply hierarchical organisational structures need to explore ways in which staff participation in decision-making can be increased. It is evident from their study that "a considerable degree of interest and enthusiasm among employees which sometimes withers when the individual has no knowledge or sense of control over their work environment" (p.54).

Traditional information system development proceeds on the assumption that a technically valid design that meets functional specifications must have its requirements stated in advance of system building. Unfortunately, the deeply embedded value of functionality essentially prevents other metaphors such as coping and learning suggested by Carnall (1995), Senior (1997) and Wingerden (2001) that promote a more reflective analysis of the use of the information system.

According to Knight & Silk (1990) whatever the size or shape of the organisation there is almost certain to be some kind of hierarchy, where there will be the managers and the managed. As with the communication of these persons, which goes in various ways up and down the layers of the organisation, information too flows between departments, between functions and between supervisors and the supervised.

Sanderson and Taylor (1999) claim that there is a strong relationship between the nature of strategy any company deploys, the prevailing dominant culture in the boardroom, the utility of information and the efficacy of processes designed to support and sustain strategy. Information has to be within the experience of senior managers before it has sufficient utility to become part of dominant culture. Research generally proposes the idea that amongst key decision-makers there is a way of looking at the world which is common to senior managers that this determines what is important for the organisation. And often what is taken for granted seems to be sensitive to the wider cultural aspect of the organisation. However, the paradigm which was also mentioned by Lyytinen & Robey (1999) may well be long-lived and deep-seated in the organisation and thus difficult to change. This phenomenon sometimes impedes the introduction of change into an organisation particularly when the change brought in does not coincide with the elements mentioned.

As in education organisations administered centrally under bureaucracy system, it is important to note that two things have become clear about the structure of bureaucracy

used in these organisations. The first is that it has taken on characteristics of rigidity, and the second it there have been subtle but important adaptation to allow for the professional nature of the education enterprise (Cunningham, 1982). According to the author, rigidity is probably not caused by size and complexity alone, but certainly these are key ingredients. The combination of these factors resulted in an organisation that needed control from the top, with emphasis on the reliability of behaviour throughout the organisation. Allison (cited in Cunningham, 1982) claims in bureaucracy rules were instituted and standard operating procedures gave appropriate direction to organisational activities. The routine later became habitual and the organisation seemed better adapted to the status quo than the need for change (Cunningham, 1982).

EMIS in many Commonwealth countries faces difficulties including the negative effects of a 'centralised culture' (Wright, 2000). To enable one to make an inference of this issue, it will be essential to distinguish between the two types of education systems; centralised and decentralised. A better insight for the type of education system the particular organisation is categorised into would provide a clearer explanation on why people react the way they do where education ISs are concerned. A centralised system refers to an authority exercised only by top management of an organisation. In the case of an education system the management of its curriculum and co-curriculum, financial and materials allocations, employment, deployment and firing of teaching and non-teaching staff are controlled by the central agency i.e. the Ministry of Education. Any decision made by the school other than the day-to-day school activities as well as teaching and learning processes has to be approved by the central agency. Directives from the ministry are sent down to schools to be implemented and the school administrators or the school inspectors would send the feedback to the respective divisions in the ministry. Decentralisation on the other hand as defined by Child (1984) describes a condition when the authority to make specific decisions is passed down to units and people at lower levels in the organisation's hierarchy. It refers to the dispersal of authority to the parts of the organisation and does not describe physical locations. In

a decentralised organisation the authority to commit resources such as personnel, materials, finance and to take meaningful decisions, is spread throughout the various levels of the organisation.

2.2.10 Management of change

In an age of computerised ISs organisation, management must strive to understand how newly introduced techniques will impinge on the management functions within an organisation as a whole (Riss et al., 2001). Ross (1970) claims that in planning for change, it is rarely possible to draw up a complete plan covering every aspect, but detailed planning is necessary in order to minimise unforeseen events. It is important that everyone who may even remotely be affected by the planned change be fully informed of what the arrival of computerised systems will mean both to individuals and the organisation. Unless the full co-operation of all staff is obtained, it will be difficult to bring about the change smoothly, as people do not naturally welcome change (Bentley, 1981; Riss et al., 2001; Thierauf, 1984).

The fact that so much of the organisation information is in computer databases means managers are able to access vast amount of information (Crowe & Avison, 1980). All this creates a change for the manager, and with the advent of good information retrieval, management style will also change. Hence, it seems crucial to the authors that users have more trust in the system before it can be institutionalised successfully throughout the organisation. Gray et al. (1994) and Riis et al. (2001), however, see the need for a multiple approach in implementing change, a picture different from those mentioned by other authors. To them “it was hard work, risky and turbulent” (p.14).

The introduction of an information system entails a change of management style and culture within the organisation, and there is a crucial need for personnel who can manage the change taking place (Wright, 2000; Riis et al., 2001). In their study on the potential of information technology to support teachers and educational managers

managing their work environment Visscher & Wild (1997) emphasise that change introduced in an organisation will place considerable pressure on the management role (of teachers) and the management tools of organisation, unless additional support systems are introduced. There is also a need to provide additional management support, in parallel with the development of IT, in order to cope with the change introduced. This is because a system changes only when people accept the need for change (Inbar, 1996; Fullan, 1999).

Rodriguez-Diaz et al. (1997) believe that the management of organisational resistance is one of the critical factors in implementing change such as ISs. They stress that organisational resistance should be managed and political resistance to planning is a common cause of process failure.

According to Serafeimidis and Smithson (2000), considering the introduction of new approaches to the evaluation of ISs as an example of organisational change may explain its lack of success. They explain that senior management within organisations fail to realise that changes involve a change of paradigm within the organisation, and do not provide sufficient support to effect organisational change. Thus, most of the changes fall by the wayside, and were not widely adopted. Nevertheless, they feel that organisations grappling with the problem of ISs evaluation and considering how to introduce new evaluation procedures would be well advised to treat such initiatives as significant organisational changes. Bearing this in mind, and acting accordingly, senior managers are more likely to be successful in achieving changes desired.

Argyris (1991) claims that managers develop a defensive system to specific issues, which deflects problems away from themselves onto other people within the organisation. Thus, the organisation is designed to defend. It defends against change because change brings potential anxiety. Carnall (1995), Senior (1997) and Wingerden (2001) note that introducing change in ways that do not encourage learning is likely in

the future to entrench negative attitudes to change. Effective organisations are those which introduce change quickly and in which people, whether employees or managers, learn about the organisation, as this process proceeds, and mentality change (Wingerden, 2001) is the essential first step in managing change in an organisation. For an organisation to adopt change successfully, there have to be leaders known as 'change agents'. These are leaders "who are able to conceive the need for change, innovative in planning change, and skilled in motivating others to accept and implement that change" (Wingerden, 2001, p.488).

2.2.11 Availability of appropriate machines and supporting facilities

Authors also point to the importance of IT infrastructures as the bedrock of organisations' ability to sustain IT-based innovation (Allen & Boynton, 1991; Heeks, 1987; Rodriguez-Diaz et al., 1997; Visscher and Wild, 1997). According to Heeks, physical problems include lack of hardware, lack of sufficiently powerful hardware, lack of portability, and incompatibility of different machines. The compatibility of hardware and software is a crucial factor that should not be taken for granted for any organisation intending to implement a computer-based information system. The need for standard equipment, whether hardware and software, is necessary for reasons of consistency, quality and compatibility. Consistency and compatibility lead to higher quality, both in terms of the way people work and in systems performance. The hardware selection will be based on the system software selected and to the operating system strategy that the organisation uses. The hardware and software then need to be tested together making sure that it works and is compatible (Bentley, 1981; FEU report, 1987; GIS Development Guide, 2000).

An MIT report; *Planning, Installing and Using Information System* (1991) states that proper planning and a clear agenda are crucial in achieving a proper balance between hardware, software and other ware. It also states that proper introduction of the computer into an organisation is important to convince people that it is their tool, not

something that dictates how they must work. Rodriguez-Diaz et al. (1997) found similar issue emerging in their study. They reveal that one of the major barriers to the spread of a system has been the inappropriate selection of the appropriate technology i.e. the choice of hardware and software, which has a major bearing on the acceptance of a system to suit executive demands. The use of a supporting computer application that formally aims to support the strategic planning process, aiding executives in analysing strategically and formulating activities at different levels of the institution does not seem to be available. A serious consideration has to be given to the physical characteristics of hardware and software specifications upon which the application of the system should be run. This issue is also mentioned by Visscher and Wild (1997) whereby there should be sufficient IT facilities which would make the system easily accessible by users throughout the organisation where the system is implemented.

Aziz (1997) claims that the absence of a local area network (LAN) system between the ministry, SEDs and DEOs leads to poor information flow in the education system. He further points out that the rigid procedures for obtaining computers and supporting facilities, which have to be observed closely by all levels in acquiring the equipment needed worsens the situation and only hinders the smooth functioning of the existing systems in the MMOE.

2.2.12 Information needs

The starting point in designing meaningful information system must be the analysis of users' needs. The problem of analysing information needs is often discussed and widely recognised. The problem of knowing exactly what data to collect and which to tabulate is not new to management. This issue is also recognised also by Elbourne (1914) who states that it is quite possible for management to collect more information than it can use to advantage, or which is more costly, or hinders production more than the information is worth. This is a real danger that has to be continuously guarded against, for routines

that serve a valuable purpose when initiated may cease to be useful due to some later change in conditions.

Bentley (1981) notes that a good information system is one which provides the information that managers need in order to make decision. Accordingly, the fundamental basis for designing such ISs is a clear identification of decision-makers' information needs to improve the decisions made and most importantly the information gathered has to do with the future. Bentley (1981) and an MIT report (1991) stress that the answer to needs assessment will influence how people will work with computers. The first concern should be how people can work best, letting implementation support it. The report states that without a satisfactory people and work plan, any change will meet with resistance, not co-operation.

According to Inbar (1996), needs assessment involves understanding the relevant culture and organisational realities of the local situation, comprehending the profile of the teaching and administrative staff in educational institutions, and recognising the composition of the students.

2.2.13 System evaluation

System analysis involves describing, identifying and tracing every element of data in the total system or sub-system. By carrying out systems analysis, the management and system developers will be able to know whether the system developed is able to function effectively and whether its function(s) overlaps with other existing systems in the organisation. The results of system analysis help to reduce the possibility of systems failure, systems not being used effectively or overlapping functions of systems. System analysis enables organisation management to minimize any waste of resources in terms of human resources, physical facilities such as computer hardware as well as financial budget in the implementation of information system. Failure to carry out such analyses has often resulted in the common complaint that ISs developed neither perform as

expected, nor provide the information needs of top management or decision-makers and other users of the systems. However, Serafeimidis and Smithson (2000) argue that “IS evaluation is an important but complex organisational process” (p.102).

Visscher and Wild (1997) and Li and Chen (2002) identify an application process that measures, amongst other things, how well the end product is defined and how much the organisation will be impacted. Heeks (1987) includes the aspect of systems evaluation in outlining general guidelines for the introduction of new technology into academic departments. Very often, when users first receive and start using the system, the design process has been ‘completed’. It is crucial that the design process of a system includes users providing feedback. Failures have been reported where user involvement and user acceptance evaluations have not been carried out (Wild et al., 1992).

In connection with evaluation, a FEU report, *Information Technology Support System for Education and Training* (1987) proposes that in a period of strict budgetary limitation, any innovation must be cost-effective, as well as improving on former practice. As a result, organisations should be able to deal with a greater number and range of users or learners at little extra cost, and so increase the quality of organisation performance or income for business oriented organisations. It is, therefore, imperative that the organisation management carries out evaluations and detailed unit costings, to ensure that they spend funds wisely at every stage of this initiative (Ward et al., 1996; Willcocks, 1994).

Willcocks (1994) points out that successful users of ISs are those that continuously measure and control their systems’ effectiveness, possibly a result of their learning experiences of being able to identify where project implications arise, and, appropriately manage contentious human and organisational factors. Mumford (1972) explains that one can evaluate a system merely in ‘human terms’, that is, by looking at whether people are using the system, whether they like it, or whether they have problems with it. Only

continual monitoring of the use of the machines and the systems, which can also be achieved by informal conversations with the users, will help to solve the emerging problems. As well as gathering subjective impressions, system developers should aim for more objective evaluative measures, such as monitoring research output of the organisation, or the use of the system via some form of log, or making comparison between manual and computerised output of an analysis.

Heeks (1987) outlines criteria against which ISs can be evaluated. Systems must be:

- flexible, to cope with changes in needs and to fit in with other components in the overall information system planning;
- powerful, to cope with growth in demand and other future applications;
- reliable, to minimise problems. An important point is that no computing technology is totally reliable, hence, there should always be an alternative system to support the computerised information system.

According to Heeks (1987) and Jones (2002) prototyping or piloting the system within large organisations is recommended as a means of evaluating the system. It is always useful to obtain feedback from users of the system, to see how mistakes were made and to hear what advice these users have to offer to improve the system. One useful way to distinguish between options is to see the system in operation and to talk to current users.

2.2.14 Lessons from experience

To the IS developers, the information user is most important, because the user triggers the development of systems and ultimately determines the success and failure of the system. However, for systems to be successful, managers at the operational level who are system users must let go of certain responsibilities (Thierauf, 1984). They must re-examine the patterns of the past and creatively conceive new systems so as to aid the efficiency of the operation. Before going forward with new systems, they should be particularly sure that the development project is sound i.e. both economically justified and operationally feasible, and yet not automate for the sake of automation.

Information systems development (ISD) is a high-risk undertaking, and failures remain common despite advances in development tools and technologies (Lyytinen & Robey, 1999). The authors claim that “advances in development in technologies are not sufficient to improve the rate of successful implementation. Rather, ISD projects remain susceptible to failure because organisations fail to learn from their own experiences” (p.86). In many organisations, non-working or ineffective practices have existed within organisations for long enough to become rooted and unable to change. Such organisations often fail to make sense of their own experiences and lessons from experience are not valued. The problems encountered by organisations might, however, be avoided if they pay more attention to their own experience and act on that knowledge. The major conclusion of Lyytinen & Robey analysis is that “organisations often misplace their attention on what and how they should learn” (p.99). Hence, in order to avoid failure, it is then necessary for IS developers to learn from both their own and others’ experiences and to use this knowledge to change their development practices.

2.2.15 Integrated system

As time passed, system designers recognised an increased need for a system that integrates all subsystems that can be logically interrelated. The system must integrate people, machines, money, materials and management, in conformity with the organisation’s objectives. The net result is a unified system commonly known as an integrated data processing system (Thierauf, 1984). As pointed out by Ross (1970) since the structure of an integrated system conforms to the structure of the organisation, it transcends organisational boundaries. Records that are kept for one purpose may thus, in fact, be put to several other uses. Related elements in different processing activities are combined into common co-ordinated procedures and work flows. This makes it possible to see the whole organisation system as interrelated. The integration of many data processing systems is likely to reduce the duplication of data collected and information files. It may also improve the co-ordination of the organisation’s major functions. Data acquired from one source are often present in many subsystems. If an

integrated system is not used, there is much wasted motion and extra cost, since each subsystem must treat the same data without taking advantage of processing accomplished by other subsystems.

Although integrated management ISs are available in many countries to assist managers (Crowe and Avison, 1980) by providing them with valuable information through the trends analysis and what-if simulations, and to evaluate the effects of the policy measures taken, the use of these systems remains limited (Visscher, 1996). This problem is likely to result from the fact that this management usage requires the following:

- the ability to decide which information is needed;
- technical information retrieval ability;
- the ability for data interpretation;
- a willingness and capability to use the information in decision-making;
- an evaluation of the effects of system usage in the organisation.

The use of integrated computerised ISs to support management functions has not been widely available in public organisations, and neither has the expertise and training. Therefore it is not surprising that most developing countries, such as Malaysia, are still in the initial stage of information technology in educational management due to lack of capable professionals, finance and the technical infrastructure needed to support system usage beyond just information storage and low-level retrieval. Aziz (1997) emphasises that the key to resolving the issue of separate systems in the MMOE is by integrating the information system into a comprehensive system, which will enable the supply of relevant data to the various education departments. In the present study, too, one may observe a bottom-to-top strategy, whereby the focal point of the entire system is the educational data providers such as schools, polytechnics, teacher training colleges, and universities as a way out of the problems of the creation of multiple IS and duplication of data collection. This notion of a 'bottom-up' approach, besides the 'grass roots' is

also indicated by Nolan et al. (1996), as the best means of developing, implementing and maintaining a competent, computerised information system.

2.2.16 Understanding of the system and its implementation

In order to implement ISs in a higher education institution, Rodriguez-Diaz et al. (1997) show that one of the major barriers to the acceptance of such a system has been the lack of understanding about the system and its implementation. Fung (1996) reveals similar issues in implementing a School Administration & Management System (SAMS) in schools in Hong Kong.

According to Serafeimidis and Smithson (2000), evaluation of IS has numerous organisational roles such as establishing by quantitative and/or qualitative means the worth of IT to the organisation and its growth (Farbey et al., 1993; Willcocks, 1994), and acting as a feedback function which assists organisational learning (Farbey et al., 1993; Walsham, 1993). This means that the IS evaluation tends to be more holistic in nature. It stretches beyond the technical and accounting issues. The lack of understanding of these different roles (Jones, 2002) or some form of role conflict could explain the failure to implement ISs effectively within an organisation. Serafeimidis and Smithson (2000) claim that traditionally, ISs evaluation was very much secondary to ISs development, in that evaluation took place at particular stages within the life cycle of system development. Thus, some form evaluation prior to implementing the system was an inherent part of the feasibility study. Various progress evaluations appeared within the project management of every development and, finally, some form of post-implementation evaluation took place shortly after the introduction of the system. It seems crucial that everyone involved has to consider both the understanding of the system as well as about the implementation of the system in the organisation.

2.2.17 Return benefits of investment on systems

From the point of view of investment, Irani and Love (2001) attribute the lack of performance improvement brought about by IT/IS to the difficulty of determining organisations' business value from IT/IS investments and the considerable indirect costs associated with organisation-wide systems. It is shown in other studies too (Cassidy, 1990; Riis et al., 2001; Irani et al., 2001; and Ross, 1970) that it may be difficult to determine the organisation's value of investment in IT/IS if the management is looking for an equivalence of the amount invested to the improvement in performance produced by IT/IS. The authors agree that not all IT/IS introduced in an organisation could produce outputs expected by the management of the organisation, and this is more likely to be the case if a zero-defect result is expected as soon as the system is introduced into the organisation. The emphasis made by Irani et al. (2001) is that evaluating the system is an on-going process, prior to determining the most effective procedures to be used when obtaining the required results. In other words, the system needs time to 'settle down', and is the only way forward if the organisation's expansion plans for growth and success based on efficient and effective IT processes is to be achieved (Irani et al. 2001).

2.2.18 Accuracy of information for decision-making

The objective of any information system is to inform management. That is, such a system must keep all levels of management completely informed on all developments in the business which affect them. To do this, data entering personnel should know exactly what data to collect and what to tabulate, and management, for its part, has the obligation to be able to write down its actual requirements for internal information. In accordance with this, Mehra (1981), as cited in Thierauf (1984), states that the effectiveness of the management's decision will depend upon receiving quality information when needed. Company management uses information from different sources and, in some cases, the intervening processing steps are extremely important, particularly when input data is supplied by different functional groups. Hence, the

development of MIS should enhance the decision-making capabilities of organisational management by providing appropriate information.

Unfortunately, however, most decision-makers are believed to make use of whatever information is available to make a decision, for without information decision-makers are unable to carry out their function in the organisation. Managers can never have access to all facts. Most decisions must be based on incomplete knowledge – either because the information is not available, or it would cost too much in time and money to get it. To make sound decisions, it is not necessary to have all the facts; but it is necessary to know what information is lacking, in order to judge how much of a risk the decision involves, as well as the degree of precision and rigidity that the proposed course of action can afford (Drucker, 1955). The relationship of information to decisions is fundamental, and remains a vital consideration in developing the right approach to the problem.

According to March (cited in Paton et al., 1984) decision-makers and organisations gather information and do not use it; ask for more, and ignore it; make decisions first, and look for the relevant information afterwards. In fact, organisations seem to gather a great deal of information that has little or no relevance to decisions. In reality, the author reveals that decision-makers operate in a surveillance mode more than they do in a problem-solving mode. They scan their environments for surprises and solutions and monitor what is going on. Such scanning calls for gathering a great deal of information that would appear to be irrelevant to decisions. They then apply rules and copy solutions from others, and indeed, they often fail to recognise a problem until they have a solution. As a result, they may find that information retrieved from the system is unreliable and inaccurate because such information does not seem to help them solve their problems.

It is apparent to March that many managers are unaware of the limitations of formal ISs. They were aware of the problems with the existing systems, but blamed this on administrative inefficiency. Managers should be made to understand and be aware that there are problems of rigidity, timeliness and accuracy, which prevent formal ISs from meeting day-to-day information needs. The role of informal sources of information, such as through ad hoc correspondence, telephone calls, discussions and meetings, was seen in a different light, as a necessary means of overcoming formal system limitations, rather than a misuse of formal information. However, a great deal of the information in formal system, while appearing accurate, is often based on highly suspect raw data (Drucker, 1955).

2.3 Educational Management Information System (EMIS)

Heeks (1987) argues that a large number of papers and books have been written about the introduction of new technology into commercial organisations. Yet, despite the large number of potential and actual academic computer users, very little work has been done to investigate the introduction of computers into the academic world. There is a wealth of literature covering the subject of academic computing, but it tends to be descriptive, giving details of one particular programme or of computer use in one department, and/or relates to one specific application for teaching and learning purposes. Meanwhile, literature on EMIS is scarce. Since the nation-wide implementation of EMIS/*SMPP* in Malaysia in 1997 there have been very limited studies looking into the emerging implementation issues at different levels in the education system in Malaysia. Two studies that have been conducted focussed on the use of computer-based information system at the State Education Departments (SED) and District Education Offices (DEO) for policy development (Aziz, 1997) and increasing the use of computerised ISs and data quality in schools (Abdul Rahman, 2000).

The EMIS is, in broad terms, an information system designed specifically for educational management, and its concept is derived from the concept of MIS. Like any

other systems, EMIS comprises a number of interconnected elements, which are organised, either naturally or by design, to achieve some purposes. It is an organised, structured and integrated information system which aims to provide information from all related sources required by the management level in enabling them to make precise, effective organisational planning, directions, control and also to perform relevant and related activities (Psharopulous, 1980).

Information synergy, in which the whole system exceeds the sum of the system parts, is the keyword in EMIS (UNESCO, 1992). In the present context, the main purpose of EMIS is to integrate all information resources related to the planning and management of educational activities and to provide them in a comprehensive way to the users. As a result, the impact of the decisions and actions taken will be greater than the combined effects of individual actions carried out based on separate 'bits and pieces' of information. Visscher and Wild (1997) also indicate that the use of computerised education ISs can also influence the effectiveness of education systems as a whole, as the school ISs do for schools. The information retrieved from the system can serve as an early warning indicator to the administrators and managers at every level in an organisation. On the whole, the authors suggested that educational organisation information system could be used to provide a basis for more informed policy development and evaluation and hence lead to a more effective functioning of educational management at all levels in education system.

In outlining general guidelines for introducing new technology into academic departments, Heeks (1987) emphasises five particular actions:

- Lead computerisation from the top;
- Involve everyone in the organisation;
- Plan all changes and make them part of some overall strategy;
- Ensure that adequate training is provided;
- Evaluate all new technology and system introduced.

The organisation of EMIS is closely linked to the distribution of planning and management responsibilities among the different administrative levels, between governmental and non-governmental agencies, and between the Ministry of Education and other related ministries and departments. In terms of functions such as policy orientations, planning, organisation, implementation, monitoring, evaluation, financing and mobilising of resources, a well-developed EMIS may contribute to a more efficient, effective distribution, and certainly better co-ordination.

According to Wright (2000), a problem faced by many developing countries in their efforts to improve data collection and processing is the issue of what is worth collecting and the quality of what is being collected. In some cases, even where there are commendable efforts to keep proper records, the quality of the data collected is so suspect that its usefulness is doubtful. Thus, if the management of education ISs is to be successful, information must be timely, and must be presented in a form that suits its intended purposes. It is also necessary to explore fully the possible ways in which technology can best be used to enhance performance, although it is clear that technology is not a panacea for all the complex problems in this area (Wright, 2000, p.81).

The Role of Computers in EMIS

Although ISs need not be computerised, computerisation is commonly implied in any discussion of EMIS. This is because of the potentially significant advantages that computer-based systems have over manual systems in large, complex organisations. Such advantages include:

- simplified data collection activities;
- improved data quality;
- reduced data redundancy;
- more timely availability of data;
- improved functioning of routine operations;
- increased opportunity for ad hoc analysis;

- consideration of a broader range of alternative policy choices;
- improved communications.

Computers can be helpful in identifying and reducing some types of data errors, eliminating the need for redundant data collection and storage, providing greater accessibility to data, increasing the speed of data retrieval, reducing data handling and processing time, and providing access to sophisticated analytical tools (Cassidy, 1990).

2.3.1 Educational issues and change

Issues of educational quality lie at the forefront of policy-making agenda of educational decision-makers. Yet attempts to improve the quality of education have not yielded the results that have been anticipated, often because policies are misinterpreted or plans are not well developed. Innovations may not always have been poorly implemented or were never implemented in practice. Levin (1976) argues that there are three broad ways in which pressures for educational policy change may arise:

- through natural disasters such as earth quakes, floods, famines, and the like;
- through external forces such as imported technologies and values, and immigration;
- through internal contradictions, such as when indigenous changes in technology lead to new social patterns and needs, or when one or more groups in a society perceive a discrepancy between educational values and outcomes affecting themselves or others in whom they have an interest.

Successful educational change, in effect, requires a shift in the way of thinking so that change is conceptualised, as well as shifts from adoption to implementation, from blueprints to incremental processes, and more broadly, from inputs to outputs. The emphasis of policy-makers needs to be on institutional analysis, effective mechanisms for monitoring and evaluation, and implementation support and supervision (Levin, 1976). The importance of a thorough and systematic problem identification as the basis for effective education change was emphasised by Dalin (1978) in his analysis of

educational change programmes in OECD countries. In 80% of cases, the selection of programme objectives was based on a preceding analysis of issues and development prospects in the education sector.

If educational change is to be successful, a balance is required between the need for improvement and a country's capacity to implement a particular change (Verspoor, 1986). The capacity of the system to handle an educational innovation is determined by at least three factors. The first is the previous experience of planners, administrators and teachers with change. The second is the organisational strength of the system, i.e. the capacity to bring about compliance with national policy objectives at all levels of the education system. The final factor is the degree of professionalism of educators in the countries themselves. The critical challenge in designing a project is to achieve congruence between constraints and opportunities created by external environment and the institutional and educational demands of the innovation.

Perhaps one of the most frustrating features of educational change is the time required. Implementing change in large organisations, such as education, typically involves the performance of the smallest organisational unit, which, in the case of education, is the school. This is a time consuming process, but time is what political and educational leaders, anxious for rapid results, often do not have.

Most researchers distinguish three phases in the educational change process (Fullan, 1982). Phase one, *initiation*, mobilisation or adoption, consists of the events leading up to and including the decision to adopt an innovation. Meanwhile, Phase two, that of *implementation*, is the process of putting an innovation into practice. The third process, that of *institutionalisation*, refers to the extent to which the programme is routinely applied and can be sustained as part of normal administrative practice.

Implementation is the process of putting a project into practice. In the case of educational change, this process is both technically and socially complex. Its technical complexities are caused by the idiosyncratic nature of education systems and the limited knowledge of effective ways of improving education systems as a whole. Its social complexities stem from the large number of people involved in the education system and the unpredictability of their behaviour. As noted by Fullan (1991):

A large part of the problem of educational change may be less a question of dogmatic resistance and bad intentions (although there is certainly some of both) and more a question of difficulties related to planning and coordinating a multilevel social processes involving thousands of people. (p.65).

In terms of implementing information system in organisations, a common difficulty is simply the lack of available human resources within a given time frame to bring about an effective solution. The majority of organisations operating ISs in daily work are operating below their budgeted staff, and have been for several years due to shortage of qualified personnel (Thierauf, 1984). The challenge, thus, is to design a strategy that is optimal for the objectives of the change programme. Administrative development is the process of directed change of the main features of an administrative system (Dror, 1978) which aims to establish an organisation's capacity to formulate policy goals, define strategies, and implement policy decisions with increasing effectiveness. Change and innovation can only occur when the elements of the organisation delivering educational services are in place and are functioning effectively. Since the educational organisation includes a wide array of people and institutions, ranging from ministers and their advisers to teachers, any change to be adopted has to be examined carefully to ensure that its implementation would bring about desirable benefits to the stakeholders. This is all the more important because all these people work together in institutions that make up the educational organisation (Fullan, 1991).

Institutionalisation is a gradual process for which the foundations are laid during the pilot phase, but which requires explicit attention throughout the implementation. A project to bring about educational change becomes institutionalised when it disappears as an innovation and becomes part of standard educational practice. Institutionalisation is, in effect, the ultimate goal of the change process. Generally a project is considered to be institutionalised when a) soft money (external grants) has been replaced with hard money (local resources); b) the project has gone through the regular budgetary cycle; c) the project has survived changes of key staff; and, d) an effective organisational framework has been established, generally on the basis of enactment of legal and administrative measures to create an institutional foundation for the project (Fullan, 1991).

Managing the institutionalisation process of an educational change project is a complex task involving the reconciliation of often conflicting demands of effectiveness and sustainability and tensions are also particularly apparent particularly users resistance to change. It is not that people resist change. Rather, they do not know how to cope with it, but along with the planned change there is often the intrusion of unwanted change (Fullan, 1991). There are many reasons for resistance taking place, one of these being the objection to innovation, which “arises when the resisters perceive that the proposed change as inimical to their espoused or enacted values and beliefs about education and social relationships through education organisations” (Busher, 2001). A study by Genus and Kaplani (2002) suggests that what seemed to be “employee resistance may actually be genuine well-founded reservations about proposals for change...what looks like acceptance and internalisation may not be that either – it may represent grudging acceptance of present proposal and the storing up of resentment...”(p.199). Hence the success of the change introduced into an organisation depends so much on the willingness of the management in the organisation to listen to resistance towards the change.

The following section provides comparisons of the development and implementation of EMIS in the MMOE with similar applications in other countries; New Zealand, Singapore, Egypt and the Philippines.

2.3.2 The EMIS in the MMOE in comparison to other countries

An example of a reportedly successful EMIS was in the development of Computer Assisted School Administration (CASA), the Massey University School Administration by Computer Project (MUSAC) which began during the late 1970s (Nolan et al., 1996). The mission of this programme was to help school administrators to be more efficient particularly in the use of their time. Thus, programmes were developed to deal with administrative tasks such as scheduling, pupil registration, school accounting and marks analysis. CASA, which was designed by teachers and school administrators, was well received because CASA met administrative and management needs as defined by the schools themselves. CASA has achieved the goal of automation of activities, the improvement of the efficiency of clerical activities, characteristic of initiation and expansion; and shifted attention from the management of computation to the management of information (Visscher, 1991). This required school participation, i.e. grassroots involvement in all phases of software design from planning, through development testing to user evaluation. The strategy welcomed flexibility, and involved listening to, and valuing, the ideas of others, especially end users; the adoption of a concept of user friendliness; and subscription by the software developers and customer support staff to a continuous, problem solving approach, with solutions provided by end-users being regularly incorporated into software updates (Nolan et al., 1996). These elements seemed to have created an organisational culture whereby existing software was constantly revised to meet existing school needs and new software is constantly under development, in anticipation of changes and new developments. It is important to note, however, that the combination of being university-based and grass roots predisposes MUSAC to be flexible, proactive and responsive. These attributes may be difficult to achieve in the MMOE system, which adopts a top-down, centralised

approach and where every step taken had to be approved by the top management. CASA was developed without the involvement of the New Zealand government, which has maintained a policy of non-involvement in the development of New Zealand school administration. Nor does the government fund schools to purchase hardware and software for administrative purposes.

Unlike New Zealand, the MOE in Singapore (EPRD, 1995) gained full support from its government when the idea of developing educational network throughout the country was proposed. The project was well funded by the government and the procurement of equipment, software and hardware at all levels of the education system was sponsored by the government. Today, educational information in Singapore education system flows directly from schools to the MOE vice-versa. One of the factors that has contributed to the success of EMIS project in Singapore was the easily manageable number of schools in the country compared to the number of schools in Malaysia.

The Egyptian EMIS development experience was similar to that found in many other countries, and illustrated that not all computerised systems provide all the benefits promised during their development stage (Cassidy, 1990). In the late 1970s a broad initiative to reform the Egyptian education system was begun. In 1979, amid great expectations, a major effort began with the aim of computerising the information system in the MOE. The system which had for many years been used primarily for the production of annual reports of descriptive education statistics was to be 'upgraded'. The new system was to be more closely integrated with the information needs of the minister and other decision and policy-makers, as well as be the basis for annual planning and provide data to the various functional units within the Ministry. The unit assigned responsibility for the ISs was explicitly directed to work with the National Centre for Educational Research and the departments of planning and documentation. The system had few users at that time. The department operated almost completely independently from the planning and research departments and all operational units in

the Ministry. The unit was not linked to other departments in the MOE, which made electronic data/information transfer impossible. The primary use of the system was to produce a series of annual reports of the number of pupils, classrooms, schools, and teachers. These reports were not widely distributed and were only available long after they had been of any use to planners, analysts, or decision-makers. The data stored in the unit could have been used by users in other departments of the MOE if its initial planning had been more far-sighted and included other data users in the MOE.

The organisational machinery for the operationalisation of EMIS in the Philippines was quite similar to that in Malaysia where the Office of Planning Service (OPS), the Central Office, mobilised staff at different levels to manage the system (Villanueva, 1990). The OPS was responsible for gathering, analysing and processing education data. However, EMIS in these two countries differ in two important respects. First, EMIS in the Philippines was developed as a result of collaboration between public and private institutions, whilst in Malaysia it remained the initiative and responsibility of the education sector. Second, one of the aims of setting up the system in the former was to provide school officials with the opportunity of responding to their own data needs, and this subsequently enabled school officials to become more responsive to the demands for basic education data and information from higher officials rather than just being the data providers.

The comparisons above provide several indications for the success of the management and implementation of EMIS in general. First, a wide range of potential system users should be involved from the initial stage. Second, there should be a lot of open and on-going discussions and communication between system developers and users, and third, there should be total commitment from the top management wherever the system was initiated, to ensure the continuous involvement of people at other levels.

Cassidy and Cresswell (1997) emphasise that in order to sustain the EMIS, what is required, amongst others aspects, is the MMOE leadership commitment. In his study, Aziz (1997) found that top official in the EPRD, the Selangor SED and a couple of DEOs in the state played an important role in initiating the development of computer-based ISs within the departments. However, there is lack of proper management control over the development of the system, and Aziz indicates that there is no evidence to show that there was a policy to guide the system development at the Ministry level. Aziz further highlights the way in which the guidelines and statements stated in the objectives of system development do not necessarily lead to appropriate action. This he sees as a notable shortcoming of the information/IS committees in the MMOE. In maintaining the momentum of the EMIS in the MMOE, Cassidy and Cresswell (1997) suggest that the ministry continues to strengthen open and honest communication among people at all levels in the education system.

Wright (2000) asserts that successful management of the education systems has always depended as much on having the necessary information available as on having personnel trained in management. He argues that “one of the weaknesses in EMIS is lack of training” (p.70). The author further highlights that with the introduction of information system, organisational management styles and culture will also change. Therefore there is a crucial need for personnel(s) who can manage the change taking place.

2.4 Discussion

The key findings of this chapter are presented in Table 2.4. These findings have been divided into different areas of MIS within private and public organisations, system evaluation, organisational management and educational change.

The literature as a whole shows that similar issues arise as a result of IS implementation in organisations, regardless of the background of the organisations. It is seen that the crux of successful implementation of IS in any organisation lies with the involvement of

Table 2.4: The summary of key issues affecting the implementation and development of IS/change in the areas MIS in private/commercial organisations, MIS in public/educational organisations/EMIS, system evaluation, organisational management and educational change highlighted in the literature.

AREAS ISSUES	MIS in private/commercial organisations	MIS in public/education organisations/EMIS	System Evaluation	Organisational Management	Educational change
Consideration on human centred issues e.g.: users acceptance, users experience with IT / IS, human resource management, users' sensitivity towards need for change etc.	Ross (1970) Crowe & Avison (1980) Robey (1983) Thierauf (1884) Knight & Silk (1990) MIT report (1991) Martino (1999) Loeffen & Wortmann (2000) Avgerou (2001) Riis et al. (2001) Li & Chen (2001) Genus & Kaplani (2002)	Heeks (1987) Visscher (1995) Fung (1996) Cassidy & Cresswell (1997) Rodriguez-Diaz et al. (1997) Visscher & Wild (1997)	Serafeimidis & Smithson (2000) Irani et al. (2001) Jones (2002)	Humphreys & McHugh (2001)	Dalin (1978) Cunningham (1982) Fullan (1991) Busher (2001)
Involvement of people at all levels in the organisation	Crowe & Avison (1980) Wood-Harper et al. (1985) Thierauf (1884) MIT report (1991) Martino (1999) Riis et al. (2001) Li & Chen (2001) Genus & Kaplani (2002)	Heeks (1987) FEU (1987) Rodriguez-Diaz et al. (1997) Baharudin (2000) Visscher & Wild (1997)	Serafeimidis & Smithson (2000)	Miller & Lee (2000) van Wingerden (2001)	Cunningham (1982) Fullan (1991)
Availability and compatibility of appropriate computer and other supporting facilities	Ross (1970) Bentley (1986) Lucey (1989) MIT report (1991) GIS Development Guide (2000)	Heeks (1987) FEU (1987) Rodriguez- Diaz et al. (1997) Visscher & Wild (1997) Aziz (1997)			Dalin (1978) Fullan (1991)

AREAS ISSUES	MIS in private/commercial organisations	MIS in public/education organisations/EMIS	System Evaluation	Organisational Management	Educational change
Bottom-up initiation	Riis et al. (2001)	Nolan et al. (1996) Aziz (1997)		van Wingerden (2001)	
Integration of new system/change to organisational change, culture and structure	Ross (1970) Crowe & Avison (1980) Thierauf (1984) Bentley (1986) MIT report (1991)	Heeks (1987)	Lynninen & Robey (1999) Serafeimidis & Smithson (2000)	Taylor & Singer (1983) Argyris (1991) Carnall (1995) Senior (1997) Sanderson & Taylor (1999) Humphreys & McHugh (2001)	Cunningham (1982) Verspoor (1986) Fullan (1991) Busher (2001)
Collaboration, involvement and commitment of top management	Ross (1970) Crowe & Avison (1980) Thierauf (1984) Davis (1985) Knight (1986) Carnall (1995) Li & Chen (2001) Riis et al. (2001)	FEU (1987) Heeks (1987) Hockey & Wellington (1990) Visscher and Wild (1997) Rodriguez- Diaz et al. (1997) Aziz (1997) Cassidy & Cresswell (1997) Baharudin (2000)	Serafeimidis & Smithson (2000) Irani and Love (2001) Jones (2002)	Taylor & Singer (1983) Van Wingerden (2001)	Cunningham (1982) Fullan (1991)
Understanding of the system/change and the implementation of system/change	Ross (1970) Thierauf (1984) Wood-Harper et al. (1985), Riis et al. (2001)	Hockey & Wellington (1990) Cassidy (1990) Fung (1996) Rodriguez- Diaz et al. (1997) Cassidy & Cresswell (1997)	Farbey et al. (1993) Willcocks (1994) Serafeimidis & Smithson (2000) Irani & Love (2001) Jones (2002)		Cunningham (1982) Fullan (1991)

AREAS ISSUES	MIS in private/commercial organisations	MIS in public/education organisations/EMIS	System Evaluation	Organisational Management	Educational change
Using past experience to deal with new organisational changes	Thierauf (1984)		Ciborra & Lanzara (1994) Lyytinen & Robey (1999) Serafeimidis & Smithson (2000)		Verspoor (1986)
Training	Walker (1968) Brooks (1972) Fuerst & Cheney (1982) Bickson (1985) Bentley (1986)	Heeks (1987) Hockey & Wellington (1990) Aziz (1997) Visscher & Wild (1997) Wright (2000) Baharudin (2000) Drew (1994)			
Understanding of organisational structure/design/culture	Ross (1970) Thierauf (1984) Lucey (1989), Martino (1999) Venkatesh (2000) Li & Chen (2001) Avgerou (2001)	Hockey & Wellington (1990) Rodriguez- Diaz et al. (1997) Visscher & Wild (1997)	Farbey et al. (1993) Ciborra & Lanzara (1994) Lyytinen & Robey (1999) Serafeimidis & Smithson (2000)	Knight & Silk (1999) Sanderson and Taylor (1999) Van Wingerden (2001)	Dalin (1978) Cunningham (1982)
Presystem/change planning/design	Schoderbeck et al. (1975) Thierauf (1984) Li & Chen (2001) Riis et al. (2001)	Heeks (1987) Cassidy (1990) Fung (1996) Rodriguez- Diaz et al. (1997) Aziz (1997) Visscher & Wild (1997)	Mumford (1972) Millet et al. (1992)		Cunningham (1982) Fullan (1991)
Information/IS/IT policies and guidelines	Thierauf (1984)	Cassidy (1990), Aziz (1997) Rodriguez-Diaz et al. (1997)			Dror (1978) Cunningham (1982) Verspoor (1986) Fullan (1999)

AREAS ISSUES	MIS in private/commercial organisations	MIS in public/education organisations/EMIS	System Evaluation	Organisational Management	Educational change
Evaluation of system	Ross (1970) Lucey (1989) Li & Chen (2001) Riis et al. (2001)	FEU (1987) Heeks (1987) Cassidy (1990) Wild (1996) Rodriguez- Diaz et al. (1997) Visscher & Wild (1997)	Heeks (1987) Mumford et al. (1972) Farbey et al. (1993) Walsham (1993) Willcocks (1994) Ward et al. (1996) Serafeimidis &Smithson (2000) Irani et al. (2001) McKay & Marshall (2001), Jones (2002)	Van Wingerden (2001)	Dalin (1978) Cunningham (1982)
Development of integrated system/ database	Crowe and Avison (1980) Ross (1970) Thierauf (1984) Premkumar & King (1991)	Heeks (1987) Visscher (1996) Aziz (1997)			
Communication between ISs designers and users	Ross (1970) Robey (1983) Thierauf (1984) Knight and Silk (1990) MIT report (1991)	FEU (1987) Aziz (1997) Rodriguez- Diaz et al. (1997) Cassidy & Cresswell (1997)		Robey (1993)	
Availability of manager of IT/ISs/ change	Thierauf (1984) Gray et al. (1994) Riis et al. (2001)	Inbar (1996) Rodriguez-Diaz et al. (1997) Visscher & Wild (1997) Fullan (1999) Wright (2000)	Serafeimidis &Smithson (2000)	Taylor & Singer (1983) Van Wingerden (2001)	Cunningham (1982) Fullan (1993)
Quality of data	Thierauf (1984)	Heeks (1987) Visscher & Wild (1997) Wright (2000)		Drucker (1955)	

AREAS ISSUES	MIS in private/commercial organisations	MIS in public/education organisations/EMIS	System Evaluation	Organisational Management	Educational change
Integration of system/change into organisation plans	Thierauf (1984) Wood-Harper et al. (1985) Li & Chen (2001) Premkumar & King (1991)	Heeks (1987) Rodriguez-Diaz et al. (1997)		Van Wingerden (2001)	Fullan (1982) Cunningham (1982) Verspoor (1986)
Availability of system manuals/ documentation	Ross (1970) Thierauf (1984) Bentley (1986) Mark & Judy (1994) Mirel (1998) Li & Chen (2001)	Baharudin (2000)			
Identification of users' information needs	Bentley (1986) MIT report (1991) Li & Chen (2001)	Inbar (1996) Visscher & Wild (1997) 2		Elbourne (1914)	Fullan (1991)

top management in the development and implementation of ISs. Similarly in order to ensure the smooth and efficient progress of EMIS, top management should be aware of the lack of, or at the very least the insufficiency of facilities at the grass roots level, be it physical, manpower or funding. The top management awareness and sensitivity, which may seem trivial, are very crucial so that drastic actions could be taken to improve the situation.

Interestingly, most of the issues discussed by authors concerning MIS in private organisations also emerge with their public counterparts, except for the issue on using past experience to deal with new organisational changes. There are two issues that overlap in private and public organisations, but which are not touched upon in the other three areas; system evaluation, organisational management or educational change. These are the development of integrated database and the availability of system manuals/documentation. Authors from all five areas unanimously agree on the pertinence of human factors, the involvement of top management and other people at all levels, integration of new change to and understanding of organisational culture and structure, and evaluation of the IS in their respective areas.

The literature on educational change is interesting. The focus of most materials on educational change is on instructional materials, teaching strategies and pedagogical assumptions and theories underlying new policies for school development. However, Fullan (1991) mentions that educational change is multidimensional, and it may take place at any level in education system. Hence, there is relevance of the introduction of IS/EMIS as an innovation in education system. As argued by Levin (1976) in 2.3 above, one of the ways in which pressures for educational policy change may arise through internal contradictions, such as changes in technology lead to new social patterns and needs. The introduction of IT/IS/EMIS into the educational field obviously arises from the increasing need for reliable and timely educational data to enable decisions to be

made. The external force is the arrival of new technology. This leads to the pressure to change and adapt to a new environment.

While all issues examined arise in the implementation of IS in private organisation, and in all but two public organisations, the issues that emerge in the area of systems evaluation are as follows: the understanding of the system and the implementation of system, using past experience to deal with new organisational changes; an understanding of organisational structure/design/culture; and an evaluation of the system. Among the key issues highlighted in the area of organisational management are the consideration of human factors, the involvement of top management and other people at all levels, the integration of new change to and understanding of organisational culture and structure, the understanding of organisational culture and structure, the availability of a manager of change, and the evaluation of the IS.

The management of IS must draw on literature concerning the management of organisations due to the nature of the structure of the organisation and the ISs. The first reason for this is that ISs are a central responsibility for any management. Secondly, it seems clear that the structure and management of IS conforms to that of organisations in general, as supported in the literature (Ross, 1970; Lucey, 1989). Hence, it may be seen that the management of IS raises many of the same issues as the management of organisations. Lucey claims that managers who see the functioning of IS as being similar to that of their organisation will be quick to adapt to changing conditions.

There must also be a widespread change in attitude among staff as IT is introduced into the working processes of the organisation. From the literature, a generalisation can be formed that people react to the possibility of change in a creative but often negative way until they have discovered the impact on themselves. Once they can see the purpose of change, their reaction, though in many cases still negative, can become at least constructive.

The discussion so far indicates the problems and issues associated with the introduction and implementation of MIS in organisations regardless of the nature, structure and culture of the organisation. The literature and case studies provide us with a key means of exploring the problems and issues emerging in the introduction and implementation of EMIS in the MMOE. We know there has been a problem in undertaking the implementation of ISs/EMIS as a newly introduced change in the MMOE, as was described in Chapter 1. We now need to know more about senior managers' response on this change. The next chapter outlines a methodology used in this case study to explore the human aspect that affect the change introduced in organisations i.e. the implementation of ISs. Based on the senior managers' knowledge of the system and in their own words, Chapter 4 describes how the decision-makers involved in this study perceive the implementation of EMIS/SMPP in the Ministry, the emerging issues that they identify as a result of the introduction of the system and how the implementation of EMIS/SMPP could be improved to serve their decision making needs. Chapter 5 will discuss the findings of the interviews with those decision-makers in relation to the literature and case studies in this chapter. Chapter 6 will present the key findings of this study, while Chapter 7 concludes this case study, presenting recommendations to several issues arising in the implementation of EMIS/SMPP.

2.5 Summary

In this chapter we have looked at the development and implementation of MIS in different areas of private and public organisations. We have also considered system evaluation, organisational management and educational change. We have, further, explained why the introduction of IS in organisations, particularly educational organisations, is regarded as a new innovation or change. From the standpoints of the various authors discussed in this chapter, it may be deduced that the introduction of change such as the implementation of IS in organisations comes in a package with problems and issues that have to be resolved by the organisation as a whole. The degree of difficulty and tension arising from the emerging issues varies according to the ability

of the management to make sense of the situation. The management needs to prioritise organisational needs and adopt acceptable solutions to the issues. As presented in Table 2.4 there are some common issues affecting the implementation of IS or change in the different areas. These issues may be divided into technical and management issues. The set of technical issues are related to:

- adequate presystem planning;
- training;
- understanding the IS and its implementation;
- understanding organisational structure/design;
- developing an integrated system/database;
- availability and reliability of computers and supporting facilities;
- evaluation of systems;
- availability of manager of IT and systems;
- good quality of data;
- integration of systems with organisation planning;
- availability of system manuals/documentation;
- identification of users' information needs;
- formulation of information/IS policies and guidelines.

Meanwhile, the set of management/organisational issues are related to:

- the need for consideration of human centred issues for example users acceptance and experience;
- involvement of people (top management and other users) at all levels in the organisation;
- communication between designers and users;
- collaboration and commitment of top management;
- learning from experience to change IS development practices;
- integration of new system to organisational change;
- re-examining of the organisational culture and structure.

As shown in the frequency of the issues highlighted, there is strong agreement among the authors that a set of technical issues and a set of management issues are needed for successful implementation of IS in organisations. Against this wider context of MIS implementation discussed in this chapter we have a strong foundation to inquire about the implementation of EMIS in the MMOE. To do so, we need to consider our research method, and the approach to collecting and analysing data for this study will be discussed in detail in the next chapter.

CHAPTER 3: THE RESEARCH METHODOLOGY

3.0 Introduction

The primary aim of the present research is to gather data from interviews with MMOE senior managers, in connection with their perceptions and experience of using the EMIS/*SMPP* database available in the Data Unit, EPRD, at the ministry.

The need to interview senior managers has arisen out of the concerns, as seen in Chapter 1, that there were problems in implementing and managing the system in the MMOE, and more specifically, that EMIS/*SMPP* data was not being used to enhance the decision making process within the MMOE (EPRD & HIID, 1997). It was identified in Chapter 1 that there were also problems of perception and knowledge about the functioning of the system among its users at all levels. In Chapter 2 some common issues affecting the implementation of IS or change in organisations were discussed with reference to the literature. Chapter 2 highlighted those factors affecting the implementation and management of IS, which include management factors, organisational features and other situational factors. The discussions made us aware of some of the importance of human factors in implementing IS within organisations.

The purpose of this study is to probe the factors impacting on the use of EMIS/*SMPP*, particularly among the senior managers. To this end, and at the outset of the study, we posed major questions relating to the implementation of the system, and identified the key persons involved in the implementation of EMIS/*SMPP*. Other approaches could have been undertaken and other questions asked but we identified the senior managers as the key group of users, as they were the driving force behind the development of the system. A qualitative case study approach was undertaken so as to probe senior managers' perspective on the system. This seemed to be the most appropriate method, as this is a new study in a new context, in that both the top management of the MMOE and educationists at all levels had only recently were

looking seriously at introducing a comprehensive EMIS within the education system. Although EMIS had been introduced and carried out in other developed and developing countries, very little was known about how it had been implemented and developed, or indeed about factors affecting its effectiveness. Such a focus seemed to require an exploratory, probing and qualitative approach, in which the perspectives of decision-makers would be uncovered through in-depth qualitative interviewing.

This chapter outlines the methodology adopted in this research. It is divided into eight sections. After this introductory section, section 3.1 focuses on the research method of the study. Sections 3.2, 3.3, and 3.4 respectively present the study's detailed research methods, strategies, and design. Relevant steps and procedures that were used to collect data are also identified and explained. Section 3.5 details the data analysis process while section 3.6 describes the pilot study conducted. Section 3.7 presents the researcher's personal reflections on the features of the methodology used and the problems encountered in the study. Section 3.8 summarises the research contributions and provides some concluding remarks.

3.1 The Research Method of the Study

In choosing a method or methods for any study, it is clear in the researcher's mind that no single research methodology is intrinsically better than any other. It is for this reason that some authors call for a combination of research methods in order to improve the quality of research (Cohen & Manion, 1994). The value of all methods is recognised if they are applied appropriately and if the research can, in fact, include elements of both positivist (quantitative) and interpretivist (qualitative) approaches.

After much careful thought and discussions with her supervisors, and based on the study research questions as well as the literature it was deemed appropriate to adopt a case study approach, using interviews, as opposed to a questionnaire survey. It seemed obvious to the researcher that a mix of qualitative methods was essential, and that there was thus a need to include the case study method, which included interviews, participant observation and document searches. As suggested by

Wellington (1996), a case study of an organisation may involve observation, discussion, interviewing, visits to different sites, and the study of written records and documentation (p.42). The data in this study was gathered through a combination of most of the approaches mentioned. The qualitative method chosen was deemed appropriate in gaining and examining responses, information and experiences of participants with the use of EMIS/SMPP database for decision making within the MMOE. The justifications for selecting this method are clarified in the next section.

The most telling point of divergence between quantitative and qualitative approaches centres around the significance of language to enquire into the nature of human beings. Bertaux (1981) argues that those who require that educational research imitates the natural sciences seem to ignore a basic difference between the participants of inquiry in the natural sciences and those in the social sciences: the participants of inquiry in the social sciences can talk and think. Heron (1981) points out that the original, or indeed archetypal paradigm of human inquiry is two persons talking and asking questions of each other. Interviewing, then, is a basic mode of inquiry. One major difference between qualitative and quantitative approaches is that in interviewing, the role of the instrument, the human interviewer, is recognised and affirmed. Rather than decrying the fact that the instrument used to gather data affects this process, the human interviewer can be seen as an adaptable and flexible instrument who can respond to situations with skill, tact, and understanding (Lincoln & Guba, 1985).

3.2 The Rationale for choice of methodology

In recent years, qualitative methodology has been recognised as “a set of methods which permits the evaluator to study selected issues in depth and detail” (Patton, 1990, p.3). It also has been accepted as a robust source of knowledge and has been seen as the optimal approach to some of the organisational issues (Yin, 1984), which the present study explores.

The following sub-sections discuss the justifications for the choice of method used in gathering data and analysing it within the paradigm of qualitative research in education, as based on the arguments presented by several authors in this area.

3.2.1 Why choose interviewing?

The adequacy of a research method depends on the purpose of the research and the questions asked (Locke, 1989). If the researcher's goal is to understand the meaning people involved in education make of their experience, then interviewing provides a necessary, if not always completely sufficient, avenue of inquiry. Qualitative interviewing has been referred to as a non-directive, unstructured, non-standardised, and open-ended interviewing and 'to be effective the identification of needs should be done through interviews' (Lewin & Stuart, 1991, p.122). The purpose of interviewing is not to get answers to questions, nor to test hypotheses. Nor, indeed, is it to 'evaluate' (Patton, 1989). At the root of interviewing is an interest in understanding the experience of other people and the meaning they make of that experience (Seidman, 1991). Being interested in others is the key to some of the basic assumptions underlying interviewing technique. At the heart of conducting research by interview is an interest in other individuals' stories or experiences. This explains why people interviewed cannot easily be coded through use of numbers. Schutz (1967) offers some guidance here in stating that it is never possible to understand another perfectly, because to do so would mean that interviewers had entered into the other's stream of consciousness and experienced the same as the interviewee.

One of the major reasons for choosing interviewing over a questionnaire survey was the possibility of not getting adequate feedback from the study participants. The researcher was well aware of the very tight schedule of the participants and was somewhat sceptical about getting back questionnaire responses on time, 'genuinely' answered by the participants themselves. Indeed, during the main study she failed to make contact with one of the participants, who preferred to respond to the interview questions in writing rather than through face to face interview. This experience

confirmed that a case study using interviews was a well-judged research method for this study.

Another reason for adopting this method was that during the interviews, the researcher was non-directive, in that she did not intervene or control the participants' responses. The advantage of this was that the conversations relating to *EMIS/SMPP* were elicited naturally. Through this approach, there is always the likelihood for unexpected findings to emerge with regard to the participants' experience and roles in the development, and utilisation of, *EMIS/SMPP* data.

The researcher's choice of research method was also based on the arguments presented by several authors such as Ferrarotti (1981) who emphasises that a social abstraction like "education" is best understood through the experiences of individuals, whose work and lives are the stuff upon which the abstractions are built. The interaction between the data gatherers and the participants is inherent in the nature of interviewing. Another convincing argument about using interviews and participant observation was discussed by Seidman (1991) who asserts that the primary way a researcher can investigate an educational organisation or process is through the experience of individual people, the "others" who make up the organisation or carry out the process.

Thus, in answer to the question of why interviews should be chosen, they are a powerful way to gain insight into educational issues by understanding the experience of individuals whose lives constitute education. As a method of inquiry, interviewing is most consistent with people's ability to make meaning through language. Being involved in the *EMIS/SMPP* project from its initiation stage, it had been the researcher's intention to listen to the decision-makers themselves, and to gain an awareness of their perspectives on the implementation of *EMIS/SMPP* within the MMOE. It was thought that the best possible way to find out the MMOE decision-makers' views and perspectives on *EMIS/SMPP* was by talking to them and listening to what they had to say about it personally. In doing so, the researcher had

a greater opportunity to probe essential follow-up questions which could not be done using other research methods. Carrying out interviews among the decision-makers was a golden opportunity for the researcher to gather different viewpoints and assumptions held by the decision-makers involved in the development and implementation of EMIS/SMPP. Identification of concerns and understanding issues related to the utilisation of EMIS/SMPP database can only be sought through the interviews conducted.

During the interviews, it was found that the participants were generous in imparting knowledge and sharing their views and opinions about the system. It was also observed that face to face interviews allowed the interviewer and interviewee to communicate informally, and to provide ample room for both to clear doubts pertaining to the issues discussed, more meaningfully. The rich information gathered (including some off-the-record statements) could not possibly have been collected if the study had been carried out through other methods.

3.2.2 Validity and reliability

In response to the questions underlying the issues of validity, reliability, and generalisability that researchers confront, by interviewing a number of participants, one can connect their experiences and check the comments of one participant against those of others. The goal of the process is to understand how participants understand and make meaning of their experience. If the interview structure works to allow them to make sense to themselves as well as to the interviewer, then it has gone a long way towards validity (Seidman, 1991). According to Vygotsky (1987), the very process of putting experience into language is a meaning-making process.

The discussion on the appropriateness of interviews in the previous section confirmed the researcher's selection of her research method. The qualitative method of case study through interview was chosen for this study in order to gain the views of the senior managers of the system. Since EMIS/SMPP was very much a newly introduced change in the MMOE, it was essential that information gathered from

other sources could support and validate the information elicited from participants in the interviews. Hence, the researcher cross-referenced the study findings with information from document searches and participant observation to validate the information obtained from the interviews. The picture that emerged was valid for the participants involved in the study. Although the information gathered was limited to the views of the interviewees, the key informants of EMIS/SMPP, it was always possible that other decision-makers may hold entirely different perspectives regarding the system. As far as possible, within the available time, the samples used were representative of the broader community, but not necessarily the perspectives retrieved.

Document searches

According to Glaser & Strauss (1967) a collection of interviews and conversations can be regarded very much as a set of interviews, conducted with either a sample of people or representatives of different groups. These were actual interviews, albeit brief and it is important to recognise that they are only one source of important qualitative data.

In order to support and supplement the interview findings, the researcher used a variety of internal documents from the Documentation Centre in the MMOE and within the study sites particularly the EPRD. These included EMIS/SMPP project documents, the minutes of relevant EMIS and JMPK working committee meetings, EMIS/SMPP Terms of Reference, formal reports dealing with the implementation of EMIS/SMPP, and charts detailing organisation structure. Most of the information for the background of the study was collected from the Document Centre. The documents searched from the study sites, particularly in the Data Unit, EPRD, and the Information Centres in the SEDs, concern; (a) the development and implementation of EMIS/SMPP in the MMOE and SEDs; (b) minutes of EMIS/SMPP or JMPK meetings held either in the MMOE or at other venues outside Ministry; and (c) the educational policy or policy drafts on the development, implementation and utilisation of EMIS data. The above documents were gathered at the study sites with

permission of the Unit Data Principal Assistant Director and with the assistance of the supporting staff within the Unit, as well as the Information Officers in the Information Units at the SEDs. In addition, material relating to the wider organisation included organisational charts, internal publications and annual reports

Documents were obtained after the main study was completed. Materials pertaining to the implementation of EMIS/SMPP particularly the minutes of EMIS/JMPK meetings, which were not ready while the researcher was doing the main study, were sent by her colleagues via e-mail.

Participant observation

Apart from the theoretical analysis of its classical, descriptive and exploratory application, there is no systematic or practically tested methodology for participant observation comparable to those of other sociological research methods (Friedrichs and Lüdtke, 1975). Campbell & Stanley (1963) state that the interaction between data gatherers and the participants is inherent in the nature of interviewing. Moreover, it is inherent in other qualitative approaches, such as participant observation. According to Punch (1988), light on the nature of the data collected can only be shed through a full history of the research process, which serves as an essential element in reporting a project. In field research, such as observational studies, “we are heavily reliant on the integrity of the researcher in terms of detailing the nature and quantity of observations, and interviews, the process of interpreting the data, and the selections made in the report...” Hence, “a serious and deep analysis of the research role, and the research project, form a prominent part of an observational study” (p.15).

The participant observation carried out in this study met the conditions outlined by Friedrichs and Lüdtke (1975). There was a plurality of observation subjects i.e. different groups of people involved in implementing EMIS/SMPP and the observation took place in differing situations such as during EMIS/SMPP seminars, and formal or informal meetings at the study sites. The observations in this research study did not take place specifically at the time when the study was carried out. It

was, in fact, the collection of observations made throughout the researcher's involvement as a secretariat member in the project, which began in 1993 up till this study was carried out. Throughout this period, the researcher had the experience of mixing with people from all levels involved in the EMIS/*SMPP* project, and she too had an accumulation of knowledge on the development of the project. At the same time, observations of people's reactions towards the project were made each time EMIS/*SMPP* team met with people from other levels and divisions, either during meetings, seminars, courses or even during informal discussions. The information gathered during these events then served as feedback, which was later discussed and given due consideration during the Data Unit meetings. These collections of feedback have now become a valuable resource in supporting, or in some cases contradicting, the views of the decision-makers in implementing EMIS within the MMOE. The position of the researcher in participant observation can be classified as a combination of pseudo-participation, where the participation is limited by the role and purpose of the observer, and incomplete participation where there is little integration, but strong emphasis on the observation, which the observer overtly pursues (Fink cited in Friedrichs and Lüdtke, 1975). Nevertheless, observation, with whatever degree of participation, is clearly an important part of any case study (Wellington, 1996, p.43).

The reflection stage

Having completed the processes of data collection and analysis, the researcher began to reflect systematically on the existing experience and knowledge related to the case under examination, and adapted the data to the research questions being investigated. As suggested by her supervisors, one powerful tool employed by the researcher during the reflection process was the continuous writing of short notes about each of the themes identified in the analysis. Once notes were written, the analysis was further improved through the application of a triangulation method. Cohen & Manion (1994) describes triangulation as "the use of two or more methods of data collection in the study" (p.254). It is a useful technique, as it provides confidence in the results generated. Interview data were triangulated with the contents of minutes of

EMIS/*SMPP* or *JMPK* meetings and EMIS/*SMPP* related documents such as the Terms of Reference, seminar papers and EMIS/*SMPP* development reports. In addition to creating a chronology and engaging in early writings, member checks were considered important, and were applied at this stage. Member checks here means that some of the written work and initial analysis was checked by people related to the implementation of EMIS/*SMPP* in the MMOE, particularly the researcher's colleagues in the Data Unit. Additionally, the interpretation of the interviews was further discussed with lecturers in the Institute of Education other than the researcher's supervisors.

The next main stage after triangulation and member checks was to compare the findings with the existing literature to reveal and explain similarities and differences. The validation process of the study findings included relating or linking the issues affecting the implementation of EMIS/*SMPP* in the MMOE to the literature on the implementation of MIS in private/commercial organisations, MIS in public/educational organisations (EMIS), system evaluation, organisational management and educational change. This will be discussed in greater detail in Chapter 5.

3.2.3 The participants

A researcher must have the ability to assess the appropriateness of a participant in contributing to the study. Seidman (1991) emphasises that the major criterion for appropriateness is whether the subject of the researcher's study is central to the participant's experience. In the case of this study, it was clear to the researcher that all participants identified were key people who had a certain level of information about the implementation and developments of EMIS/*SMPP* within the MMOE.

The researcher adopted purposive sampling, for this study which enabled valid generalisations to be made (Wellington, 1996). Purposive sampling involves choosing people whose views are judged to be relevant to the research problem. Neuman (cited in Saunders et al. 1997) suggests that this form of sampling is often used when

working with very small samples, as in case study research, and when the researcher wishes to select cases that are particularly informative. The weakness of this sampling is that it is not suitable where change occurs during the period of research, and affects the members of the sample. And in the case of the MMOE, as mentioned in Chapter 1, changes such as personnel movement or transfer in the Ministry are inevitable.

It was initially planned that the interviews be carried out solely among the top management of the MMOE and selected MMOE Division Directors who are the ultimate decision- and policy-makers within the Malaysian education system. Due to their constant tight schedule and unpredictable routines, the researcher had to consider a contingency plan by involving SED Directors who were also the committee members of the Educational Planning Committee meeting, the highest decision-making body at a federal level.

A total of twenty-four participants, comprising eight senior managers of the MMOE, eleven of the Division directors/secretaries and five SED directors, were involved in this study. The total represented half of the overall number of decision-makers in the entire administrative education system, excluding the learning institutions (see Figure 1.1a). Participants from the Ministry's top management and divisions included both professionals, who were teachers by profession, and administrators. The participants comprised both male and female respondents. All the participants had been, in one way or another, involved in EMIS/*SMPP* meetings at either the Ministry, Division or state levels, and they were of decision-making level both at the MMOE and SEDs. The participants were given the assurance that their identities would remain anonymous in the final report and a coding scheme was devised with a code assigned to each of the participants (see Appendix I).

3.2.4 The Researcher – an insider

As suggested by Bogdon and Taylor (1984) the goals of qualitative investigation are to achieve in-depth understanding of the setting and the theoretical insights which

transcend that particular type of setting, and to experience reality as others do in order to understand how they see things. On a similar note, action research, a branch of educational research, is described as a systematic study of attempts for practitioners to change and improve educational practice by means of their own practical actions and reflection upon the effects of those actions in their own settings (Ebbutt, 1985). These authors suggest that a researcher with prior knowledge of the settings and the profession can achieve the goals of qualitative investigation more easily than one without it. The researcher's status as a previous member of the organisation eased the process of her study. Indeed, her involvement in the implementation of the system (see sections 3.2.1 and 3.2.2) enabled her to identify the most appropriate subjects for the study, and to acquire the relevant documents at the study sites. Being part of the culture has helped the researcher to understand the people involved in the study and the organisation, and this speeded up the process of gaining access to the study sites and the subjects. Being an insider, the researcher is also fully aware of the culture of the organisation and the events taking place where the implementation of *EMIS/SMPP* is concerned. Thus, when given the opportunity to step outside the organisation to investigate the implementation of the system from the outside, the researcher brought with her these experiences which are not available to outsiders.

Although gender, ethnic background, age and bureaucratic obstacles are among the factors identified as affecting the conduct and success of research (Punch, 1986), it is believed that the researcher's gender does not have any significance in the process of carrying out this study. There is also no doubt that a researcher from a different culture, without a thorough knowledge of the organisation, could gain access to undertake this study. Nevertheless, there is every possibility that he/she would miss or overlook several issues, particularly the more sensitive ones, in the study, which are only obvious to those who are involved in *EMIS/SMPP* implementation process. Thus, being an insider provides a great advantage to the researcher in enabling her to crosscheck and triangulate her study findings with her knowledge, experience and observations made throughout her involvement in *EMIS/SMPP* implementation project.

3.2.5 The Use of a multisite case study

The empirical part of this research consists of a multisite case study that investigates the complex organisational phenomenon of managing the implementation of IS. Ward-Schofield (1993) explores the consequences of site selection for validity and generalisability, and suggests that both can be maximised either by selecting a typical site or else conducting a multi-site study.

To ensure a comprehensive coverage, the study had to include decision-makers from the MMOE and SEDs. These decision-makers are committee members of one or several steering committees, which are responsible for making decisions within the MMOE. Hence, for the purpose of this study, a multi-site case study involving the MMOE and SEDs is used rather than a single-site case study.

3.3 Research Design – Preparation Phase

Research design is referred to by Merriam (1988) as a plan of assembling, organising and integrating information (data), and its result is a specific end product. The design depends on the research problem, research questions and the desired end product, although in some cases research, design can be cyclical (Wellington, 1996). Lindlof (1995) states that research design in qualitative methodology consists of a sense of purpose, some researchable questions, an understanding of the researcher's own resources and some idea of the overall features and dynamics of the setting to be entered. As had been considered by the researcher prior to undertaking the research and as defined by these authors, the research design of this study has the purpose of highlighting issues associated with the introduction of EMIS/SMPP in the MMOE. This study will give better insights into the barriers to the effective working of EMIS/SMPP in the MMOE from the perspective of the decision-makers. It will be based on a case study in which the knowledge and attitudes of decision-makers are seen as key variables. It sheds light on general issues related to the implementation of IT into organisations.

3.3.1 Research site selection

Choosing an appropriate study site and building a relationship with its participants is a key issue for all qualitative case studies. Wainwright (1997) argues that it is the potential to access the authentic views of the informants that guide the researcher's selection of a site, rather than the largely unattainable goal of being representative.

The sites of the study were the MMOE and the SEDs. The main reason for selecting these sites was that EMIS/*SMPP* was first initiated in the MMOE, actively involving several Division Directors such as the EPRD, Computer Service Division, Teacher Education Division, Finance Division, Examination Syndicate, and Schools Division, to mention a few. Besides this, the MMOE Information and Computerisation Committee meeting was chaired by the MMOE Deputy Director General and the Deputy Secretary-General, two of the top management level of the MMOE. As EMIS/*SMPP* project is now implemented throughout the country, the main agency responsible for educational information at every state is the SED. Thus, it was deemed appropriate to involve the SED Directors, as they were accountable for the educational information of their respective states. Finally, in the process of policy and decision making, the educational data frequently requested for inputs during meetings were derived from databases located at either of these two sites.

Undoubtedly there were available resources at the study sites, the MMOE and the SEDs, which would serve as important reference and support to the findings of the study.

3.3.2 The Design of the Case Study Protocol

The use of a case study protocol as part of a carefully designed research project can provide the reliability which is required from all research (Yin, 1994). Based on the design suggested by this author, a preliminary research protocol was designed, based on previous research and a review of the literature. A case study protocol should contain not only the survey instrument, but also the procedures and general rules that must be followed in using the instrument. These are:

- an overview of the project - project and case study issues;
- field procedures - credentials and access to sites;
- questions - specific questions that the investigator must keep in mind during data collection;
- a guide for the report - outline and format of the narrative.

An interview protocol for this research was created before the data collection phase. During this phase, several key issues such as the matters of access (3.4.1), availability of resources (3.3.1 and 3.4), and the data collection schedule (3.4.3) were considered.

This study adopted a retrospective approach. It was based on a case study, interviews with persons who could provide accounts of events that preceded particular outcomes, the researcher's own observations of the organisation and the implementation of *EMIS/SMPP* over a period of seven years (1993 – 1999), as well as a collection of secondary data on the implementation of the system.

3.4 Data Collection Procedures

The collection of data in qualitative methodology can be done either in one or a combination of three methods listed by Patton (1987): (1) in-depth open-ended interviews; (2) direct observation, and (3) written documents, including such sources as open-ended written items on questionnaires, personal diaries, and programme records. Yin (1994) identifies six major sources of evidence in case studies: documents, archival records, interviews, direct observation, participant observation, and physical artefacts.

This research involves three of the six sources detailed above; document searches, interviews and participant observation throughout the initiation and implementation stages of *EMIS/SMPP*. The adoption of these methods allows the process of triangulation (Cohen & Manion, 1994). One of the most obvious advantages of this is to check validity and findings (Bryman, 1989; p.175). It appears to be a useful

technique as it provides confidence in the results generated since data are derived from several collection methods and triangulation also helps to overcome the problem of method boundedness. Wiersma (1986) suggests that the use of multiple data collection procedures enhances internal reliability.

3.4.1 Accessibility and acceptance at the study sites

As noted by Ball (1993), it is normal in qualitative methods to accept the rules and guidelines laid down in organisational procedures. The MMOE has set requirements before one could carry out research in any premises or which involves participants within the education system and the EPRD is the division handling requests and approvals for such research. An application form for conducting this study was submitted to the EPRD through the Malaysian Student Department in London and the Scholarship Division then arranged for the researcher's departure to Malaysia for the main study.

While preparing the research proposal, the researcher made contact with the interview participants identified. Realising the highly bureaucratic nature of the Malaysian government agencies, contacts with the participants were initially made through formal letters, which consisted of a brief introduction of the researcher, a short but concise explanation of the study and her intention in setting up an appointment for the interview. The following contact was made either in person or by telephone where at this time the researcher dealt with the participants' personal assistants or secretaries. In either case, the researcher then found out whether the participants had agreed to be interviewed. Subsequently, a suitable date was set for the interview. During this contact, the nature of the study was presented in as broad a context as possible, and made more explicit with regard to what was expected of the participants. Although it was preferable to see the participant in person, in most cases the researcher had to rely on the participants' personal assistants or secretaries to convey the message to the participants. About a couple of weeks before each interview, it was important to make another telephone contact to reconfirm the

appointment set up. During the main study there were two cancellations and the researcher had ample time to find a replacement.

3.4.2 Semi-structured / Open-ended interviews

Cohen and Manion (1980) define four kinds of interview that are specifically used as research tools: the structured interview; the unstructured interview; the non-directive interview; and the focussed interview. As with any description of types, the reality of each researcher is rather a mixture of types (Radnor, 1994). We called the interview format for this study semi-structured, as a number of open-ended questions were devised as a result of seeking to find a useful way to elicit responses to the research questions. The interview format has the features of minimal direction or control exhibited by the interviewer and the freedom of the respondent to express his subjective feelings and as spontaneously as he chooses or is able (see Appendix II). However, within each open-ended question there was information that the researcher picked up on in all interviews. It was structured in such a way that she could trigger herself to note that, if the participant did not offer information about these things in response to the open question, further questions were asked.

The researcher felt that this structure had several benefits. Firstly, it kept the conversation free flowing, and she was able to judge the appropriate time to ask follow-up questions in a manner that keyed into the style of the conversation. Secondly, it ensured that equivalent information in the sense of the topic covered was collected in all interviews, thereby fulfilling the research objectives, and thirdly it allowed the participants the chance to expand on what they saw as a priority in their own situation. The researcher found that this was important data and data that was not possible to collect if she had structured the order of the questions and made them too specific and focused.

The interview schedules devised for this study were designed to elicit explanatory information, views and suggestions that present a picture of the participant's interpretation of the area under study. Although the questions were in a particular

order in the schedule, the researcher did not follow the schedule order during the interviews. She sometimes began the interview with an open-ended question, and continued by selecting questions in the schedule and rephrasing the questions in a different way depending on the situation in which she was interviewing and the response from the participants. What was important to her was that as long as all areas were covered, she would use her discretion, keeping in mind the context in which she was interviewing.

All interviews were carried out during office hours, in the participants' offices. The interviews were initially scheduled to last between twenty to forty-five minutes each. However, during the main study almost all interviews ranged between forty-five minutes to two and half an hours. The interview schedule was prepared in English, bearing in mind that the communication language during the interviews would be left to the participants to decide; either in Malay language, or English, or a mixture of both. And as anticipated, most interviewees were more comfortable conversing in English and several in a mixture of English and Malay.

Tape-recorded Interviews

There was no doubt in the researcher's mind that the interviews must be tape-recorded, although the literature is not unanimous on this point (Bogdon & Taylor, 1975; Lincoln & Guba, 1985). Through her experience during the pilot study, the researcher believed that to work most reliably with the words of participants, researchers have to transform those spoken words into a written text to study. Another benefit of tape-recording interviews was that by preserving the words of the participants, researchers have their original data. If something was not clear in the transcript, the researcher can return to the source and check for accuracy. Tape-recording also benefited the participants. They could feel assured that there was a record of what they said and had access to. As a result, they had more confidence that their words would be treated responsibly (Seidman, 1991). An additional benefit of tape-recording especially for new researchers was that researchers could use the tapes to study their own interviewing technique to improve upon it.

Besides the reasons mentioned above, the researcher personally felt that she ought to tape her interviews because it meant that she would have rich data, as well as the participants' words to work on and analyse from. And since she expected and hoped that all the interviews would be tape-recorded, consent of the participants was requested before starting the interviews to make sure that they were happy about it. During her pilot study, the researcher found that sometimes the tape recorder could inhibit participants, as admitted by several participants themselves, but after some time, they soon forgot its existence. Out of the twenty-four interviewees, one was reluctant to have the interview tape-recorded. However the interviewee agreed to speak at a slower speed to provide the researcher the opportunity to take fuller notes of what were said.

3.4.3 The Duration of the Study

The study began in December 2000 until mid May 2001. There were two phases of interview sessions. In the first phase i.e. from December 2000 to January 2001, the researcher concentrated on the decision-makers at the Ministry level, while in the second phase i.e. from March to May 2001 the concentration was on decision-makers at state level and three others at the Ministry whose appointments were rescheduled. Considering that the participants often had very tight schedules and ad hoc matters to attend to, the duration of the interviews was stretched to the third week of May 2001. Although it was the researcher's wish to complete the interviews within the first two months of the stipulated time, so that the remaining months could be utilised for participants' validation of their interview transcripts, it did not turn out to be so easy to set up appointments with them all. There was an instance when an interviewee had to reschedule the appointment four times before the interview could be held. Finally the researcher had to use the entire three months scheduled for interviewing all the twenty-four participants. Overall, one EMIS-related seminar was attended while doing this study. Two e-mail interviews and three telephone interviews were used to collect and verify data, respectively. The collection of data on participant observation lasted from 1993 to 1999. The following section describes the process by which a detailed chronology was created and applied.

3.5 Data Analysis

The analysis of the findings of this study was based on the various sources of knowledge such as interviews, participant observations, library search on literature review of the study and documents search. Data analysis of interviews was carried out as soon as the work of transcribing was completed. This section discusses and explains the researcher's personal approach to managing and analysing data through the research method of interviewing during the interviews. Extracts used in this section and in the rest of this report are those from the main study interviews conducted, and are verbatim transcripts.

In order to achieve quality data analysis, a distinctive framework, based on the focus of the case study, was employed. This helped to capture relevant details and simultaneously facilitated the analysis of the organisational elements interlinking with the implementation of EMIS. The goal was to trace the knowledge and perspectives of the MMOE decision-makers on the implementation of EMIS/*SMPP* at the different levels of the Ministry.

3.5.1 Managing the data

To work with the material generated by the process of interviewing, the researcher made such material accessible by organising it. This organisation of work began well before the interviews were conducted, and would only end after the chapter on the analysis of the findings of the study was completed. It involved keeping track of the interviewees through the copies of letters that were be sent to them, labelling tapes of interviews accurately and accordingly, managing the files/drafts while working with the transcripts of interviews. It also entailed keeping track of decision and pertinent points in the entire process. Before arriving at the interview, the researcher made sure that the tape was in place with the participant's code, a title and a date spoken labelled on it. While conducting the interviews, the researcher made short notes of the main pieces of information that arise in the interviews. The main reason for this administrative work was to make it easier for her to trace interview data to the original source on the interview tape at all stages of the research. Another was to

enable her to contact an interviewee readily whenever there was a need. This took place while transcribing one of the tapes, and the researcher had to e-mail the interviewee to confirm what was recorded and in reply the interviewee, clarified what had been said.

3.5.2 Transcribing interview tapes

The researcher found transcribing her interview tapes was time-consuming particularly for those whose interview took up to two and half hours. It took the researcher almost two days to transcribe such lengthy interviews. However, she felt that by transcribing her own tapes, she came to know her interviews better. In transcribing the tapes, the researcher began with the whole material, rather than transcribing pre-selected parts of the tapes. Briggs (1986) suggests that in working with material, it is important that the researcher start with the whole. Although a transcript can be only a partial representation of the interview (Mishler, 1986), it can reflect the interview as fully as possible by being verbatim. At this point, notes taken during the interview played a very important role in confirming what was said by the interviewee during the interview and what the researcher gathered from the tape while transcribing. Seidman (1991) stresses the importance of paying attention to the words of the participant, and using those words to report on the result as far as possible, and looking for both salient material within individual interviews and connections among interviews and participants.

3.5.3 Analysing qualitative interviews

In analysing the interviews, the researcher realised that the process involved close examination of the information she had collected, in order to find answers to her research question. This section describes her approach to the interpretative stage.

The researcher's procedure for organising the interview data from a taped transcript was as follows. The issues emerged from the data and arose out of familiarity with the data. This referred to reading the taped transcripts a number of times, and 'staying close to the data' at all times. All the taped transcripts were on computer but for the initial stage, the researcher worked from a printout of the interview.

Firstly, the researcher listed the emerging issues when reading the whole text. At this stage, she drew out all the issues embedded implicitly in the responses, as well as ones that are explicitly mentioned by the participants. At the same time, she cross-checked those issues with the short notes she took during the interview. The original questions often helped to give a basic structure of broad issues. The issues in the interviews were oriented, among other aspects, training, provision of basic facilities, top management commitment, people's attitudes towards the system, management of IT/IS/change, and so on. These issues were categorised under human-, management-, and technical-related issues. Next the researcher read the transcripts again and wrote sub-headings for each issue category (see Table 5.1). Areas of interest and concerns discussed in the interviews generated the sub-headings (see Appendix III).

The next step was to code the content to issues by going through the text and marking the main quotes (see Appendix IV). At this stage, the researcher simply marked and coded the text, so that they could be found again. The category was written next to the text and the sub-heading that describes the text put next to it. For example, if the text concerned management issues about the commitment of top management, then the particular part of the text was underlined, and in the margin 'T/CT' was written – 'T' is the category, 'CT' is the subheading. The content of each transcript was coded in this way covering all issues identified.

When the transcripts had been coded, the data chunks were placed under the appropriate topic. In doing so, the researcher could gain a picture of the number of data chunks on each topic. She used the copy and paste rather than the cut and paste function, so that she could also retain an intact copy of the whole interview in the computer.

Having assembled the quotes, an interpretative statement that supported the quotes was written. These statements summarised the findings within that issue, as the researcher interpreted them. These interpretative statements (in bold) formed the basis of the research report and the researcher used the material as she continued to

work with the data to offer an explanation of the phenomena under study. Having explored all the categories, she concluded the report by seeking out relationships and patterns, and making connections in order to come to a particular view or an abstract conceptualisation of the phenomena studied.

3.6 Piloting the work

As any other research method, it is always recommended that researchers pilot their research instrument before carrying out the main study. This exercise corresponds with the process outlined by Seidman (1991):

The best advice I ever received as a researcher was to do a pilot of my proposed study...Although it may not seem ahead of time that the world of interviewing research takes one along strange paths or through dangerous places, the unanticipated twists and turns of the interviewing process and complexities of the interviewing relationship deserve exploration before researchers plunge headlong into the thick of their projects (p.29).

Before conducting the main study, the researcher had the opportunity of carrying out a pilot study with a small number of participants in the Institute of Education, University of Warwick. Besides trying out her interview design, the pilot study enabled her to gain some experience in conducting interviews as well as to get a truer picture and feedback from developers and users of a newly introduced system in an organisation. The interviews were held from the 27th to 29th March, 2000, and involved the administrators and academic staff of the institute. The main objective of the interview was to identify issues in implementing the First Class (FC) computer-based information system within the Institute of Education. It also aimed at gathering other related information based on the experience of FC users with the newly introduced systems.

Whilst carrying out the pilot study, the researcher was required to tackle some of the practical aspects of establishing access, making contact with the assistance of her supervisors, and conducting the interview. Prior to conducting the interview, the researcher had a brief discussion with her supervisors on the interview schedule

prepared. After completing the pilot study, she had the chance to step back, reflect on her experience, and discuss the findings and analysis with her supervisors. The processes that the researcher went through, and what had been learned from her pilot experience, gave her room to consider the research method for her main study more deeply.

Taken as a whole, the interviews provided the researcher with a deeper understanding of the issues, processes and policies gathered from the interviewees' responses. It also gave a fuller appreciation of the complexities and difficulties of change brought into an organisation, which unconsciously had a direct effect on other factors such as the management of the organisation, decision-making procedures and the attitudes of the stakeholders towards the change introduced. Senior (1997) remarks that all people in all organisations are concerned and involved with change, whether of the small-scale variety, such as adopting an up-dated version of a computer-programme, or of large-scale variety, such as a change of strategy and subsequent changes in structure and operation. Effective organisations are those which introduce change quickly and in which people – whether employees or managers – learn about the organisation as this process proceeds.

Analysing the transcripts of the pilot interview was a very meaningful experience and it provided useful guidelines for the researcher in analysing the findings of the main study itself.

3.7 Methodological problems encountered in the study

Throughout this study, the researcher was faced with a number of methodological challenges and difficulties. These were mainly caused by the complex multi-disciplinary nature of the study itself. First, the researcher had to choose whether to undertake a broad literature review covering a number of technological, managerial, and organisational issues in organising factors affecting the implementation of EMIS, or to opt, rather, for a much narrower yet possibly deeper analysis of a limited number of IS implementation case studies. However, the first alternative was

preferred, because such an analysis of the literature could provide a broader foundation for this exploratory study.

Second, there was a challenge in deciding which specific issue in implementing EMIS to study. Reflecting on the visits to the EPRD and conversations held with colleagues, the researcher came to realise that for a new system to be introduced and function effectively as planned in an organisation, there are other factors which should be thought about seriously and looked into more thoroughly. ISs implementation entails more than just the utilisation of the new system itself. It is assumed that the introduction of change in an organisation, particularly when it involves the use of technology, does not lend itself to the effective function of the system unless the human factor is taken care of. According to Visscher et al. (1995), it is 'people variables' that prove to be crucial anywhere. Motivation for, and attitude about, the innovation were mentioned very frequently, as was the extent to which future users can influence the process of development and implementation.

As mentioned in the previous chapter, since its implementation in 1993, there have been studies on EMIS/SMPP; *The Use of Computer-based Information System for Policy Development in the Ministry of Education, Malaysia* (Aziz, 1997), and *Investigating ways of increasing computerised information system use and improving its data quality in schools – the state of Selangor, Malaysia* (Abdul Rahman, 2001). In the present case study, the challenge of choosing which aspects to study resulted from the difficulties involved in clearly separating different activities when implementing the system. Although initially the researcher intended to look into the utilisation of the EMIS/SMPP database in the decision-making process, after examining the findings of the pilot study and discussing it with her supervisors, the researcher then decided to study the issues in the implementation of the system in the MMOE from a different point of view. This concerns the knowledge and perspectives of people within the organisation, particularly the decision-makers, which is assumed to have a great effect on the utilisation and implementation of the system rather than focussing on the system itself. This gave the researcher more

room to explore the complexities of IS implementation and management within the MMOE.

Third, there is a question of whether IS implementation/management researchers should possess intensive knowledge of the areas being investigated; namely IS and management. As far as the researcher is concerned, her lack of specialised technical IS knowledge is not a problem, since the focus of the research is on the perspectives of those making decisions on the IS, rather than the technical aspects of the system. This particular concern could be of interest in any future EMIS research study, in terms of whether the researcher requires in-depth knowledge of the subject or organisations under study.

Fourth, the researcher was also concerned with the validity of the data collected, i.e. whether or not the data expressed the considered and authentic views of the interviewees, with minimum interference or distortion through the research process. As this research was based partly on document searches and interviews, the documentary evidence permitted the cross-checking of many of the details presented in the interviews.

Fifth, several accounts of qualitative research touch on stress, deep personal involvement, role-conflicts, physical and mental effort and the time-consuming nature of field research for the researcher. However, it is felt that much is left unsaid, and that there are restraints in being completely open. The researcher often runs into difficulties when attempting to write frankly and honestly about what actually happened before, during and after research, an issue she constantly discussed with her supervisors. Entry and departure, distrust and confidence, elation and dejection, commitment and divulgence are as fundamental in her study as they are in making field notes, and writing this report. It is strongly felt that this reaction is likely when dealing with academic work, particularly in a centralised system such as that in which this case study was based, which is less acute in decentralised systems (Punch, 1986). Hence, the researcher is left with a feeling that far more could be told

about the concealed politics of research in such a system. As Van Maanen (1984) argues: “Frustrating as it may be, we simply have to face up to the fact that, institutionally, it proves difficult for social researchers to be totally open about their research experience” (cited in Punch, 1986, p.19). On a similar note Punch (1986) reveals that such frustration is not merely due to unsatisfied curiosity, but far more the intellectual urge to pinpoint the whole range of personal and structural factors that influence the process and outcomes of research.

Sixth and the most challenging of all, during the data collection and data analysis process, one potential bias was the researcher’s own beliefs, values and prior assumptions, which may have prevented adequate investigation and consideration of possible contradictory data and unduly influenced the analysis of the case study. To avoid such bias, the interviewees were given the opportunity to ask questions regarding the purpose of the study and were assured that their individual views would remain confidential.

An important question to ask at the end of this discussion of methodology is the extent to which the methods employed in the case study enabled research findings to be generalised to other organisations. Unlike a quantitative case study, generalisability is derived by gaining an in-depth understanding of the patterns of behaviour and interactions of organisational elements within a specific context. Therefore, the generalisability of the case study is limited. Furthermore in this study, findings are based on the personal knowledge and perspectives of decision-makers representing individual views, and not the organisation itself.

3.8 Summary

This chapter has discussed some of the key issues underlying methods in social sciences, and has studied the implications of these issues for the design of research into IS implementation/management. A qualitative case study approach using in-depth interviews, participant observation and document searches was selected for this study. The aim of this case study is not to produce a representative, unbiased

measurement of the views of the population, but to deepen our understanding of management issues by conducting an in-depth analysis of the articulated consciousness of decision-makers involved in the phenomenon.

The decision to use a case study approach was taken because the aim of the research was to highlight the issues hindering the implementation of EMIS/*SMPP* from the perspectives of the decision-makers. In other words, the purpose of the study was to obtain a sufficient depth of understanding and value of EMIS from the point of view of the decision-makers. After identifying the concerns of IS implementation/management and conducting a detailed literature review, a research design was established and no hypothesis was developed. However, during the research, the researcher was faced with one main problem that had, ironically, helped to determine and shape the boundaries of the research, that is, the problem of multiple disciplines.

The main contribution of this chapter has been to present and justify an approach as a means of inquiry. The following chapter focuses on the description of the interviews and the themes derived from the interviews.

CHAPTER 4: DESCRIPTION OF THE INTERVIEW

4.0 Introduction

The main aim of this study is to gain insights into the MMOE senior managers' knowledge and perspectives on implementing EMIS/*SMPP* within the ministry. In Chapter 1, the problems regarding the implementation of the system within the MMOE were highlighted, and the issues in implementing IS, or more generally, change within organisations from various standpoints were outlined in Chapter 2. In Chapter 3, we justified the research method selected and presented the procedures for analysing data gathered in this study. Using a probing, qualitative approach to interviews, as discussed in the previous chapter, the spoken responses of twenty-four people from three levels of decision-makers; top management (8), Division directors/secretaries (11) and SED directors (5), as 50% sample representative of the total decision makers in the MMOE were elicited. These will be described in detail in the present chapter.

The interviews raised issues at human, organisational/management and technical levels. The human related issues concern peoples' attitudes towards the system and their sensitivity towards data. The management related issues concern the commitment of top management, the need for a manager of IT/IS/change, the need to formulate an information/IT/IS policy, a review of the organisation rules and regulations and utilisation of EMIS/*SMPP* data among users. The technical-related issues include the provision of basic facilities, evaluation of the system, the development of an integrated system and the standard interpretation of terms and training. The decision-makers' responses are categorised under different areas pertaining to EMIS/*SMPP* as follows:

- (a) Knowledge of EMIS/*SMPP*;
- (b) Use of EMIS/*SMPP*;
- (c) Evaluation of EMIS/*SMPP*;
- (d) Suggestions to improve EMIS/*SMPP*;

- (e) Factors affecting the development of an integrated database in the MMOE;
- (f) Suggestions about developing an integrated database in the MMOE.

4.1 Knowledge of EMIS/SMPP

There are two levels of knowledge of EMIS/SMPP among the decision-makers in the MMOE:

- advanced knowledge of EMIS/SMPP (9 interviewees) – the interviewees had knowledge of the type of data stored in the system, how the system worked, how it could be used to inform users, and the extent to which the data had helped the MMOE management to reach educational decisions and to formulate policies;
- basic, or very little knowledge of EMIS/SMPP (15) – the interviewees were aware of its existence, but had little knowledge on how the system worked and knew that the EPRD was the custodian of the system.

Ten out of twenty-four interviewees comprising MMOE top management and division heads either do not know, or do not know in detail about EMIS/SMPP. Six of the interviewees, two of the MMOE top management, three of the division directors and one of the SED directors had basic knowledge about EMIS/SMPP while the other eight either knew more, or had advanced knowledge about the system. Except for MMOE top managers, there were either members of EMIS/SMPP technical committee when it was first introduced or were involved directly in its implementation at state level.

Nine out of the ten who had very little knowledge of EMIS/SMPP were aware that it was an existing system whose purpose was to manage educational data for all government schools. Two of them revealed that they had never used the system:

What EMIS/SMPP is exactly? I don't know. I don't know the details. I know it's about educational management information system. I never use it myself.

(DS5)

Of the ten, two of them admitted that EMIS/SMPP was frequently mentioned during meetings held in the Ministry and that was how they got to know about the system:

In actual fact, I've heard about it in meetings I attended but what it is really, I don't know. What I gathered from the discussions, I think EMIS/SMPP could give or provide information at various levels and details at various level of decision making. It should keep track of trends and make lots of trend analysis because that's the kind of information that has always been asked for... Only that much I know about EMIS/SMPP.

(DS6)

One of the ten with basic knowledge of the system was well aware of the existence of EMIS/SMPP. He was involved at an early stage of its construction, but now believed it was not necessary for him to know more about the system, and did not have any idea about it once the system was operationalised:

...How EMIS/SMPP operates, what are its information content and structure, I really do not know and possibly it's not necessary for me to know because at the early stage of EMIS/SMPP construction I was aware of it because I was also involved. I was aware of some of the things that you want to do. Since then when it was operationalised now I don't know what it is.

(SM3)

Another two interviewees from the ministry knew about the system when they were in the EPRD but lost touch and no longer kept up with its development once they had left the division. One of the SED directors claimed that he had lost touch with the system since he left the DEO to join the SED:

I don't know much about EMIS/SMPP since I moved away from EPRD. I don't know much about what the capability of our EMIS/SMPP is ...If I want data from the Examination Syndicate, I go to the Exam Syndicate and I still get what I want rather than from EMIS/SMPP whereas initially the purpose or objective of EMIS/SMPP earlier on is supposedly to have integrated database...

(DS10)

However, all decision-makers interviewed, regardless of their level of knowledge of EMIS/SMPP, had no doubt that EMIS/SMPP was handled by the EPRD. This was either directly or indirectly mentioned during the interviews.

Through the interviews it seemed obvious that what the decision-makers knew about EMIS/SMPP was influenced by comments of colleagues as much as by any exposure to its use. This was made particularly clear especially for those who admitted that they did not know, or had no idea of what EMIS/SMPP was, what it did or how the system worked:

EMIS, I know very little and maybe the little bit I know is too little for you to comprehend. It is a management information system managed by one of the divisions. I knew very little through the few meetings I attended representing my Division. We are not involved directly and I do not know very much.

(DS7)

Three interviewees regarded EMIS/SMPP as a new innovation in its implementation stage, whereby EPRD was still in the process of strengthening and perfecting the system and they believed that it had a long way to go for it to be a stable and perfect information system. They, too, were well aware of the weaknesses of the system, and believed that there were a lot of questions to be asked about the integrity of the information it contained.

Three of the top decision-makers pointed out that the idea of developing EMIS/SMPP was with the intention of integrating all databases in the MMOE, but until now, that has not taken place. One of the division directors perceived that EMIS/SMPP's conceptualisation was not comprehensive during the initiation stage, and that this led to the less effective use of the system:

...EPRD has to depend on us for data on private education, meaning that data in EMIS/SMPP is not comprehensive. It has not included all educational data in its planning concept.

(SM4)

Only one out of all the decision-makers interviewed knew that EMIS/SMPP data was presently updated every month.

Summary

The degree of the decision-makers' knowledge depends on how involved they were with the system, either at the ministry or state level. Those who had little knowledge about EMIS/*SMPP* claimed that they learned about it during the meetings they attended while those who knew a lot about the system were either in the EMIS/*SMPP* technical committee or were involved during its implementation at state level. Other decision-makers who did not have any idea of what EMIS/*SMPP* was about said that they had very little or no exposure at all to the system. Due to its very limited publicity most decision-makers seemed to be very sceptical about its capabilities in providing input for decision making. And, furthermore, until now, EMIS/*SMPP* has still not been able to achieve its objective of integrating all databases in the ministry, which had become one of the main issues in the MMOE where IT was concerned.

The knowledge of EMIS/*SMPP* among decision-makers in the MMOE ranges from very little knowledge to advanced knowledge about the system. The number of decision-makers, according to their level of knowledge of EMIS/*SMPP* and their positions in the ministry is illustrated in Table 4.1.

Table 4.1: Knowledge of EMIS/*SMPP* among decision-makers in the MMOE

Knowledge of EMIS	MMOE top Management	Division Directors	SED Directors
Basic or very little knowledge	6	8	1
More or advanced knowledge	2	3	4

Top management and division directors were significantly more likely to say that they did not know about EMIS. (Fisher test $p < .05$ 1-tailed)

4.2 Use of EMIS/SMPP

It is evident from all those decision-makers interviewed that they had never directly used the EMIS/SMPP database to retrieve data or information in their daily work or in the process of making decisions. The information gathered in this section provided answers to research question i) of this study (see section 1.6).

The decision-makers ignored EMIS/SMPP data because they felt that the data was neither current nor timely. Indeed, they saw it as inaccurate, with little applicability in terms of administrative purposes, and with little informative value in daily operations. They strongly felt that EMIS/SMPP could not inform decision making. Some had the opinion that EMIS/SMPP data could be used only for trend analysis. There were obviously mixed perceptions as to the acceptance of EMIS/SMPP within the entire education system. Managers at the MMOE considered that EMIS/SMPP was useful at SED level, while those at the SEDs thought that it was very well accepted and more useful to decision-makers at the ministry and for school administrators. Schools, on the other hand, had the impression that EMIS/SMPP was developed mainly to fulfil the needs of decision-makers at the ministry level. Although there were several decision-makers who agreed that EMIS/SMPP could provide them with data and information required for the decision making process, others totally denied its capability. It was, indeed, surprising to learn that some of those who dismissed the capability of the system neither had any idea of what EMIS/SMPP was, nor how it worked. Their judgement with regard to the system was based on pieces of information gathered during meetings with other division heads and the MMOE top management.

Ten of the interviewees at the ministry level, and five from the SED, indirectly used EMIS/SMPP data in making decisions, either by making requests for particular data or information directly to the EPRD or through the Information Officers at Information Centre in SEDs, or the schools:

Not at my level but at the PSU (Assistant Secretary) level what they do is to match information about teachers before they go for study leave

and this is done by merging and matching our data with EMIS/SMPP data.

(DS1)

One of the interviewees claimed that he had to rely on EMIS/SMPP because the division he was leading neither collected, nor kept any form of, data on schools, whilst he required information on class enrolment to enable him to make decisions at his division level. He saw EMIS/SMPP database as a source in providing data for decision making:

We don't have the statistics or a database, and that means we depend on other divisions to provide us the information. We get the class enrolment for example from EMIS/SMPP. Up until today there's no problem, we get all the information that we require.

(DS4)

Another decision-maker used EMIS/SMPP data to crosscheck data provided by schools, and considered EMIS/SMPP as the benchmark. Besides this, other decision-makers using EMIS/SMPP data to prepare budgets for staff emolument, as well as for development and financial consideration.

When I need the details too and I would make reference to the divisions.... Then something like development and financial consideration, then EMIS/SMPP could provide the data.

(SM2)

Three of the interviewees admitted that they had never used EMIS/SMPP data because their divisions dealt directly with other divisions and institutions, which provided input for their decision making:

I get data on staff monthly, because it's stored here in the administration department. The other data we normally get them from the polytechnics and vocational schools...

(DS6)

Those who went to the UK, the Scholarship Division do have it...If I want data from the Examination Syndicate. I go to the Examination Syndicate and I still get what I want...

(DS10)

It was claimed by four interviewees that EMIS/SMPP was not meant for the MMOE but was designed specifically for the EPRD to cater for planning needs:

There's a thought, whether it just serves EPRD or also for other people. Is there interaction across boundaries or is it just within? So, EMIS/SMPP is not for the MOE but for specific purpose.... EMIS/SMPP is good for EPRD purpose to collect data for planning.

(SM1)

There also seemed to be diverse opinion about the use of EMIS/SMPP at school level, where one said that it was a good system to use in schools while another opposed the idea saying that schools were not using the system at all.

When I was in Penang one principal told us that they're not using EMIS/SMPP. They've developed their own application to collect data because what they developed satisfies their needs... They're not using the data EPRD is collecting. They have a different application because that application helps them in their school administration...but this means that EMIS/SMPP is not usable at school level. I can say that EMIS/SMPP is of no help to schools' administration. ...The other reason why they don't use EMIS/SMPP is because EMIS/SMPP data cannot be applied for administrative purposes.

(DS11)

Summary

- no interviewee had directly used the system;
- ten interviewees used EMIS/SMPP data for decision making;
- reasons for using EMIS/SMPP data:
 - the division neither collected nor kept school data;
 - to crosscheck data provided by schools;
- three interviewees did not refer to the database because the required data were obtained directly from the particular divisions or institutions;
- four decision-makers felt that EMIS/SMPP data are exclusively for the use of the EPRD for planning purposes.

The responses described in this section reflected both the decision-makers' experience in using the system or making use of the data obtained from the system and their opinions about the usage of EMIS/SMPP.

4.3 Evaluation of EMIS/SMPP

The evaluation of EMIS/SMPP extends to identifying current and emerging critical educational policy and development issues based on inputs from those decision-makers interviewed. It also involved an exploration of organisational issues, whether strengths or concerns, which were considered to be of particular relevance to the developing and implementing EMIS/SMPP. In evaluating the system, the decision-makers identified the shortcomings of EMIS/SMPP, its constraints during the introductory phase and its implementation. They too identified the problems of updating EMIS/SMPP data, the issues of data reliability, accuracy and timeliness, the training of personnel handling/managing the system at all levels and the commitment of top management at the ministry and SED levels. The decision-makers' perspectives in this section provided answer to the research questions i), ii) and iii)a of this study (see section 1.6).

4.3.1 The value of EMIS/SMPP

The decision-makers' views on the effectiveness of the system ranged from valuable to not valuable as illustrated in Table 4.3.1 below:

Table 4.3.1: Decision-makers' views of the effectiveness of EMIS/SMPP

Value of EMIS/SMPP	Top management	Division heads	SED Directors
Valuable		2	1
Of limited value	3	6	4
Not valuable	5	3	

EMIS/SMPP was valuable to three decision-makers who made use of EMIS/SMPP data as input for decisions they make. These decision-makers could obtain the data they needed from the database, for example, information relating to students' enrolment for projection of teachers, inputs for trend analysis, publication of Educational Statistics and world educational indicators. EMIS/SMPP data was, however, of limited value to ten decision-makers as one source of data in making decisions. For these, it could not provide comprehensive set of data for decision

making. Indeed, other data could have been obtained from other sources elsewhere. Although three interviewees did not refer to the database because they obtained the required data directly from respective institutions, they still felt that EMIS/SMPP was of a certain value to decision-makers. Eight decision-makers felt that EMIS/SMPP was not valuable, believing the system to be either unreliable (and therefore, never using its data as input for decision making) or that the system was meant to serve the EPRD, and hence could not serve their needs.

It was apparent from the responses of the three decision-makers at ministry level that EMIS/SMPP was an ineffective system, which was unable to serve the information needs of decision-makers because the data was not timely. Hence its reliability was open to question. There was felt to be a serious issue of updating, and this was unsuitable for planning or operations:

But I must frankly say that EMIS/SMPP is not effective, it's not able to service the decision-makers. That's the main reason why I don't ask for data from the system, even though I know it contains data about schools and personal teacher records.

(DS7)

There were five interviewees who had never used EMIS/SMPP data and only during meetings, commented that EMIS/SMPP was an ineffective system. They evaluated it as not being able to service decision-makers and as not meeting the stakeholders' expectation:

Then the data that's in there within EMIS/SMPP, how does it serve the ministry on the whole? ... EMIS/SMPP doesn't help in operations. It's not an information system that can help the organisation to function.

(SM1)

However, there were also some positive evaluations about the system made by several decision-makers interviewed. Two of them agreed that EMIS/SMPP data was satisfactory and could provide them with useful information for administrative purposes. They thought that it was a good system, which could provide data/information at various level and details for major and long-term educational

policies and decision making besides serving the purpose of trend analysis. One of the ministry's top management felt that EMIS/SMPP was able to provide very valuable school information:

Yes, yes. I thought EMIS/SMPP has given us very fruitful and substantial information with regard to school information...

(SM2)

Four other interviewees were confident with the system, having used EMIS/SMPP data regularly for administrative purposes, at least. One judged it as the best personnel management system and strongly felt that the database was useful for administrative purposes:

It is very well accepted at all levels, the schools, the districts and among units in the department. The Information Centre in this department has been showing efforts to improve the quality of data from time to time. I could see the response from schools is very encouraging indeed.

(SD1)

Four of them at the Ministry and SED levels felt that although the system was functioning at a very slow pace and said to be not up to the expectation of many decision-makers, EMIS/SMPP data managed to provide input for certain aspects of decision making at several divisions within the ministry. Two of these decision-makers claimed that they relied on EMIS/SMPP to make decisions and major policies at their levels:

The existing system is not reliable. In fact, when budgeting for staff, we use EPRD's projection figures, which of course they would use EMIS/SMPP data and its margin of error is about 10%.

(DS5)

EMIS/SMPP helps towards planning in the sense it provides information to make projection of new schools, teachers supply. Meaning that for personnel management and planning, I'd use EMIS/SMPP.

(SD3)

Nevertheless three decision-makers claimed that EMIS/*SMPP* was perceived to be more useful at the ministry level than at the SED level since the latter needed operational data for decision making.

Perhaps at the Ministry level but at SED level, I would say it's of little use because we still have to depend on operational data collected by sectors because the system is not up to date. The information stored in there doesn't suit my requirements and needs...I don't mean that it can't be used at all. It could be used for major policies all right but for operational purposes, very little information can be extracted from it. For operational decision making it's safer to use current data, as of today....

(SD4)

4.3.2 Poor quality of EMIS/*SMPP* data

The decision-makers highlighted factors that affected the quality of EMIS/*SMPP* data. The discussion on this issue covered the dimensions of:

- people's attitudes towards the implementation of EMIS/*SMPP*;
- people's awareness and sensitivity towards data;
- people's understanding of the system;
- scope of EMIS/*SMPP* data;
- interpretation of terms;
- insufficient basic facilities and infrastructure;
- the MMOE reaction towards school data;
- EMIS/*SMPP* business cycle;
- additional workload for data providers;
- organisational bureaucracy;
- organisation work nature.

From the perspective of the decision-makers, some of these factors such as that of insufficient basic facilities, the MMOE reaction towards school data and additional workload for data providers had a strong effect on the data updating process, and subsequently, affected the accuracy, timeliness and reliability of EMIS/*SMPP* data.

Twelve of the interviewees comprising both professionals and the administrators considered human attitude as the major challenge in EMIS/SMPP implementation. This included, among others, psychological resistance among users. People at all levels were not seen as providing full support, commitment and co-operation in implementing the system. There was also a lack of sense of responsibility, accountability and sensitivity to the needs of the top management for decision making on the part of data providers:

We lack support from top management and also from the central agency regarding the creation of posts of data officers at the SED, DEO and school level. What happens now is data officers at these levels are appointed administratively and they do not hold the substantive posts. We also lack support from school administrators...Some of the SED directors don't understand the objectives and functions of EMIS/SMPP and officers at DEO level don't seem to provide the support...

(DS9)

People's attitude, I mean whether he's a person who always does things at his best. There're people who just did some clicking and that's what they call updating without even checking whether the particular data needs alteration or not. What he did was to move the cursor from one field to another till the end of the application where the date is changed automatically to show that the data has been updated. That's the easiest thing for him to do and there are such people in schools.

(DS11)

Six decision-makers pointed out that the other likely reason for the poor quality of data, which was due to the lack of awareness and sensitivity towards the importance of data/information:

It's attitude. It's purely attitude, whether they're serious or not. To them, I mean the schools, maybe this collection of data is an administrative burden to the HMs and teachers because it is not their core business. They feel that it interrupts their teaching. But we have to convince them how important data is. Data helps them in improving the school system. So, I think the hiccup is purely a human factor. First they must know the importance of data, why we collect this data. There is always a psychological resistance. So this attitude is developed because of human factors.

(SM2)

Four decision-makers strongly felt that negative attitudes towards the system was due to a lack of understanding at grass roots level as to the functions of EMIS/SMPP and the importance of good quality data:

People come and go. The former officers might be very well versed with EMIS/SMPP but as the new ones take over the job I find that there's a problem in understanding the function of EMIS/SMPP... I notice that the HMs and principals are very encouraging in the sense that they make sure that the data are filled in but they lack understanding. So much so that they aren't able to utilise EMIS/SMPP data for their daily decision making.

(SD5)

As highlighted by one interviewee, the large amount of data collected by EPRD through EMIS/SMPP contributed to the problem of data timeliness as it took longer to verify the data and hence affected the data accuracy. On the contrary, four decision-makers felt that the scope of EMIS/SMPP data was limited in nature and thus, that the system was not sufficiently comprehensive to serve the needs of all divisions:

If you talk about information, there's a lot more coming in from other departments or divisions ... What EPRD is getting from the ground is limited in nature....

(DS8)

It was evident from the interviews that there were several reasons that led to the problem of data reliability. One of them, as mentioned by four interviewees, was the different interpretation of terms used by different personnel handling the database at different levels. It was claimed that there was disagreement between the interpretation of teachers' options for instance, used by the system developers and users particularly at grass roots level:

EPRD has its own information system called EMIS/SMPP. But this information is based on its own format, its own perceived format, which is not necessarily the kind of format perceived by the people operating on the operating ground. Let's take for example the case of defining the specialisation of teachers. The EPRD would think that teachers are made to teach the subjects that are not really their specialisation. EPRD has decided that if a teacher were to teach a particular subject over five years continuously then they would consider that to be their

specialisation. But in terms of planning for needs of teachers the School Division would say that what they're concerned about is not what happens five years later. What they are very concerned about is what is the specialisation that particular teacher is teaching today because of the vacancy in school. So, to send teacher to school then, we need information for that particular time. If schools say they're short of two English teachers the school would mean that they're short of two English teachers capable of teaching English. They're not saying that they're short of two teachers who're specialised in English. So, that is where the interpretation comes. Interpretation becomes very different. When you then plan for English teachers for the next ten years you'll find that the data is inaccurate.

(SM8)

As pointed by five interviewees such attitudes among those involved in implementing EMIS/SMPP raised a serious issue of updating, which subsequently had great effect on the quality of data produced:

That shows the concern that the accuracy of data doesn't exist among stakeholders in schools...Updating seems to be a weakness in our existing systems...

(SD2)

However, one of the interviewees pointed out that data updating posed problems only at the first time in using the application where all the data had to be keyed in:

Updating is not a problem. We've mentioned to the schools that the hardest part is the first time when we use the application where we have to key in all the data for the first time. The rest of the times will be updating of data, wherever necessary and that's definitely not the entire application. So that's trust, it's one's attitude. If he's an honest, accountable and responsible person we'll get reliable data. Otherwise we get last month's data and that defeats the purpose of updating.

(DS11)

Two interviewees mentioned that there were Data Teachers in several schools who updated school data at the DEO, either because there was no computer available in their schools or the school was without electricity supply. It was obvious that such a practice consumed a lot of time. Consequently the particular DEOs were often behind time in sending district level data to the SED and then from SED to the EPRD. As a result the production of timely educational data at ministry level was

also affected. At the same time, it was also highlighted that some schools are not supplied with computers:

Our schools have computers and I was told by the teachers and SED officers that sometimes they don't use the provided computer line for computers but for the telephone instead. The picture here is the requirement for infrastructure is not met.

(SM1)

... there're constraints and problems that haven't been addressed seriously. Like the provision of hardware and also the basic physical facilities in schools, I mean the infra structure. They should be looked into first and very seriously if we want any system to work effectively.

(SD5)

Four decision-makers identified factors such as the malfunctioning of the system supplied to schools and inadequate provision of basic facilities that often discourage data providers from updating data. This led to the problem of data timeliness:

Number one is the software used. What I discovered from schools, when I visit them, is sometimes the software or rather the application provided cannot function properly. I understand EPRD is in the process of upgrading and improving the application. Perhaps it'll take some time before the application is stabilised and error free...

(SD1)

One interviewee pointed out that poor updating of EMIS/SMPP data in schools was partly because the schools felt that data submitted was insignificant for the MMOE decision-makers. There was no immediate action taken to overcome problems faced by the schools.

Schools are sometimes fed up especially when they badly need a particular subject teacher and the ministry takes a very long time to send one whereas they've been sending signals through the data they gave, trying to tell that they lack teachers for that particular subject. And yet nothing happens. If immediate action were taken as soon as schools send in their information then probably schools would be more responsive and serious in what they send to us.

(SD2)

Four decision-makers felt that the business cycle of EMIS/SMPP i.e. from collecting, editing, verifying to disseminating involved a lot of people and levels. Thus it took quite a long time for one complete EMIS/SMPP process before the data was ready to use:

The problem of data timeliness could be due to the cycle, the business cycle to complete the assignment. From collecting, editing verifying, it takes time. Data management is really a tedious process. It's not a one-man show. It involves a lot of people and parties like the schools, DEOs and SEDs because our method is such. Our method of collecting is through those stages... The root of the problem is we're not able to supply the information as required and our problem for not being able to do that because data comes from the source, the schools. Even if other divisions wish to collect data from schools, they too have to go through the same process. Data isn't complete when even one school doesn't send in. We can still manage but the fact is it's still not complete.

(DS11)

By not having an online system the process of updating at school, DEO and SED levels had to be done manually through the application provided. This meant extra workload for data teachers and DEO officers who were already burdened with teaching loads and other administrative responsibilities:

On the other hand the DEO level have the impression that they're given extra workload with EMIS/SMPP data collection.

(SD4)

We want teachers to teach and at the same time we also want them to do this and that and to a teacher who's not trained, collecting data is additional workload.

(SM5)

As mentioned by two of the interviewees, another factor affecting the updating process of EMIS/SMPP data was the frequent movement of teachers and personnel at all levels in the education system. One of the two claimed that due to bureaucratic regulations, it was sometimes quite difficult for data managers to trace these movements and update the database:

...it is not only the application or the system. Data updating is interrelated with the other non-computerised systems. For instance, a

teacher is sent to a particular school, transferred from one school to another, maybe accommodation and address of new teachers may look small and mundane but because of the accommodation problem in the states of Sabah and Sarawak, these may affect the completeness of teachers' records. What I'm trying to say, we didn't anticipate this problem, the system has been designed so beautifully but when you're at school to update a lot of other problems arise. If I'm not mistaken at school level, the data must be keyed in and should be updated automatically and should be on-line with other levels. But the problem is, the information like the transfer document will take some time to prepare and issue and the teacher will take up the position earlier than the official directive. Well, there're so many factors for example the frequency of transfer...All in all what I'm trying to say is updating is the major problem... You're talking about promotion of teachers, you want to find out so that you may like to upgrade the profession of teachers. But you find it so difficult to get the information, possibly you don't have such information, so sorry. But, basically these are the information detail parts that need to be analysed. The schools can't upgrade the salary because the salary is not even updated in the record of service and the record of service is located at the state level. So, how is updating to be done in schools? These things, as far as I know are some of the reasons why schools aren't able to update information in the system.

(SM6)

One of the decision-makers pointed out that interdepartmental problem at the ministry level had also resulted in resistance to the use of EMIS/SMPP data among the decision-makers. Some divisions were reluctant to share their data with others. Hence they turned to grass roots level for the data/information they required.

4.3.3 Low utilisation of EMIS/SMPP data

In relation to the use of EMIS/SMPP data the decision-makers felt that EMIS/SMPP data was poorly utilised among users at all levels. This was due to factors such as the following:

- data could not fulfil their daily needs;
- absence of electronic online system;
- absence of in-built data analysis in the system;
- poor data quality - out-of-date, unreliable, inaccurate and often not consistent with what was on the ground;

- users impression that the system was developed only to serve the decision-makers at the ministry;
- lack of marketing and publicity on the functions of the system;
- lack of training and exposure to the system particularly for the decision-makers.

It was revealed by five of the decision-makers interviewed that most people at grass roots level were reluctant to use the system because the data could not fulfil their daily needs:

They could just get the information from the teachers themselves and there's no point referring to EMIS/SMPP because what's in there may also be out dated. So, to them EMIS/SMPP is just for the ministry... For example for the purpose of promotion, SED will send forms to schools to get names of teachers eligible for promotion. For this purpose the HMs or principals are very committed. They'd check the data, have it signed and be accountable to the information provided. According to them if they make mistakes in providing information for EMIS/SMPP, no action will be taken against them. There's no repercussion on them. But if there's error filled in the forms sent by SEDs, teachers will question and retaliate.

(DS11)

According to six of the interviewees, the absence of an online system where the required information could be retrieved at a press of a button was one of the reasons for decision-makers not getting timely and current data:

Unless we can develop an efficient network linking the schools to the districts, to the SEDs and to the ministry. Today the process is the schools pass on the information to the districts then districts will forward to the SED and that causes the delay. But feeding information from schools direct to the centre, we're not able to do that yet.

(SM2)

However, one of the top decision-makers made it clear that the presence of electronic online system throughout education system was a far-fetched ambition. He considered that the geographical factors of distance and communication accessibility of some schools would slow down the process of achieving such objectives.

The other reason why EMIS/SMPP data was considered unreliable as mentioned by one of the decision-makers was due to the absence of data analysis in the system:

I don't know whether any analysis has been done about the rate of increase in the number of schools. I think that kind of analysis is good as an indicator of how much we're spending on school development every year, how much are we spending on every child in school and compare it to the rate of increase in population. That kind of analysis is important and I think it is not provided by the system. I don't know whether EMIS/SMPP is just supplying data they're managing but somebody has to do some kind of analysis. I don't know if trend analysis is there in EMIS/SMPP.

(DS10)

Eight interviewees highlighted the issue of poor data quality. They claimed that the reliability of EMIS/SMPP data was often questionable and disputable among the decision-makers:

I wouldn't say that EMIS/SMPP couldn't deliver the information altogether. Maybe the constraints you're referring to can be termed as short-comings in EMIS/SMPP data, then yes, there are. It often differs from other sources therefore its reliability is the number one shortcoming. I know updating is very difficult at school level, very slow. So what I can say is EMIS/SMPP data may be a bit outdated for planning purposes. Basically that's why the information from EMIS/SMPP I believe you can't have confidence in especially for a huge organisation like the MOE with more than 14 divisions with different systems. We find that EMIS/SMPP data are often contradicting data provided by other divisions.

(SM6)

EMIS/SMPP is a fine system but it should be able to facilitate in providing data for decision making. However sometimes it doesn't happen that way, in the sense that it's not able to provide current data. As we know EMIS/SMPP data is census data therefore it is almost always a little behind. At my level I need very current data, if possible data as of today in order for me to make operational decisions...If it could be made operational then EMIS/SMPP data would have been very useful to us. For example, meetings with the politicians at state level or the local council, we can't possibly present data or information which is 4 to 6 months old because those are development meetings.

(SD1)

Three of the interviewees had the impression that new directors at the ministry level did not have any idea what EMIS/SMPP was about because it lacked publicity and marketing:

They too should be able to sell the system...I personally think that new directors do not have any idea what EMIS/SMPP is about. And I would say that the message on the implementation of EMIS/SMPP has been forgotten.

(DS10)

Two interviewees evaluated the system from the training aspect. They brought up the issue of lack of training for data and system managers particularly at school level:

Training. What I mean is the use of information is not included in the training of HMs and Principals. It should be a component by itself where the new HMs and Principals are shown how they can utilise EMIS/SMPP or whatever database they have in schools to improve the school performance, administratively or academically. We had inexperienced trainers during the course we attended at IAB and they didn't help much.

(SD5)

On the other hand, one of the division heads acknowledged the EPRD efforts in providing exposure of EMIS/SMPP to the users:

Training is getting much better now...I know EMIS/SMPP conducts courses every now and then for those down the line and that's a good attempt in making sure that the system works and the people know exactly how it works.

(DS5)

4.3.4 Why EMIS/SMPP is not able to provide input for decision making

In this sub-section the decision-makers made it clear why they felt EMIS/SMPP was not able to provide input for decision making. The reasons were:

- system developers' inability to capture decision-makers' needs;
- change in decision-makers' needs;
- absence of data/system manager;
- unimplemented policies and directives.

One of the interviewees regarded the inability of system developers to identify and capture users' needs as the main problem in the effective functioning of EMIS/SMPP in the MMOE:

The thing is, sometimes we don't see what their needs are or maybe even if we see them, it's not for us to provide. ...we have to provide them including the operational data. It is a very high expectation indeed.

(DS11)

Two of the interviewees gave entirely different reasons as to why EMIS/SMPP was unable to fulfil the needs of decision-makers. One of them felt that the decision-makers were more inclined towards the use of operational rather than census data even for planning purposes, which conflicted with the function of the EPRD i.e. to provide input, which used to be census data, for decision making for planning purposes. The other believed that the decision-makers did not know what kind of data they actually needed for decision making:

What the system was developed for is a little historical. There was a time when EMIS/SMPP was meant for planning and not for operations. But now things seem to have changed. We've also got to serve for professional aspects meaning day to day administration. If it's for planning, data that we have 3 months ago is usable. Like the BS, for their operational purposes they need data as of the day, the most up to date data. Now, they turn to EPRD asking for the data, of course we don't have it. So, they start collecting. For planning purposes, we need census data so have to go to the source to get it. We don't have to collect every month. We can just collect 3 times a year, we verify, we analyse, that's for planning purposes such as the 8th. Malaysian Plan and budget allocation. But for operational purposes definitely our data is outdated. So, people start grumbling that EPRD doesn't provide up to date data. The Minister too asks for current data now whereas I feel that he should be looking for data meant for planning because he doesn't deal with day to day business. Due to political pressures perhaps, I guess, he too has been asking for the most current data. So, when we say we only have data valid 3 or 4 months ago, he suggested that we collect every month and while we're collecting every month, there's another suggestion that we go on line meaning updating data everyday, perhaps.

(DS11)

The absence of a full-time database or system manager at all levels was another identified issue in implementing EMIS/SMPP, as raised by one of the top management:

...you need to have continuity of people handling it. The problem with the SED level, when the Head of Department or unit is transferred, the one in-charge of service, on promotion or whatever, then a new person comes and then we have to train.

(SM7)

Two of the interviewees felt that unimplemented directives were the root of the problem of not updated data. The directive saying that teachers on transfer to another school had to bring a diskette containing personal data/information to the new school was not observed by school administrators and teachers:

I personally feel that translation of policy should be looked into more seriously. At our level we'd like to see policies being implemented successfully though there bound to be a lot of other problems we have to face in implementing those policies.

(SD2)

4.3.5 Other factors affecting the development of EMIS/SMPP

Besides the factors mentioned above, the decision-makers felt there were other factors affecting the development of the EMIS/SMPP which led to the ineffective functioning of the system. These factors were EMIS/SMPP's slow development from the time it was introduced, the fact that the initial conceptualisation of the system was not comprehensive, the very high expectations with regard to the users on the system and the inability of users to acknowledge the weaknesses and pitfalls of the system.

Two of the interviewees strongly felt that the problem with EMIS/SMPP was its slow development from the time it was introduced, so much so that other aspects were given priority by the top management of the MMOE. It was also felt that people involved in the development of EMIS/SMPP were swayed away from the initial objectives of setting up EMIS/SMPP:

... I think the problem with EMIS/SMPP is that it's slow. They're keeping up with the development, in the rapid development of IT, being on-line and many other things...As I said the development of EMIS/SMPP is rather slow. In the end we can see that other things are being given priority. Will it be wrong if I say the people involved in EMIS/SMPP are swayed away from the initial objectives of setting up EMIS/SMPP? I don't know.

(DS10)

On a similar note, one interviewee observed that the message regarding the implementation of the system had been forgotten, whereby initially the proposal was to develop a comprehensive EMIS/SMPP and that it had a lot of support then. Three others believed that the conceptualisation of EMIS/SMPP was not comprehensive during the initial stage, and the implementation did not follow exactly what had been planned. These had, in consequence, led to the system failure in fulfilling the needs of decision-makers:

One of the decision-makers at the ministry level who used the data frequently was quite confident in the EMIS/SMPP data and claimed that its margin of error was only about 10%. Despite all the comments about EMIS/SMPP, it was said the fault was not in EMIS/SMPP but the very high expectation of the users. Since there was no other system available in the MMOE for them to depend on, it was expected that EMIS/SMPP could fulfil their data/information requirement perfectly:

And the fault is not in EMIS/SMPP itself... We expect a lot from EMIS/SMPP because we don't know other sources we could obtain the data we need.

(DS5)

EMIS/SMPP was seen as a starting point in ICT development within the MMOE by two of the interviewees, and it was suggested that developers and users alike might acknowledge the weaknesses and pitfalls of the system before it could become a more stable and effective system:

...But put it this way, if we don't start we can never start, we can never have EMIS/SMPP, so whether rightly or wrongly we have to start somewhere. And we improve as we go along. This is with regard to

ICT. If you don't like the idea it'll be with us. This is just a kind of revolution. Somehow we have to start.

(SM7)

Summary

Decision-makers at all levels were aware of the issues affecting the quality and the development of EMIS/SMPP. The issues are summarised in Table 4.3 as follows.

Table 4.3: Issues affecting the quality and the development of EMIS/SMPP

Issues	Dimensions
Accuracy of data	<ul style="list-style-type: none"> ▪ Attitudes of people at all levels ▪ Responsibility of data feeders ▪ Sensitivity towards the importance of data ▪ Scope of EMIS/SMPP data ▪ Interpretation of terms ▪ Insufficient basic facilities and infrastructure ▪ MMOE reaction towards school data ▪ EMIS/SMPP business cycle ▪ Additional workload for data providers ▪ Organisational bureaucracy ▪ Organisation work nature
Low utilisation of EMIS/SMPP	<ul style="list-style-type: none"> ▪ EMIS/SMPP inability to fulfil decision-makers needs ▪ Absence of electronic online system ▪ Absence of in-built data analysis in the system ▪ Poor data quality ▪ Users impression that the system was developed only to serve the decision-makers at the ministry ▪ Lack of marketing on the functions of the system ▪ Lack of training and exposure to the system particularly for the decision-makers

Issues	Dimensions
Inability of EMIS/SMPP to inform decision making	<ul style="list-style-type: none"> ▪ Inability to capture decision-makers' needs ▪ Change in decision-makers' needs ▪ Absence of database/system manager ▪ Unimplemented policies and directives
Development of EMIS/SMPP	<ul style="list-style-type: none"> ▪ EMIS/SMPP slow development ▪ Incomprehensive initial conceptualisation of the system ▪ Very high expectation of the users ▪ Users inability to acknowledged the weakness and pitfalls of the system

4.4 Suggestions to improve/strengthen EMIS/SMPP

The suggestions put forward by the interviewees touched on several aspects related to problems faced in implementing EMIS/SMPP, as discussed earlier, and respond to research question iii) of the study (see section 1.6). Their suggestions included ways of strengthening the functioning of the system at all levels in terms of:

- the improvement of data quality;
- updating processes;
- training;
- human attitudes;
- establishing an online system;
- support and commitment of management;
- provision of facilities;
- marketing of the system.

The decision-makers strongly felt that for EMIS/SMPP to work effectively there should be awareness of how the system could help in decision making at all levels. Suggestions as to how to improve and strengthen the functioning of EMIS/SMPP at all levels were made by decision-makers interviewed, regardless of whether they were familiar with the system or not. There was a high level of expectation among

the decision-makers to see EMIS/SMPP as *the* database within the MMOE, and that it worked effectively to fulfil the needs of all decision-makers. They also observed that there had been efforts both at SED and ministry levels to improve the functioning of EMIS/SMPP. In order to be accepted and used nation-wide, the interviewees agreed that the system had to meet the realistic expectations of its users.

4.4.1 Change of attitude

Decision-makers felt that there was a crucial need for all involved in the implementation of EMIS/SMPP, particularly the data feeders, to be positive about the change and be more responsible in doing their tasks. As regards the top management, the interviewees believed that they had to be truly committed and very supportive in achieving the objectives of the EMIS/SMPP project.

Six interviewees stressed the problem of dealing with human attitudes. They strongly felt that top management, and indeed all personnel, should be more committed and serious in their work, in order to see the effective function of the system. According to these interviewees, a successful EMIS/SMPP required the thoughtful integration of people, institutional arrangements, organisational entities, management initiatives, and operational procedures:

If all are aware of the importance of the task then there'll be no problem at any level and I can be sure that we'll get a good information flow in our education system. ... Whenever new HM or Senior Assistant comes to a particular school, the work flow changes. During this transition period sometimes procedures are not followed. So the others, I mean the other staff should make sure that the job is back on track.

(SD2)

Three interviewees strongly felt that the administrators at the grass roots level should be more responsible in ensuring that the system was used in schools and updating of data was done as directed. Personnel at all levels should have a positive attitude towards the system. It should not be assumed that the system was meant for the ministry purposes *per se*:

I personally feel that the enforcement should be at SED level because they are our main feeders...

(DS3)

One of the decision-makers commented that the commitment, awareness and support of educationists and administrators within the ministry were essential. Without their full support and co-operation the system would not function successfully as planned. One further interviewee suggested that it was of the utmost importance that all division heads in the MMOE, particularly the EPRD and School Division, should resolve differences concerning data.

One member of the top management within the ministry stressed that the steering committee dealing with information and computerisation of the MMOE (JMPK) should be headed by a member of the top management of the MMOE who was really committed and responsible. He too argued that the Director General or the Secretary General should remain committed to the setting up of the information system and seeing it through:

So, the KPPM himself and the Secretary General himself must be the head and be committed. As in other divisions or organisations, whenever it comes to management information system, it's always placed in the office of the top management. MIS is always in the office of the top management and part of the corporate planning efforts of a particular organisation and that corporate planning effort, although headed by corporate planner officer, will have the CEO during the actual co-ordination. Then it'll work. Without that involvement it would not work. And to get that CEO committed, it must also be a person who is conscious about planning needs. It must be a person who is aware that planning is very important for the Ministry.

(SM8)

4.4.2 Sensitivity towards the importance of data

The decision-makers highlighted the need for all, in particular people at the grass roots level, to increase their sensitivity towards data accuracy. They felt that this was important as the management relied on this data in making decisions.

Five decision-makers claimed that there was less sensitivity towards the importance of information, particularly at the grass roots level. An effort should then be made to

instil the awareness and sensitivity towards the importance of information, increase the sense of accountability in verifying the data and to use appropriate data/information in daily work:

Well, I'm talking about those at school level now. If they're able to make use of the information they supply to EPRD, I'm sure they'll take great pains in seeing EMIS/SMPP database updated. Yes, I guess they just don't know how EMIS/SMPP database can be useful to them for their administrative purposes. I'm not saying all schools but most of them aren't utilising the database...

(SD1)

One of the interviewees also suggested that the grass roots level should be encouraged and guided so that they began using data in their management and decision making.

4.4.3 Implementation of procedures

The interviewees claimed that the weakness of the system's implementation was partly due to the ineffective implementation of directives. Hence, there were suggestions that management at all levels should monitor directives pertaining to the implementation of EMIS/SMPP were be adhered to. In so doing, they strongly believed that the problem of data management would eventually be addressed.

In order for schools to provide reliable data, five decision-makers proposed that there should be profound improvement and strengthening of procedures at school level. Instead of the data teacher or school clerk doing the updating of data, two interviewees suggested that the school administrators or at the least the Senior Assistants took the responsibility to perform the task. They felt that the latter would be more sensitive to the accuracy of data of the school under their management and this practice would consequently improve the data quality from schools.

As asserted by one interviewee it was important for school administrators to do away with the practice of passing down the task of keying in data to people at the lower level, to ensure that the impact of the work was not diluted:

Some just don't see the relationship and the next level which receives the information should do some checking, a counter check maybe with last year's data. If they treat statistics as just part and parcel of the job then things just won't change for the better. ... The process of passing down the job should be eradicated. Everyone should be aware of the significance of the job at all levels and what's lacking is the sense of accountability in the whole process. That's the weakness of our information system at the moment.

(SD2)

Three interviewees hinted that the directive, whereby teachers had to bring along with them diskette(s) containing their data/information to new schools they were transferred to, required discipline and practice. It was indicated that should such a directive be adhered to seriously and strictly, then schools would not face data updating problems at all. According to them, it was important to get everyone to cooperate and commit to the project. In so doing, the clerks and data teachers would be alert all the time to the need to keep their databases up-to-date.

4.4.4 Evaluation and monitoring of system

The decision-makers felt that constant evaluation of the system was one of the measures that should be taken seriously in order to make sure that it fulfilled the needs of users. They also thought that the system developers should regularly re-examine the data collection and verification procedures. At the same time, they should always monitor if the machines and system applications supplied to schools were functioning.

This was highlighted by four decision-makers. They agreed that upgrading, updating and improving the system was necessary as today's technology changed very fast. In so doing, the problem of system incompatibility would not emerge at any level. Besides that the system developers too should be sensitive to the needs of users as well as the top management and be proactive where data was concerned. The people handling EMIS/SMPP should be those who know what EMIS/SMPP entails and be one step ahead of anybody in terms of IT. They have to be more analytical and be able to provide warning systems using the data and information in EMIS/SMPP:

The developers of the system shouldn't feel complacent with performance of the present system. They should always be alert for changes in technology, the needs of users and be proactive so that the system would function more effectively and could provide quality data for decision-makers. The only thing is constant evaluation of the system... There're hiccups here and there but I think they're doing all right. All that need to be done is for EPRD to review the system and adapt it to the needs of users in the entire education system.

(DS4)

The culture of wanting the system is there but the culture of using them isn't there. But it's tied to the system. How appealing is the system? How user friendly is the system? Is there a help desk provided in the system? If the system doesn't have that then probably people won't use it.

(SM1)

Five interviewees pointed out that the ministry should look into the aspect of monitoring and maintaining software and hardware in schools as frequently as possible, since school budgets for maintenance are very limited. In so doing no failing machine in schools was left unattended. Three of the interviewees perceived that it was crucial for system developers to have a post-mortem on the achievements and failures of the system and at the same time, acknowledge its weaknesses and improve on it:

Once we've started we have to improve. We should remain constant. We shouldn't be afraid to acknowledge the weaknesses, the pitfalls of the system, so all right we bridge the holes, the gaps. Of course in any system there tend to be failures but we have to try to make it perfect but if you don't start you'll never get started.

(SM7)

According to two interviewees, the keying in mechanism definitely needs improvement. Currently it is done manually and took some time especially for A-grade schools to complete the task. Based on their experiences as school principals, two interviewees indicated that for the EMIS/SMPP to function effectively, the ministry had to be firm about the updating of data from the moment the system was introduced in schools nation wide.

They also stated that it should be mandatory that verification be done at every level. The DEO, SED and EPRD alike should play the role of identifying errors and telling the schools the right approach and the right way to handle the system. If it has to be done, the former has to keep reminding data providers to update data in the system accordingly:

Verification of data should be carried out at every level. ...Give particular attention to the grass roots level. What we shouldn't do is to complain and point our fingers at data providers. Identify the errors and tell them the right thing and the right way to do it. Don't just retrieve and feel suspicious about the data. Always get back to the root.
(SD2)

Four interviewees suggested that the EPRD had to merge data collection of all divisions in order to get up-to-date data and also to lessen the burden of schools:

When we want to improve the information or data collection it has to be from schools and schools will pass them to the DEOs. From there the data is sent to SEDs and SEDs to headquarters. We have in fact asked EPRD to try merge the data collection so that we get up to date data, not based on the last 3 or 4 months. So, they're looking into that. They say that it's possible, so that'll be good....

(SM5)

It was also recommended that it would be better if EPRD could keep collection systems as simple as possible so that it would not take too long for them to verify the data.

4.4.5 System manuals and interpretation of terms

The interviewees proposed that the system developers should make sure there were system manuals available and updated whenever necessary. They also felt that it was pertinent for the system developers to standardise the interpretation of terms used in EMIS/SMPP with other system such as the SMS, in order to avoid confusion among users and inconsistency of information.

Two interviewees suggested that precise manuals on the working of the system should be produced for users at all levels. These manuals would serve as guidelines both to the users and system managers at any level:

What's absent at the moment is the user manual. The Ministry should think about producing manuals for EMIS/SMPP so that new comers would be able to handle and use the system more efficiently and of course manuals help in ensuring the smooth functioning of any system developed whereby all users have the same way of handling and operating the system.

(SD5)

Of equal importance was the need for the system to have standard, clear definitions of terms used. Four interviewees highlighted the problem of misinterpretation among users, especially at grass roots level. They were certain that the availability of a standard interpretation of terms could overcome the issue of data reliability:

... deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter and then the information system will become useful or otherwise it would only be useful in accordance to the interpretation of that particular division. It may not be useful for overall planning for the Ministry.

(SM8)

4.4.6 Integrated system/comprehensive database

The decision-makers at all levels proposed that the EPRD should work towards developing a definitive database for the MMOE. The database would include all educational data and contain all information from other divisions as well as outside the ministry. They strongly felt that with the existence of an integrated system, the problem of data inconsistency could be overcome.

Seven decision-makers thought it was necessary for the EPRD to integrate all existing systems and databases within the MMOE, so that all divisions would be able to share the data retrieved from the database:

EMIS/SMPP should also include information about higher education, finance and training. The EPRD should be, I mean EMIS/SMPP is, the

source of all information. Thus, all information should be there. So far it only has school information, there should be proper application and I think it must stress that EMIS/SMPP should combine the information that other divisions have. ...Any information outside the MMOE, which is not ours but that kind of information is also useful to us, I think that information should feed into EMIS/SMPP. Say, about the amount spent on school development, it's there in our file but not on computer.

(DS10)

4.4.7 IS/IT/change manager

Although the issue of having a database/system manager was brought up by only one decision-maker, the others made suggestions that the MMOE seriously needed a manager of IT/IS/change to ensure that the implementation of EMIS/SMPP work through. They believed that there was no one capable of managing the change taking place in the ministry as a result of the introduction of IS in the MMOE.

According to three interviewees, having a good system did not guarantee that the data collected would be reliable, accurate and timely because what the system needed was qualified and committed people to make it work. There should be trained personnel at all levels to manage the system. The officer(s) in charge should not just be anybody, but someone who has the ability to exploit the capabilities of the computers, able to sell the system to stakeholders, make analysis of the data and provide warning system using data/information derived from the system.

Two of the interviewees suggested that DEO officers should play a more active role in taking care of information under their jurisdiction, by monitoring schools more frequently, and they too should be very creative and proactive in getting data/information ready at hand all times:

In terms of information system, DEOs in this state have upgraded their systems. DEOs should be taking care of all information in the district. For instance in FELDA where the population drops as it reaches its 16th. year onwards. Why is it so? This kind of information should be dealt with at DEOs level but instead we can see that it's done at higher level. Logically the DEOs are the nearest agency to these environments or happenings therefore it's easier for them to capture the true picture. In this state there're 35 FELDA schools which are under-utilised, not under enrolled. Therefore the DEOs can and should do their part in signalling to the top management the whole picture or trend in the

group. And this means that data officers in DEOs should be very creative and proactive.

(SD4)

Another decision-maker asserted that officers at the DEO or SED should update information in the system and make sure that data in the system is complete and accurate. For this to become a reality, two interviewees indicated that the SEDs should have EMIS/SMPP officers only to do the task on a full time basis:

But the daily routine, that needs serious instructions. The personnel must be instilled with awareness about the importance of information. That's why we need full time, well-trained personnel to manage.

(SM7)

4.4.8 Training of personnel

The training aspect, too, was seen as an essential factor in ensuring the continuity of a system. Although the decision-makers saw that EMIS/SMPP developers were continuously conducting training for people at the grass roots level, the decision-makers strongly felt that the managers at all levels should be given training for them to have a better understanding of the system.

Six decision-makers highlighted the issue of training, particularly with regard to how to utilise and analyse data from EMIS/SMPP. Three of the interviewees strongly felt that it was important that training be made into an on going activity because the turn over in the education system was very rapid. It was also suggested that the use of data/information and information system should be integrated into training sessions for school administrators:

The other might be the training part. Well, people come and go and so do these people handling the system. Although there is training conducted by EPRD I think that is insufficient. Of course EPRD has limited time and budgets and could only train certain number of people each year but it would be great if training could be made as an on-going activity. It would also be a good idea to involve the administrators like the HMs and the principals in the training so that they know what's in the system. In this way they'll see the importance of providing accurate data and how crucial data is for future education development. ...There're a lot of movements in the ministry, every now

and then, therefore everyone must be exposed to the working and use of EMIS/SMPP.

(SD1)

Besides this, it was also hinted that there was a need for the MMOE top management to provide personnel, professional or technicians, with incentives, skill, and knowledge in order to keep them committed to the work of managing the system:

Sometimes the problem is not the system. The manpower, we don't train the manpower. We don't give proper incentive, skill, knowledge and commitment. So, everybody should know his responsibility. That is very important.

(SM6)

4.4.9 EMIS/SMPP restructure

A suggestion was made by the interviewees that the EPRD should re-examine the structure of personnel involved in its implementation at all levels. There was a need for someone to monitor the data collection and verification process at every level and be responsible in supplying relevant data/information required by decision-makers.

Four interviewees proposed that there be full time personnel responsible for monitoring the functioning of the system. There was also a suggestion from one of the top management that there was probably a need for the MMOE to assign an officer/statistician responsible for statistics and data collection at SED level:

So one suggestion at this stage is at SED or DEO, we should have an officer or several officers whose function is updating not only for EMIS/SMPP but also for personnel, finance, development, and for schools. At the moment we have a few officers, professionals to be helping out with the updating job. Now we have to have a re-look at the structure. One officer who should exist is one who is responsible for statistics and data collection at the SED. He or she has a few officers to be operators. So there are officers assigned and dedicated to do data collection, statisticians for the ministry, and it's an officer with a few checklists, EMIS/SMPP, development, schools, personnel, private education, etc. Maybe one model is to have a statistician responsible for data collection at state level.

(SM3)

4.4.10 *Electronic online system*

The establishment of an online system where data could be sent electronically to and from all levels seemed to be the most preferred way of managing among the decision-makers interviewed. They envisioned that there could be direct transfer of information from schools to the EPRD once the electronic online system was developed.

Two of the decision-makers felt that there should already be a network linking schools to DEOs, SEDs and the ministry itself to enable decision-makers to access data from their offices:

I wish there already a developed system that can be used at all levels, online with us so that we can make electronic transfer of money, but again if they don't key in appropriate data, it still won't work.

(DS3)

One of the interviewees proposed that the EPRD should link with the Examination Syndicate in order to obtain the exact number of students throughout the country when the online system was ready. Another suggestion from three interviewees was for the EPRD to examine the possibility of an electronic data collection and updating so that data could be made valid at any one time. This would enable schools and SEDs to update data on monthly basis. Once the online system was made available, the EPRD could tap necessary information from other systems. Thus, it might no longer be necessary for the division to collect data from grass roots level:

...if possible EMIS/SMPP data should be made valid at any one time, always current and that means it has to be real time. But I suppose it's still a very long way to go to establish this kind of system and culture.

(SD3)

However, the idea of real time information in the education system was opposed by one of the top management, who instead suggested that there should be sharing of data in the ministry:

No planning agency in the world has real time information system. The only real time information is for stock exchange and banking. And they

have justification for it because people want real time information on their money and they're willing to pay for it. But no education system has real time information just to collect data. ... My advice was to utilise whatever existing facilities and network that we have, either you share or tap some of the information. They have to conceptualise how this has to be done. It's something that has to be worked out very professionally. In e-learning, the idea is there must be shared services more than exclusivity.

(SM3)

4.4.11 'Marketing' of EMIS/SMPP

In an effort to improve the effectiveness of EMIS/SMPP, the marketing and promotion of the system to all stakeholders should also be increased. It was suggested that the EPRD should promote the usage of EMIS/SMPP from time to time, so that decision-makers are aware of the relationship of the various variables in the system.

According to three decision-makers, marketing of the system would also help to improve its effectiveness, since in this way, users would be aware of its existence, functions and capabilities. Four of the decision-makers agreed that one way to market or promote the system proposed would be by calling for regular meetings or seminars to keep users and administrators in touch with the development of the system. Since the success of the system depends on the support of top management, it was deemed appropriate that from time to time there be a promotion of the system's usage, so that decision-makers could be more aware of the functions of the system:

EMIS/SMPP meetings and seminars or symposiums should also be held from time to time so that users and administrators won't be out of touch with the development and progress of EMIS/SMPP. First stakeholders should be able to understand the importance of having a complete database. By complete I mean valid, accurate and reliable data. In order to achieve this, there should be regular meetings or something like workshops or seminars held. All should be involved, from the top management in the MOE right down to the clerks in schools. Then perhaps everyone would realise how crucial information is in an organisation like the MOE.

(SD1)

4.4.12 System support

The interviewees agreed that an effective implementation of IS would not be achieved without sufficient system support in terms of material and human resources. The decision-makers felt that there was a crucial need for EMIS/SMPP developers to ensure that the basic needs of the users, particularly at the grass roots level such as the infrastructure, necessary materials and manpower, were met for the system to work effectively.

As mentioned by an interviewee, for all the above suggestions to work, the EPRD had to obtain co-operation from all quarters, from grass roots right up to top management in the MMOE. Above all, four interviewees seemed to agree to the fact that there should be enough financial allocation, hardware, software and trained staff to handle the system in order to improve the functioning of the system:

First we must have trained personnel, then we must have enough resources to go with. ... At the moment also we have some officers manning the information unit at the SEDs but in terms of service position they are not appointed as such. Basically they're teachers and in the eyes of certain sectors teachers must teach. They mustn't be involved in other aspects other than teaching. But we're looking into other areas - what else can teachers do to help update information. So EPRD is looking into that but I find that there'll be some problems there. It looks like we have to make clear to the top and then we have to have some trained personnel to do the job. This may be difficult but we've to do that otherwise our data will not be updated and then questionable.

(SM5)

The interviewees felt that the infrastructure at the DEOs and schools should be improved in the sense that they should be using lease line rather than dial up so that communication between levels would be more effective and at better speed too. Eight decision-makers stressed that the provision of basic facility, particularly electricity supply to schools, should be given priority, for without it, electronic online system would never become a reality and decision-makers would not be able to have current data for decision making. Support in terms of monitoring and maintaining

the hardware and system applications are also seen as crucial aspects in the implementation of EMIS/SMPP at grassroots levels:

In terms of facilities, it's quite sad to see that some schools until today still do not have computers yet. For example, the indigenous schools here in this state, none of them has got computers but the administrators are committed and they go to the DEO to key in. The travelling takes time and as the result data does not arrive on the target date. ...Again at this point I don't know how this problem can be solved. There're schools with computers but having software and hardware maintenance problems. Having computers in schools means we're also ready to maintain and monitor both the machines and the applications. There's no point in having a machine if it takes hours just to up-date a single data. This will naturally discourage the person managing the database. Maintenance could be costly for schools. It's not a problem for big schools in town areas but if that happens to small schools in remote areas, such computers will be left not repaired for a long, long time. So, how can data be updated? So, the ministry should look into the aspect of monitoring and maintenance of computers in schools. In this state key personnel at the DEO and SED take the initiative to repair and maintain the computers in schools. I always encourage them to do that so as to cut costs.

(SD1)

One of the top managers suggested that the EPRD should work its way through the steering committee on the development of information system. The Division should serve as the secretariat in the co-ordination and integration process rather than being the leading agency in the development of the system. As such, the Division could gain wider views on the system development and co-operation from other divisions and levels:

EPRD in the first place should spearhead the formation of steering committee on the development of information system. That steering committee must be headed by the top management of the Ministry who must be committed, who must see that it is his responsibility to co-ordinate the various divisions. Whenever there's a need for co-ordination and integration, and EPRD would serve more as the secretariat rather than to lead and to handle. Unless and until EPRD is given a status much higher than other divisions meaning that the head of EPRD would then be somebody equivalent to say TKPP but that also would not work because there're other TKPPs of the same level.

(SM8)

4.4.13 Needs assessment among system users

It was viewed by the decision-makers as necessary for the EPRD to conduct a needs assessment among the decision-makers to gauge their information needs before developing the system. In so doing, the system would contain the data required for decision making and hence it was able to better serve the decision-makers.

One interviewee proposed that the EPRD carry out a needs assessment among decision-makers at the beginning of each year so that the information required might be included in the system:

At the beginning of the year it should have been asked that we list down all the information that we need for decision making at our level, any of us. Because each of us have different types of information that we need. ...I thought EMIS/SMPP should conduct some kind of needs assessment so that our needs are fulfilled.

(DS10)

Summary

The suggestions proposed by interviewees are as follows:

- a) Top management should be committed at all levels.
- b) People should be sensitised towards the importance of data, particularly at grass roots level.
- c) The responsibility of updating and verifying data should be given to the Headmasters/Principals or the senior assistants of the schools.
- d) Frequent evaluation and monitoring the system should be carried out, especially at grass roots level.
- e) There should be availability of complete documentation, including system manuals and interpretation of terms used in the system in order to produce reliable data.
- f) EMIS/SMPP developers should be alert to changes in IT so that EMIS/SMPP could be updated and upgraded accordingly.
- g) There should be development of an integrated system to cover the entire education spectrum.

- h) The structure of EMIS/*SMPP* personnel should be reviewed, with a post created for a full time EMIS/*SMPP* database manager at all levels.
- i) Training should be made into a component in courses conducted for the Headmasters, Principals and other decision-makers at the MMOE training centre.
- j) An electronic online system should be set up so that EMIS/*SMPP* data could be processed and transmitted electronically from grass roots level to the MMOE.
- k) EMIS/*SMPP* marketing strategies should be improved, so that users have a better understanding of the functioning of EMIS/*SMPP*.
- l) There should be adequate system support in terms of material, financial and manpower at all levels, particularly in schools, for the system to function effectively.

4.5 Factors affecting the development of integrated system in the MMOE

The responses gathered in this and the following sections provide answers to the last research question (see section 1.6). As mentioned by all decision-makers interviewed, there are many issues that affect the development of an integrated system.

Such issues are:

- provision of hardware and infrastructure;
- upgrading of the system to capture more data for decision making;
- technological compatibility;
- on-line application;
- management attitudes as to the importance of information management;
- involvement, commitment and driving force from top management;
- the place of IS within the office of the top management;
- collaboration and co-operation among divisions;
- manpower;
- size of the organisation – the MMOE is the largest government agency in the country;
- organisation nature of high bureaucracy and compartmentalised system;

- wide range of data and information to cover the needs of all decision-makers;
- mind set of being protective over one's system;
- serious discussion on IS management among division heads;
- managers of technology to manage technology and change;
- documentation of the systems;

According to the decision-makers these issues have to be looked into seriously before an integrated system could be developed successfully in the MMOE.

All interviewees agreed that insufficient provision of hardware and infrastructure such as telecommunication system at all levels to support the system was one of the main reasons why an integrated system had not taken off up till today:

Third is the problem of application. This includes creativity and understanding. To accept change and to change the current working culture is not a simple thing. We could see computers in almost all organisations but the usage is still very limited.

(SD3)

According to eight of the interviewees, the requirement for infrastructure was not met, especially in schools and DEOs in very remote areas of the country where some were not even accessible by road. They also strongly felt that the system should be upgraded accordingly:

You want online system, fast and broad band but there's no basic facility. How could that be done? That's all related. It's good theoretically but I don't think we have good infrastructure for it, I mean Malaysian schools. Out of 9000 schools, only slightly more than 4000 have access to telephone line. So, how about the other half? So, online, the concept is good but then the supporting infrastructure has to be there too. If it's not there nothing could be done.

(SM1)

The main concern of one of the interviewees was that too many schools faced technological issues whereby the machines available were not compatible due to different type of configuration, system, software and hardware:

I'm taking it seriously but without depriving others of having their own computers. But you must first go to the central point to make sure there's no duplication of work, compatible to one another, otherwise we'll be wasting lots of money. I've gone round to see the schools and it's pitiful, I mean the state we're in now. There're new computers in schools but no software to use because the ones provided to schools by the ministry could only run on stand alone machines while they have net working computers. And we've spent hundred thousands there.

(SM1)

Five of the decision-makers felt that the issue of technology compatibility also existed in several divisions in the ministry since different machines were meant to support different systems with different configurations and objectives:

The problem with these isolated databases in the Ministry is they can't talk to each other and there's no way for us to share the information when that's the main purpose of having and using computers in any organisation.

(DS8)

Only one of the interviewees strongly felt that the main factor that held back the development of an integrated system was the absence of on-line application.

The development of Smart School Management System (SSMS) was a classic example of how the management felt about the importance of proper information management, as viewed by twelve of the decision-makers interviewed. However, it was indeed a disappointment to these decision-makers that in an effort to integrate the existing information systems at all levels there was a new system such as the SSMS, meant solely for the smart schools, and not linked either to other schools, DEO, SED or the ministry. Hence, now the Smart Schools had two systems, EMIS/SMPP and SSMS, to update:

The MMOE needs consolidation of databases. Almost every division and school is developing its own database and they are all developed in isolation. Now, we have the smart schools programme with its own system, the SSMS, which is not on the same platform as any of the existing systems in the ministry.

(SM8)

The lack of involvement, commitment and driving force from top management, both the administrators and professionals, was seen as one of the most crucial factors in the successful development of an integrated information system. Without the total support, involvement and the willingness of top management to invest their time in the whole process, it was assured that the system would not work. They were aware that the development of an integrated system involved a lot of work and in a bureaucratic system like the MMOE, the directives have got to come from the top before the job was done. There also have to be total commitment from all the people involved in the working of the system, to update and verify the data as well as to manage and maintain the system. This issue was raised by nineteen of the decision-makers interviewed:

I think apart from me saying that we aren't having an integrated system we're also having difficulties in trying to arrive at an integrated system. We must agree to a common format, in terms of certain words and more so is there has to be a driving force behind wanting to have a complete information system and that driving force must come from the top management. And I think there's a lack of that kind of commitment to have the information system that is useful. ...They sit down and spend hours trying to decide on information system. Unless the top management themselves committed to do it nobody would subscribe to it. I think it would be difficult to get an information system that would become stable and that would be useful. I'm talking about the head, the Secretary General of MOE, the commitment is really not there to get an integrated information system...

(SM8)

It was pointed out that the information system should have been placed in the office of the top management of the ministry and not in any one of the divisions in the MMOE. It was also commented by one of the top decision-makers that the key person concerned had not been getting himself seriously involved as the head of steering committee and was not able to co-ordinate the sections or divisions under his jurisdiction. The planning of integrated system and comprehensive database was entrusted to the EPRD, which was not superior to other divisions. Thus, it was tough for the division to co-ordinate systems in different places:

I think there's a feeling in the ministry that the planning has been entrusted to one division that is the EPRD and therefore they should do the planning. That is true. But without the backing and commitment

from the top management then EPRD themselves will find it difficult in integrating all systems from other divisions because EPRD is not superior to the others. And so there would be some amount of very relaxed attitudes from the other divisions. Whenever request is made for certain data or format very often we find that there's delay. So, over time probably EPRD also said that they themselves should be relaxed about it.

When I say top management I mean there are several MMOE top managers who don't get involved as the head of the steering committee, to co-ordinate the entire section. It is left entirely to the responsibility of EPRD. That's what happened and when that happened, the EPRD tried its best, that's tough, with many systems in different places, all the people in-charge to co-ordinate. Because there're levels below and levels above it and there're needs to say different things and that's one of the main difficulties...

(SM8)

And, as any other divisions in the ministry the EPRD also faced the problem of shortage of manpower to take charge of the system as highlighted by four interviewees:

Next is the turn over of our officers are very rapid. Say, we have this person who knows how to manage but once he leaves the ministry either on transfer or retire there's nobody to take over his job. Although there might be people who under studied him before he left but somehow the system will not function as effectively as before, not anymore.

(DS7)

As noted by twenty-one interviewees, the difficulty of arriving at an integrated information system was mainly due to the fact that the MMOE was indeed the largest government agency in the country. Its nature of high bureaucracy, and compartmentalised system where every division had its own jurisdiction, makes integration a very complex, massive and tedious job. It involved too many levels:

But the problem in this kind of organisation, it is very highly bureaucratic. Whatever projects or programmes are to be carried out have got to go through a lot of procedures and of course there're a lot of red tape too... Yes, compartmentalisation is another problem that creates the ineffective information flow in the ministry. Everybody says that's my job, I know how to handle it or that's not my jurisdiction so I stay away. Attitudes like this create barriers among the divisions. Perhaps if we could break the wall things will work better. Every division will be more transparent to one another and hence there'll be less red tape.

(DS7)

Why is it still not working after so long, after 12 years or so? Because it's complex. Computer system is complex and for a big organisation like the MOE makes it more complex.

(SM1)

It's good because it comes under one system, meaning EPRD is the statistician for the whole education sector, both public and private. But will that be manageable, I have no clue because that's a very massive and tedious job. MOE is a huge organisation and there's just a wide range of data and information need to be collected to cover the need of all divisions and decision-makers. There's finance, development, scholarship, schools, personnel including teachers and other staff, service and all sorts of other stuff.

(SM4)

Eight of the decision-makers noticed that there was a wide range of data and information to be collected in order to cover the needs of all divisions and decision-makers. Since the needs were very diverse and broad, the functions of the divisions and departments in the ministry had to be compartmentalised. Although systems integration is on the minds of every decision-maker they realised that it was quite a difficult task to carry out since the nature of work of each division was based on completely separate activities and different time lines from one another. However it seemed pertinent to have an integrated system in order for the MMOE to come up with EIS:

But as for a system for the whole of education system, it is very diverse, very broad. So, you design a system to capture all including the remote schools, the divisions in the ministry. Partly because of the diversity, the system then possibly has to be compartmentalised to cater all. So, as far as a comprehensive system for the MOE, it is a bit difficult to work...

(SM6)

According to all SED directors and seven Division Directors, the mind set of being protective over one's system also led to another major problem that had to be overcome before integrated system and comprehensive database could be developed in the MMOE. This involved the readiness of division heads and personnel in the division to part with what they had had for a long time. Some were simply not willing to let go of the existing system they had been using. There was a clear

existence of a 'protection of turf' concept whereby people were very guarded about their data:

To me, there's ingrained attitude here that something belongs to you, which is not healthy. I'm new that's why I'm going to say it. If I had been here for long maybe I would have the same mind set too. I'm looking at it from outside the ministry or as an outsider. I see there's a dimension where people tend to be very protective for one's system. That's the problem to begin with. With that attitude, there's already existing system within their boundary which, they're not willing to let go. If say the mind set is there but the system doesn't exist yet, it's not too bad because we can impose on them. But once the system is already there and they used to having that so they just wouldn't let it go. That's the main problem. So the first step is to look at their mind set and we can't simply impose on them.

(SM1)

The second mind set is inflexibility. Inflexible mind sets always hinder us from thinking outside our cocoon. The third, I mean another problem created not just in the ministry but also in public service, in public sector, even in private sector, is a self-centred mindset. You guard your turf jealously. Don't come close to me and that creates problem. I think this contributes towards having the pockets of data system we have now. That creates integration problem. This system belongs to me. That system belongs to you, that system belongs to the third person. So, we should not be talking to each other. But that's ours, and that's also hers. I'm giving my frank judgement. ...Next is readiness because once you integrate you may lose something. Are you prepared to part with what you have?

(SM7)

There were some constraints as seen by four interviewees where the above issue was concerned. Firstly, the division heads never tried to discuss the matter seriously with one another:

If there is co-operation from every division, it's possible because our top management always put stress on data. So, if all the divisions and departments cooperate in giving some effort I don't see any problem in achieving that. I mean, we have to really conceptualise the data we need.

(SM4)

Secondly, people simply refused to accept the fact that the system they had been using did not function the way computerised/electronic information system should be

functioning. And thirdly, people were not intellectually honest about the work they did, hence, everyone did his own things:

Maybe there's nothing wrong with the system, it's the users. I'm pointing back on how users use the systems. If people know how to handle and use the system correctly then we'll be able to improve the functions of those systems. So, it's important that we know the usage of the system.

(SD2)

But more so, I think it involves the people involved do not see information in terms of planning. They see information more in terms of getting day to day job done and very often sections or divisions are more concerned about solving day to day problems than to support planning and therefore they don't see very much the reason why they want to get information properly integrated. I think this is one of the constraints that we have.

(SM8)

Although they agree to the development of an integrated system, four of them were troubled by the fact that if integration was to take place they had to agree to a common format and they felt that it might create duplication of work with what they had been doing presently. It was suggested that an integrated system would be based on one of the existing systems:

We need to have an integrated system. Even at the moment EMIS/SMPP and BSM are collecting data. They must make sure they're not collecting the same data. That'll confuse people on the ground. The second phase is for them to stop and as we suggested earlier for the ministry to have integrated information system or database through EMIS/SMPP or BSM.

(SM5)

According to five interviewees, the school level lacks people who are competent and knowledgeable about computers and the expertise is limited to very few schools. All levels in the education system lacks managers of technology to manage technology and change in order for system integration to take place. They felt that the MMOE did not have the expertise for system integration:

When we talk about the computer in government agencies, we don't have managers of technology. We've spent money, billions on technology, but there's no manager. Who manages EMIS/SMPP? ... So

these schools don't have the software and don't have the skill to upgrade the computers. Isn't that pitiful? Why? Because we don't have a manager of technology someone who knows about technology. I feel sad because we don't have some one who can pull all the loose ends together. That should be it. Everyone does his own thing.

(SM1)

Of course there's no one best information system that can truly be relied on. But the fact that in this ministry there's no one to drive up the point that this is an integrated system that should be used in the MMOE.

(SM8)

One of the interviewees disclosed that although there were system and technical people from both administrator and professional level these people possessed insufficient theoretical backing to make the system work. Since there was lack of documentation of the systems developed so far, there was no guidance for the staff to handle the system. It was also claimed that there was insufficient training provided and also inadequate exposure of the system to users. Based on these undesirable experiences users were rather sceptical and felt indifferent about the integrated system which bound to be more complex than their existing individual division system:

People developed systems and left. There's no document, documents about it, no manuals, and no guidance for the staff to handle the system. We're not only unable to manage technology but even to manage change. Sometimes when the government is going to implement a system, there's no such thing as meeting the people telling them what the system will provide them, how they should react, what the people should do, what's the implication of the system introduced. We should first defreeze people from the shock or fright. Provide training, exposure, guide them and slowly let go of their hands, unfortunately, that doesn't seem to happen. So the result, people are shocked with the newly introduced system and are scared or sceptical about the system. Is there change management in EMIS/SMPP?

(SM1)

Summary

The issues affecting the development of an integrated system, as mentioned by all decision-makers interviewed, included human, management and technical related issues. The human-related issues are:

- management attitude towards the implementation of ISs;
- involvement and commitment of people at all levels;
- mind set of being protective over one's system;
- collaboration and co-operation among divisions;
- people's understanding of the system and its implementation;
- incentives for learning – transfer of skills and knowledge;
- communication between IT experts and the professionals;
- people's awareness and sensitivity towards the importance of information.

The organisational/management issues are:

- provision of hardware and infrastructure;
- the place of IS in the office of the top management;
- manager of IT/ISs/change;
- sufficient manpower;
- size of the organisation – the MMOE is the largest government agency in the country;
- organisation nature of high bureaucracy and compartmentalised system;
- IT/ISs/information policies;
- additional workload for people at grassroots level;
- utilisation of EMIS/SMPP data;
- development of separate and isolated systems/databases;
- single division manning the system.

The technical issues are:

- wide range of data and information to cover the needs of all decision-makers;
- integrated ISs;
- system evaluation and monitoring;
- manuals and documentation of the systems;
- upgrading of system to capture more data for decision making;
- technology compatibility;
- on-line application;

- provision of basic and supporting facilities;
- length of EMIS/SMPP cycle;
- quality of EMIS/SMPP data;
- standardised interpretation of terms.

4.6 Suggestions on the development of an integrated IS in the MMOE

All interviewees were keen on the idea of an integrated system in the MMOE, though with some reservations on questions of what, where, when, and how. Their concerns revolved around matters such as who decides on the information to be stored in the database, where it should reside, when is a suitable time to introduce it, and how it could be done for a huge organisation as the MMOE. Besides this, there were also qualms about data ownership, accessibility and protection which have to be made very clear before the database is set up. These are similar issues emerging in other public and private organisations. Hence, the top management within the MMOE must be very cautious and sensitive regarding the consequences before they even begin to plan for the project as the education organisation is made up of several levels. This entails the voluminous educational data to be stored in the database. Although the decision-makers are in favour of the development of an integrated system, they raised the need for the MMOE to have a system and/or database manager to manage and improve the functioning of existing systems in the ministry. However they felt that the ministry could achieve this objective, judging by the collaborative efforts shown by divisions such as the EPRD and the CSD.

According to three decision-makers, there have been positive efforts towards improving the implementation of information systems within the ministry. One such move was a collaboration between the CSD and the EPRD in the preparation of common data dictionary for the existing systems, EMIS/SMPP and Staff Information System (SMS):

When the dictionary is ready, the next thing is the integration of the system in the sense that we have to upgrade EMIS/SMPP, update SMS so that whatever term used is communicated to the other system and the other system understands. When that works, if SMS is updated at state

level whilst EMIS/SMPP at school level, so who-so-ever update first, everything will go online, hopefully. When we've reached the stage that there's no difference between the two systems then we'll be able to break down the psychological barriers among the decision-makers. Meaning that whatever system, it's the system of the MOE, which can be used to deliver information for decision making.

(SM6)

The other move was reactivating the functions of the steering committee, the *JMPK*, chaired by the *TKSU* cum Chief Information Officer (CIO) of the MMOE:

We've spent money, billions on technology, but there's no manager... That's why we're now in the process of strengthening JMPK.

(SM1)

Five interviewees unanimously agreed that the *JMPK* should be able to bring division heads together and work out differences concerning data in order to come up with an integrated system:

...if EPRD could already capture operational data needed by other divisions then I think the existing system can be improved. All that's need to be done is for division heads to sit down and thrash all the differences about data that they have and start planning for one common database that can be used by all divisions.

(SM8)

It was proposed by the decision-makers that the information system in the ministry should not be centralised in terms of its operation. In other words the data collection should be decentralised, so that each division collects different data/information according to their scope of work. There were suggestions by one division head that the system developer should look into a new technique or procedure of collecting data at the source or entry points e.g. *BS* for deployment of teachers, *BPG* for teachers' specialisation and so on. In order for this technique to work effectively, another division head suggested that there should be a clear line of demarcation where one division stops and the other picks up the collection of data. By doing this, it was deemed to be less likely that divisions would collect the same data: hence, the issue of duplication of data collection could be overcome:

I suppose there needs to be an introduction of new techniques or procedures such as collecting data at source. Say we build database from the beginning of the entry point like BS for deployment of teachers. In that way, we'll be able to know how many teachers are deployed for that particular year, their options and where they are posted. At the end of the day, if that becomes a routine work we'll be able to capture how many teachers are there in a particular state. The details such as what subjects they're teaching can be collected from schools, perhaps. I presume at source data collection will lessen the burden of schools and we can somehow be more confident of the data quality and reliability.

(DS6)

The suggestions above meant that there would be several databases or applications to serve the bigger needs of divisions. At the same time, these systems should also work on the same platform, to enable communication between divisions involved in data collection:

Yes of course provided that we have a common platform... So if they develop a system which can talk to one another and use common variables then that might work. If a division has its own database and we can gain access to it, then there's no problem at all.

(DS11)

Six of the interviewees further suggested that the top management also had to decide on developing an integrated system either through EPRD or BSM information system. The system should, however, cover all information on the entire education spectrum and become the backbone of the ministry. The present EMIS/SMPP was seen as the beginning, and has a very challenging future ahead to be *the* educational database:

I think that's our future direction, future plan, to have an integrated EMIS. That is what we're developing. The concept is not just within Malaysia but also for overseas purposes. Overseas agencies need information from us, so with the integrated system we'll be able to access the required information.

(SM2)

Three interviewees visualised that the integrated system should be able to draw data from all systems in the ministry. It should then automatically capture operational data needed by divisions and decision-makers and it was suggested that the EPRD could simply extract data from these databases for planning purposes:

To me it is a necessary transitional process devoid of having proper databases from where this section and the aggregation can be done ...so they have to go back to the source to collect. So, in fact I can see the time when EPRD wouldn't have to do all these. On a condition the operational databases are there right at the school levels, at the state level and also at the Ministry level.

(DS8)

One decision-maker proposed that if the existing personnel in the MMOE were unable to develop such operational system, the ministry should seriously consider outsourcing the task of developing information system to qualified agencies:

The other thing that can be done is to outsource the development of information systems. If we don't have the ability to do it, maybe because of shortage of manpower there's no harm in outsourcing it to qualified agencies, of course with terms laid down to ensure security of data.

(DS6)

In order to improve the data updating process, it was recommended that the ministry personnel monitor the work at schools as well as at the SEDs on regular basis. As suggested by five interviewees, the MMOE should have a unit to monitor and to maintain the system, hardware and software and plan what information was needed and must be obtained with minimum activity possible:

The ideal is to have a computer unit to look at the system. Of course we cannot be centralised in terms of operation. This thing becomes sort of you face a problem, solve it and operating it at different levels. Decentralise but there must be some kind of R&D or a headquarter looking at the hardware, software. Then we can break the walls. Otherwise there'll never be an integrated system in the ministry.

(SM3)

However, this idea was opposed by one of the top decision-makers whereby it was claimed that by having another normal bureaucracy department or unit would create just another barrier.

Four interviewees highlighted the issue of the shortage of manpower particularly to verify the data once the databases are integrated. They felt that this issue should be given serious consideration so that people did not feel overworked or burdened as

presently the existing officers already could not cope with the volume of work they had to deal with.

Three decision-makers shared the same view that it was of utmost importance for system managers to co-ordinate and obtain all the divisions to co-operation in giving some efforts towards improving the functions of the information system:

Managing database or system is an additional workload and because of this we find that people tend to take this responsibility very lightly. Maybe we need a full time system analyst at all levels to make sure that the system is managed properly.

(DS6)

It was also seen necessary by four interviewees for the ministry to reduce rigidity of rules and regulations particularly on procurement of equipment as long as the application made by divisions were sensible and appropriate to perform the task. This is especially so when it involved other ministries.

One of the toughest obstacles one had to overcome in introducing change in an organisation was seen as gaining people's confidence and acceptance towards the change introduced. To do so it was suggested by thirteen interviewees that the system manager had to first gauge the people's mindset and then deal with the management of the technology:

Integration to me is not a question of hardware or software but it's the people. First, I've to gauge the mind set. That's the first step that I'm going to take. Starting with the personnel system this afternoon. What their response is like if we were to integrate the databases.... System is more than hardware and the first thing is mindset, then the system.

(SM1)

It had to be emphasised to users that it was a brilliant idea to have an integrated system containing reliable data and also accessible to everyone in the Ministry. To four interviewees the best way to get this done was by providing attention and support in terms of commitment, finance, manpower and to straighten out the problems. The management has to study the root of the problem and solve it from

the root itself and the first move is by calling the heads of divisions for a discussion. It had to be explained to them about the system, how it worked, in what way(s) it could serve them and why it was essential for the ministry to have an integrated system or a comprehensive database:

The Minister has asked me to do something about data in the ministry. I'm calling the heads to discuss this and I'm pushing them. ...Tell them that it's good to have integrated database, validated and reliable and accessible to everyone within the ministry. So the bigger picture from the old sectoral picture.

(SM1)

It was also put forward by one of the top management interviewed that for the whole system to work effectively and efficiently the politicians in the Ministry also have a role to play in the implementation of IS in the MMOE:

So, while the government as a whole is very interested in getting information right, I think the ministry's top management, I mean a group of politicians with the ministry must have the passion to develop that kind of system and must have passion for planning for particular aspects of the information system.

(SM8)

On the part of the government, a positive step has been taken by issuing a directive that every ministry was to create a post for a CIO who would assist the organisation in improving the functions of the information system. Thus in the case of the MMOE six decision-makers shared the opinion that the appointed CIO would be held responsible for co-ordinating the divisions in an effort to realise the development of an integrated system for the MMOE.

Summary

The decision-makers presented several suggestions that they felt would be useful in developing an integrated system (Table 4.6). These suggestions may be distinguished according to whether they are human, related to organisational/management, or connected with technical issues:

Table 4.6: Suggestions in developing an integrated system

Issues	Suggestions
Human-centred	<ul style="list-style-type: none"> ▪ Collaboration work between divisions ▪ People's mindset towards the change introduced
Organisational/ management	<ul style="list-style-type: none"> ▪ reactivating the functions of the steering committee, the <i>JMPK</i> ▪ formulation of IT/IS/information policies ▪ decide on the division responsible for its development ▪ consider outsourcing the task of developing integrated system to qualified agencies ▪ availability of sufficient manpower to verify the data once the databases are integrated ▪ co-operation of all divisions and levels ▪ reduce unnecessary rules and regulations rigidity particularly on equipment procurement ▪ involvement of top management and politicians in the Ministry ▪ creation of the Chief Information Officer (CIO) post to assist in improving the functions of the information system
Technical	<ul style="list-style-type: none"> ▪ re-examine the management of IS procedures ▪ work on the same platform to enable communication between divisions ▪ MMOE personnel to monitor the updating process at grass roots level on regular basis for improved data quality

4.7 Summary of the chapter

The interview descriptions in this chapter are grouped into six main areas. These are:

- a) Knowledge of EMIS/*SMPP*
- b) Use of EMIS/*SMPP*
- c) Evaluation of EMIS/*SMPP*

- d) Suggestions to improve *EMIS/SMPP*
- e) Factors affecting the development of an integrated database in the MMOE
- f) Suggestions to develop an integrated database in the MMOE

Within each area, there are several issues which can be categorised as human-, organisational/management-, and technical-related issues. It is clear from the interview responses that decision-makers of the same level, whether top management, division directors/secretaries or SED directors shared similar perspectives as to the usefulness of the system. The SED directors strongly felt that the database was useful for administrative, though not for operational purposes. The Division directors/secretaries, meanwhile, varied in terms of how they valued the system. Two of them found it valuable, whilst six felt that it was of limited value, depending on their data needs and the nature of the decisions made. Three others claimed the system was not valuable, as it only served the EPRD and the data was not timely. Three of the top management found the system to be of less value, whilst five other viewed the system as unreliable. It may be seen here that the views held by decision-makers on *EMIS/SMPP* were influenced by their position or level, either at the federal (ministry) or state levels, the nature of decisions they are making and the scope of data available in the system.

In the next chapter the issues highlighted by decision-makers in this chapter will be further discussed in the light of the literature already presented in Chapter 2.

CHAPTER 5: DISCUSSION OF FINDINGS IN CONTEXT OF PREVIOUS LITERATURE

5.0 Introduction

In chapter 2, the main issues pertaining to the implementation of ISs within organisations identified by authors of MIS in both public and private organisations, system evaluation, organisational management and educational change were discussed. The use of interviews, as discussed in Chapter 3, led directly to the interview findings, as described in the previous chapter. We found that there are similar issues emerging in the implementation of EMIS/*SMPP* within the MMOE as in other organisations explored in the literature. It can be seen that there were problems in implementing ISs within organisations arising from issues such as the absence of total commitment from the management, the inability to listen to users' resistance and to ensure good communication between all levels and groups of people, and the difficulty of managing the changes that follows, to mention a few.

This chapter aims to discuss and compare the important issues highlighted by the interviewees in the main study and those discussed in Chapter 2. Considering a broad area of literature in context is the key to this chapter. The examination of a range of contrasting literature is important for two reasons. First, it helps to improve the confidence levels (internal validity and generalisability) of the research findings, and secondly it offers analytical opportunities for the researcher (Eisenhardt, 1989). In this comparison stage, literature discussing similar findings is also important, because it ties together underlying similarities. This results in stronger internal validity and wider generalisability.

Similar issues emerge in the case studies to those found in the MMOE. That is, there are some common issues regardless of whether the organisation is private or public, centralised or decentralised. Indeed, some issues such as management support and commitment, people's early involvement, training, and proper IS planning, to

mention a few, highlighted by interviewees in the MMOE are also mentioned and discussed by authors and researchers in the case studies. What is more fascinating is that several issues raised in a case study pertaining to a particular field, for example in the field of MIS, seem to reappear in another case study of a different field, for instance that of organisational management.

5.1 Discussion of findings

The interview findings discussed in the last chapter showed that those decision-makers interviewed had not directly used *EMIS/SMPP* (see section 4.2). It was also shown that top management and division heads were significantly more likely to say they did not know much about *EMIS/SMPP* (see section 4.1). From the point of view of the decision-makers interviewed, several issues are hindering the implementation of *EMIS/SMPP* in the MMOE, and their responses have explicitly answered the research questions of the study. The table below (Table 5.1) lists those issues that impede the implementation of *EMIS/SMPP* and the development of an integrated system or a comprehensive EMIS in the ministry, as discussed in the previous chapter.

Table 5.1 lists the areas explored in the previous chapter and the issues associated with these areas. The issues are divided into three groupings; human-centred, organisational/management, and technical issues. There were six areas of focus during the interview: knowledge of *EMIS/SMPP*, use of *EMIS/SMPP*, evaluation of *EMIS/SMPP*, suggestions to improve *EMIS/SMPP*, factors affecting integrated systems in the MMOE, and suggestions to develop integrated system/EMIS in the MMOE. Several issues emerged repeatedly during discussions of the above-mentioned areas. The markings in the table are used where appropriate and most relevant, and usually shared by several interviewees. This means that the absence of an asterisk does not necessarily mean that the particular issues were not mentioned during the interviews. Indeed, they may have been mentioned, but were not considered as being important to particular decision-makers. Many of the issues are

Table 5.1: Interview areas and issues analysis

Group	Areas	Know- ledge of EMIS	Use of EMIS	Evaluat- ion of EMIS	Suggest- ions to improve EMIS	Factors affecting integrated system	Suggest- ions to develop integrated system
	Issues						
HUMAN	Awareness and sensitivity towards the importance of data (AS)			*	*	*	*
	Co-ordination and collaboration among division heads (CD)			*	*	*	*
	Communication between system developers and users (CS)			*	*	*	*
	Involvement and commitment of people (IC)			*	*	*	*
	Decision-makers information needs (IN)			*	*	*	
	Learning from experience (LE)					*	*
	Attitude towards the system (PA)	*	*	*	*	*	*
	Understanding about the system (US)		*	*	*		*
ORGANIZATIONAL / MANAGEMENT	Additional workload at grass roots level (AW)		*	*		*	
	Bottom-up initiatives (BU)				*		
	EMIS as source of information (EI)	*	*		*		*
	Human resource management (HR)			*	*	*	*
	Manager of IS/IT/change (MC)			*	*	*	*
	Outsourcing of work/project (OS)						*
	Organisation work culture (OW)		*	*	*	*	*
	IT/ISs/information Policy/directives (PD)		*	*	*	*	*
	MMOE 'cold' reaction towards data from schools (RD)			*			
	Organisation rigid rules (RR)			*		*	*
	Single division manning EMIS (SE)	*		*			
	Isolated and separate systems (SS)		*			*	*
	Utilisation of EMIS/SMPP data among users (UE)	*	*	*	*		

GROUP	Areas	Know- ledge of EMIS	Use of EMIS	Evaluat- ion of EMIS	Suggest- ions to improve EMIS	Factors affecting integrated system	Suggest- ions to develop integrated system
	Issues						
TECHNICAL	EMIS business cycle (BC)	*		*	*		
	Basic and supporting facilities at grass roots level (BF)	*		*	*	*	*
	Comprehensive system design and pre-system planning (CD)	*		*	*	*	*
	Built-in data analysis in the system (DA)	*	*	*	*		*
	Evaluation and monitoring of EMIS/SMPP (EM)	*		*	*		*
	Effectiveness of IS (ES)		*		*		*
	Integration of systems/databases (IS)	*			*		*
	Needs assessment among system users (NA)			*	*		*
	Quality of data (QD)	*	*	*	*	*	*
	System development phases (SD)	*		*			
	Scope of data (SE)	*		*		*	
	Comprehensive system manuals/documentation (SM)			*	*		*
	Compatibility of IT/standard system platform (SP)		*		*		*
	Standardised interpretation of terms (ST)			*	*	*	*
	Training, exposure to, and marketing of the system (TE)	*		*	*		*

The various issues emerged from the interview responses are plotted against the different areas pertaining to EMIS/SMPP.

seen as being related to one another, and some, indeed, caused the emergence of another issue. This will be discussed in detail in the next chapter. From the table, it is evident that some of the issues raised by the decision-makers in the MMOE were similar to those highlighted by authors in Chapter 2. These issues are discussed below according to the respective groupings.

5.1.1 Human-centred issues

Human-centred issues discussed throughout this study refer to how human reactions affect the organisation and the implementation of ISs. These include variables which have a major influence on the attitude of people to the change, i.e. the introduction of ISs in their work life. Such variables are:

- the extent to which the organisation meets the personal needs and aspiration of the people involved;
- how the people believe the change is going to affect them and their interests;
- how the system developers will change the attitudes of users as well as their use of technology;
- how the system developers perceive their roles and how this affects their attitude towards users and the strategies adopted to get the change implemented;
- the level of people's involvement and participation in system development;
- clarity and amount of communication permitted between people to avoid misunderstanding (Mumford, 1972; Avison and Crowe, 1980; Irani et al., 2001).

These issues are culture-specific, and can be affected by rewards to individuals.

a. Involvement of people at all levels

Twelve out of twenty-four interviewees believed that in order for EMIS/SMPP to function effectively in the MMOE, people at all levels in the education system have to be totally involved in its implementation.

However there is no doubt that 'people variables' have proved crucial in every context, and this has been mentioned by the authors (Crowe and Avison, 1980; Thierauf, 1984; Barta et. al., 1995; Martino, 1999; Miller & Lee, 2000; Humphreys & McHugh 2001) and interviewees alike (DS5, SD2, SM4, SM7). The suggestion that staff should be made more sensitive towards the need for change and encouraged to be involved in prior planning, as proposed by Genus and Kaplani (2002), seems to be applicable to the implementation of EMIS/SMPP in the MMOE. The design phase of EMIS/SMPP included personnel from several SEDs and the initiation stage

of the system involved representatives from DEOs, SEDs and every division in the MMOE as members in the Information and Computerisation Committee (DS11).

Despite this, the follow-up upgrading and alteration of the system was done only by the key person who has control and knowledge of the system (DS4, DS10). Although the system was also meant for use in schools, people from this level were not involved in the planning stage, and the system was found to be of little help, if any, to the school administrators. Hence, the schools do not see the need to update data in the system as a serious issue (DS8, DS11, SD1, SD4, SM5, SM6). They provide the data merely because they have been directed to do so by the central agency, although most of the time without taking the initiative to check the validity of the data. This phenomenon is proven true when the most recent data sent in to the EPRD was cross-checked with the data of the previous year, and it was discovered that there was no change of data in fields where changes were expected (DS11).

It is unfortunate that the step of gaining 'organisational commitment' taken by Li and Chen (2001) did not take place when EMIS/*SMPP* was implemented in the MMOE. Although the idea of setting up EMIS was first initiated by the top management of the MMOE, it took several years for the idea to be documented, discussed and initiated. Unlike the case study by Li and Chen, the planning of EMIS/*SMPP* was entrusted to the EPRD, and the division had to 'run the show' until the system was implemented in all schools nation-wide. It was, indeed, a very challenging responsibility for the EPRD, particularly the Data Unit, to handle the project, in particular with limited manpower to cope up with demanding tasks (DS4, SM6, SM8). Other personnel from other units of the EPRD, as well as other MMOE divisions and levels in education system, were involved only in meetings, training (locally and overseas) and seminars organised by the Data Unit cum EMIS/*SMPP* secretariat. As a result, there was little, if any sense of involvement and enthusiasm, and few responses or suggestions from others within the organisation as far as the functioning and success of EMIS/*SMPP* were concerned (DS11).

What seems obvious in the MMOE is that people, particularly the top management, are less interested in following through a project until the end when they are not involved in it from the very beginning (DS5, SM1). As a result of this, the Division responsible had to struggle in order to get people at all levels to become more involved in, and to co-operate more fully with EMIS/SMPP.

b. Top management support and commitment

In order for ISs projects such as EMIS/SMPP to be implemented, top management needs to be involved and committed before it can be accepted by users at all levels in the education system. This was highlighted through the eighteen decision-makers interviewed.

Computers and computerisation do not compensate for ineffective organisational structures, poorly skilled system managers and users, or a lack of clearly specified information requirements. Indeed, computerisation does not always lead to information and improved decisions (Visscher, 1996). The decision makers in the MMOE do agree, however, that computer-based IS design and development is a much more complex undertaking than is generally understood or appreciated (DS1, DS4, DS5, DS6, DS11, SD2, SD3, SM4, SM5, SM7, SM8). Hence, current efforts to develop improved education ISs in Malaysia will be successful only if the decision-makers, the top level management in particular, expand their focus beyond a limited set of computer-related technical issues and become more integrally related to broader reform issues.

The problem of top management paying 'lip service' to computer systems but not committing themselves to ISs development (Crowe and Avison, 1980; Thierauf, 1984) appears to be one factor impeding the smooth development of EMIS/SMPP in the MMOE (DS5, DS6, DS8, DS10, DS11, SD2, SM1, SM2, SM3, SM6, SM7, SM8). This is also consistent with Rodriguez-Diaz et al. (1997) and Hockey and Wellington (1990), who agree that lack of total commitment from the top management poses one of the problems in the implementation of IS in organisations.

It was mentioned during the interviews that lack of total commitment and 'real' involvement from the head of departments, as well as on the part of top management, in particular the need to invest their time in the development of the system (DS8) is one of the main problems that system developers in the MMOE have to struggle with. The developers of *EMIS/SMPP* find it hard to gain the confidence of heads of divisions without the support of the top management, who are sceptical about the system themselves (DS6, DS8, DS11).

Since the MMOE is a large, complex public organisation with several levels of management, the management of database covering the entire spectrum is obviously a huge one (SD4, SM2, SM5, SM6, SM8). It takes an experienced and dedicated database or systems manager to manage. Such a task includes not only managing technology and ISs, but also people of different management levels and different administrative groups. Moreover, the structure and politics of the organisation has to be taken into serious consideration to avoid any conflict between ideas and job performance (DS5, DS8, SD2).

Serafeimidis and Smithson's (2000) observation regarding the lack of senior management support is a familiar problem where the development of ISs in the MMOE is concerned (DS3, DS5). Very often, the development of ISs depends on the initiatives of individual divisions. As a result, various systems were developed at all levels; within the ministry itself, in SEDs, in DEOs and even in schools. Nevertheless, the applicability of these systems is very limited, since the system was developed to fulfil the needs and functions of the respective division, department or unit. It is quite discouraging that when efforts are made to introduce something new that was thought to be of benefit to the organisation, the idea risks being rejected even before it is discussed in depth (DS8). This is likely to happen when this idea, once implemented, might overshadow the project that another division is managing (DS5). Thus, in order for the idea to be given serious consideration, the strong backing of the top management is required, and it must be headed by someone at an influential level, with authority to make decisions (DS5, SM4). In a structured and

highly bureaucratic organisation, it is sometimes difficult for a project to take off or to be implemented as planned. One has to go through too many levels and consult many people before gaining approval for the project, or before the project is turned down (DS3, DS5, DS6).

c. Management attitudes towards introduction of ISs

The top management's reaction to avoiding contact with the introduction of ISs, as highlighted by five interviewees, was, indeed, an interesting revelation. It was claimed that the avoidance occurred even though they had sanctioned the project, and it was left to the technology experts to make decisions about computing within the organisation.

In line with the findings of Humphreys & McHugh (2001) regarding the effect of organisational structure in the implementation of MIS, there were suggestions by the interviewees that there should be a restructure in the MMOE in order to minimise the so-called "professional-administrator gap", to decrease the compartmentalisation of work and to improve the information flow within the ministry (DS1, DS3). With the implementation of ISs in the education system, there are believed to be several managers at all levels who are unhappy about the changes brought to bear in their respective institution (DS5, DS8, SM7, SM8). These managers are described by the authors to have closed minds, and to object to the implementation of IS, be it the Staff Information System (SMS) or EMIS/SMPP. Thus, in order for the system to function more effectively, the developers have to wait patiently for these managers to leave the education system through retirement (DS8).

With reference to Lyytinen and Robey's (1999) conclusion regarding the failures of ISs development projects, as a result of the failure of the organisation to learn from their own experiences, it was realised that there was a large amount of data available at every level of education system. People have the somewhat naïve idea that the computer can do wonders, and that they want as much information as possible (DS3, DS5, SM6). Unfortunately, this data stored in the databases at all levels is used only

for the purposes of analysing trends. Most of the time, the data available is not used to the optimum. It is always exciting to do or to introduce new processes, as it were, to “jump on the bandwagon” and to do many things at one time, so much so that people often request the most current data rather than making use of the data available in the system (DS5, DS11). The existence of retrogressive, inflexible and self-centred mind sets among division heads also hindered the enhancement of several projects including the development of IS within the MMOE (SM7). As a result, it is difficult to introduce systematic change, because such a way of thinking has been strongly rooted, and therefore, there are a lot of “things to dismantle” before any change can take place (SM1, SM7).

d. Management's expectation on the return benefits of IT investment

The decision-makers interviewed showed concern about the benefits of implementing EMIS/SMPP and their scepticism as to whether the project was worth the money spent. However, some felt strongly that it was too early for anyone to query the return benefits of the MMOE investment on the system, as it takes some time for EMIS/SMPP to stabilize and become fully institutionalized (DS4, DS5).

The perspectives of six of the interviewees (DS4, DS5, SM2, SM5, SD2, SD3) are supported by Irani and Love (2001), who state that it is difficult to measure benefits and costs, and this causes uncertainty about the expected impact of IT/IS and thus, becomes a major problem facing decision-makers. The cost and complexity of a DBMS is mentioned by Thierauf (1984) as one of the issues impeding the smooth development of ISs within an organisation. In many cases, for example one mentioned by Irani and Love (2001), the lack of delivery of performance improvement by IT/IS as set against the investment made by the organisation is due to the attitude of managers about being committed to the development of IT.

In implementing EMIS/SMPP, the MMOE management is uncertain of the benefit that the ministry would gain when using computerised systems to deal with a large quantity of data and information. As mentioned by one of the interviewees, “We

simply don't know what to expect if we were to embark using IT in our organisation. We weren't too sure whether our investment is worth the money spent, afraid that it might not come up to our expectation. The fear of losing something that we've been holding on too for a long time, something that has been the norm in our organisation. All these contribute to the late introduction of IT in the ministry" (DS4). Top management and division heads felt that the amount of budget allocated to get EMIS/SMPP started was high. Even before it was implemented the developers were already expected to make the system function perfectly so that it could deliver output as requested by the top management (DS5, DS8, DS11). The system developers and those involved were not given sufficient time and opportunity to judge the suitability of the system developed (DS4, DS5) although by right the system developers were expected to restudy and re-evaluate the functioning of the system as time went on. However, although this is one of the most crucial aspects of the process it is often not seriously looked into both by system developers and the management as they are more anxious to produce a so-called 'acceptable' output (DS6, DS10, SM1, SD4, SM7).

Irani et al. (2001) note that the top management lost interest in the system because it could not deliver the output they require. Conversely when EMIS/SMPP was introduced, the decision-makers showed their enthusiasm for the system (DS10, DS11). They already had a very high expectation of the system even during its first year of implementation (DS5). However, this system was claimed to have failed in fulfilling the needs of decision-makers and previous studies. Crowe and Avison, 1980 and Irani et al., 2001 also suggest that an organisation's failure to implement ISs successfully is primarily attributed to not meeting user expectation, which underlines the significance of the human and organisational issues involved with ISs. For similar reasons, EMIS/SMPP is not taken seriously by the top management of the MMOE. At this point the administrators in the MMOE made an effort to improve on the system, JGMG, they developed earlier (DS5). It was then claimed that the information in EMIS/SMPP was redundant in comparison with what they had in their improved system, JGMG front end system (DS8, SM1, SM6). Since

they have the upper hand where the management of computers in the ministry is concerned, attention was diverted to implementing the latter system developed by the administrators (DS7, DS8, SM1, SM6).

e. Co-ordination and collaboration among heads of divisions

From the interview findings, there was a lack of co-operation among division heads in the MMOE where the implementation of EMIS/SMPP was concerned. Decision-makers were aware of the difficulty of the EPRD to gain support from other divisions in seeing the system through.

Aziz (1997), in his study on *The Use of Computer-based Information System for Policy Development in the Ministry of Education, Malaysia*, mentions that there has been no co-ordination between SEDs and divisions where data collection is concerned. Though it has been agreed in many a meeting there should be co-ordination in data collection among divisions, until the time this study was carried out, the co-ordination does not seem to exist. This is because so far, there has been no particular individual or committee in the ministry with full authority to see that the agreement was adhered to. One of the major issues in the development of computer-based IS in the MMOE, according to Aziz, is “the educationists’ role in developing ISs owned and controlled by different departments and the absence of a networking system that can integrate the systems” (pp.255). Hence, departments tended to obtain data from other sources or initiated their own data collection project (Aziz, 1997). The result is the creation of multiple ISs across the ministry. The interviewees seemed to agree with this finding (DS5, DS11, SM7, SD1, SD3, SD4) and one of the top managers highlighted that the division heads were more concerned about getting the information they needed for their daily operations than looking ahead into the future of the organisation (SM8).

f. Lessons from experience

The interview findings show that the MMOE management was unable to transfer lessons from past experience with IT/ISs to improve the present ISs implementation

in the organisation. Three decision-makers believed that if the management was able to trace the sources of problems in the development of previous ISs, implementing EMIS/*SMPP* might be more straightforward.

The best intentions to learn are often affected by the capacity to process information and to make sense of experience. As Lyytinen and Robey (1999, pp. 92), state: "Information overload is a barrier to building organisational knowledge because it is difficult to learn anything when there is so much to know and so much information to process". The authors suggest that too often organisations are occupied with too many ongoing concerns to step back and reflect on available empirical information. In assessing EMIS/*SMPP* work progress Cassidy and Cresswell (1997) note that not all learning has been fed back into the system, a process which could have been very useful for the successful implementation of the system. On a similar note, Ciborra & Lanzara (1994) noted that organisational staff become blinded by pre-existing institutional arrangements and related thinking patterns, another reason that limits an organisation's ability to learn.

While conducting the main study, it was discovered that the Staff Information System (*SMS*) is facing similar problem as the *JGMG*, in that those concerned at SED and DEO are not responding positively to the system. As a result, the information in the *SMS* in the majority of states is at least five years out of date (DS5, SM6). What has been described here reflects the study of Lyytinen & Robey (1999), whereby the developers failed to draw lessons from their experiences in the development of ISs. The Computer Service Division (CSD) management should have used their knowledge and experiences while implementing *JGMG* before plunging themselves into another 'quite inappropriate' system which has used much of their time and not to mention budget (DS4, SM6, SM7). It is learned that the CSD is currently working on *JGMG* front end system which has been developed by one of the SEDs and is piloted in schools in the particular state (DS4, DS8, SM1).

The development of Smart School Management System (SSMS) described in section 5.1.3c is a further example of such an event, whereby the MMOE management again overlooked the need to take into account of past experience in developing ISs in the education system.

g. Management styles

Two of the top management raised the issue of management styles of the managers in the MMOE. It was claimed that the management styles adopted by the management at different levels had a bearing on whether ISs were accepted in the organisation.

The management at all levels of education system in Malaysia comprises a mixture of all three styles mentioned by Van Wingerden (2001): pro-active management, reactive management, and inactive management. It is partly due to the variety of styles in operation that there appears to be different levels of success in implementing EMIS/*SMPP* in the ministry, SEDs, DEOs, and schools throughout the country (DS5, DS8, SM1, SM6, SM7, SM8). It was mentioned by the interviewees that middle and top management at the ministry level have to be more pro-active, rather than remaining reactive, in order to see a positive change in the administration of the MMOE (DS3, SM7).

Where decision making is concerned, the culture in the MMOE is for decisions to be made through the collaboration of division heads and top management (DS2, DS5, SM2, SM5, SM7). This is in fact the practice at every level in the education system. Brain storming and discussion are common during meetings before a consensus on issues is reached. A strength here is that the meeting will be attended by representatives of all divisions or those related to the subjects discussed during the meeting. Hence the results of the meetings will be disseminated to the different divisions/departments by those representatives attending the meeting. However, the drawback is that often several activities agreed upon in the meeting are not carried out as expected. This is common during EMIS/*SMPP* meetings. It was observed

that during EMIS/*SMPP* meetings there were very few arguments about the content and the functioning of the system. This is partly because those who attended the meeting are officers with no authority to make decisions for their divisions and those who might not even have the slightest idea on whether the system would be of any help to their divisions. As a result, there were few issues raised during EMIS/*SMPP* meetings although there was considerable dissatisfaction with the system voiced in meetings among the division heads or with the top management particularly when it comes to discussion on educational data (DS5, DS6, DS11).

h. Incentives for learning and transfer of skill and knowledge

As a hierarchically structured organisation, the MMOE should consider involving related staff in decision-making pertaining to projects, or work, which will involve the particular staff. Failing to do so leads to staff doing the assigned work mechanically, with little commitment and only superficial knowledge of the project.

In the case of EMIS/*SMPP*, the professional educationists group has high enthusiasm for the effective functioning of the system. However the top management hinted that the professionals should only be concerned with education matters, and allow the administrators/technical people to handle the development of systems in the ministry (SM1, SM7). This limits to an extent the ability of the professionals in the MMOE to explore and widen their knowledge and skills in the area of technology.

Opportunities to learn from failure are usually missed because of an obsession with success. Organisations provide many incentives to succeed, but few incentives to fail (Lyytinen & Robey, 1999). For instance, when a particular project is successfully implemented and institutionalised, the news spreads quickly to the whole organisation and is further discussed during meetings. The people involved in the project are given credit and praise and also, in all likelihood, trust to handle more projects. However, the failures of projects are often not highlighted, nor indeed discussed openly during meetings. Failures are too often wiped from the organisation's memory, for fear that they will recur and consequently valuable

material for learning from the failure, is ignored. According to several division heads, the MMOE top management are said to be too eager to do things perfectly, and there is no room for mistakes, in case people criticise (DS5). This attitude often leads to indecisiveness, and people become too afraid to make mistakes, so much so that they do not even try and as a result people never learn (DS5, SM7). There is no doubt that the management encourages the staff to improve themselves, knowledge and career wise, by sending them to attend courses, attachment programmes, study-leave and the like. However, the staff are often prevented from expressing their views for fear that their ideas may contradict those of the top management. As a result the staff will do their tasks as instructed even though at times they are doubtful of the result (DS5, DS9, DS11).

High turnover within organisations where ISs are being developed saps them of relevant experience and knowledge. The high expectations of the management that people should not make errors while handling the system, as discussed above, makes it difficult to find a replacement when a system manager leaves the organisation. It is even difficult to transfer experience from one project to another because of time constraints and the specialised requirements and cultures of different users. For example, in schools or DEOs where EMIS/*SMPP* is actively used, the transfer of a data teacher/officer often causes problems to the school/DEO administrator to find another teacher/person to do the work of keying in and verifying data in the system (SD2, SD5, SM7). As a result, there will be a delay for that particular school in sending in their data to the respective DEO, and this creates a delay in producing annual Educational Statistics at the MMOE level (DS11).

i. Communication between IT specialists and professionals

The interviewees did not deny the fact that there was minimal interaction and communication between IT specialists and professionals in the MMOE. They too were aware of the frequent miscommunication between the two groups. This phenomenon led to further serious problems in implementing ISs, there being disagreement where technology procurement and ISs management were concerned.

The argument by Ciborra & Lanzara (1994) that a technologist's perspective does not encourage an accurate diagnosis of the role of computing in organisation strategy and operations may be applied to the implementation of IS in the MMOE. Before introducing EMIS/*SMPP*, the CSD designed an IS aimed at providing educational information, particularly on teaching and non-teaching staff. There is however a deficiency in the operation of the system from the point of view of the top management as well as the professionals, whereby it was not possible to provide the information needed by the decision-makers (DS5, DS11, SM3, SM5, SM6). Among the reasons for the deficiency was the incomplete definition of variables in the system and the lack of availability of details crucial for regularly requested information from the top management. It was understood that the designing of the system was done entirely by technical people who have little, if any, insight about the teaching profession. Thus, there was every possibility that they overlooked certain aspects of the field, which can be essential information for educationists (SD2, SD4, SM5, DS11).

On the other hand, EMIS/*SMPP* was designed by educationists familiar with the kind of educational information requests from both inside or outside the ministry. The system designers were assisted by technical experts from the ministry's computer department regarding the technical aspects of the system, and from other users at SEDs, DEOs and school levels regarding the type of information to be stored in the system. Broadly speaking, government school information in the system covers the needs of users at all levels particularly for planning purposes (SD3, SM2, DS11). However, as implied by Ciborra & Lanzara, since EMIS/*SMPP* was developed by educationists rather than technology experts, users may be sceptical about the capability of the system in providing information required by decision-makers (DS5, DS6, SM5).

Baharudin (2000) has found that if CAS in public organisations are to function effectively the management has to narrow the communication gap between system developers and users. Hence, computer or technology specialists and the

professionals in the MMOE must begin to work together and overcome differences in improving ISs in the MMOE. As mentioned by one of the interviewees although the MMOE is managed by two sectors, the professionals and the administrators, the managers have to “look at it as one, from one angle...now these two sectors have come to terms with the coding system and interpretation of terms and able to talk to one another. Let’s hope for the best in our education system” (SM5).

j. Decision-makers’ information needs

In relation to the information needs of users, interviewees believed that both users, particularly the top management and system developers, had their own roles to play. According to two decision-makers, while top management made it difficult for system developers to provide relevant data for decision making as the former constantly changed their information needs and priorities, system developers were seen as not capturing the information needs of all decision-makers at the beginning of each year and storing the necessary data in the system. The interviewees too claimed that the top management were unclear of data they needed for decision making.

The analysis of users’ needs is the starting point in the design of meaningful ISs and the problem of analysing information needs is often discussed, and widely recognised (Elbourne, 1914; Drucker, 1955; Li & Chen, 2001; Bentley, 1981). Because the output of MIS is directed towards management, the type of information needed by different levels of management should be identified so that the data collection exercise is worth the effort, time and cost. And most importantly, decision-makers should understand the system limitations to meet their daily information needs. The interviewees regarded ad hoc correspondence as an approach of solving formal EMIS/SMPP limitations (DS11, SD3).

Cassidy (1994) claims that one of the threats during the design phase of ISs is unclear specification of data needs, particularly among the decision-makers. There were two main reasons given as to why EMIS/SMPP is unable to fulfil the needs of

decision-makers. Firstly, the decision-makers were more inclined towards the use of operational rather than census data, even for planning purposes, and secondly, the decision makers did not know what kind of data they actually needed for decision making. Because of this, it is difficult to analyse their information needs and the findings of needs assessment seldom materialise (DS9, DS11).

k. Understanding of the system and its implementation

The interview findings show that the top management and other users have to understand the purpose of developing EMIS/SMPP before setting their expectations on the system and requesting information not stored in the database. As regards the system developers, the decision-makers felt that the system developers had to make explicit to users at all levels the main objectives of setting up the system and also explain clearly the specific objectives of EMIS/SMPP that the developers had decided to prioritise.

The MMOE experiences the phenomenon mentioned by Cassidy (1990) and Irani et al. (2001) when attempting to improve the performance of ISs in the ministry. That is, the ministry's top management claimed that the system has failed both to share the data available in its database with other users (Cassidy, 1990) and to satisfy the requirements of its internal stakeholders (Irani et al., 2001) (DS7, DS10, SM1, SM3, SM6).

In describing how the MMOE could manage system tensions, Cassidy and Cresswell (1997) outlined three main issues namely goals and visions, organisation, and technology issues. In terms of the first of these, they emphasised the need to focus on clear goals within the organisation as opposed to open-ended discovery, models of professional educators versus technicians, awareness of threat and risk versus awareness of opportunity. Touching on the organisational issues, the main considerations were to focus on:- the hierarchy's needs versus focus on customers' needs; information reinforcing structure versus information subverting structure or promoting change; incremental change versus breakthrough change; and timeliness

versus reliability of data. Where technology is concerned, Cassidy and Cresswell (1997) stress the need for organisations such as the MMOE to examine the focus on:- machines or devices versus focus on human dynamics; the highest capacity system possible versus keeping it short and simple; all the bells and whistles versus only what is necessary to be effective; and maintaining a stable system versus letting go of obsolete systems. According to them, these considerations demand better understanding of what promotes success, and lie mainly with the leadership of the MMOE.

Goals and objectives are difficult to define (Riis et al., 2001), yet they seem to impinge on the smooth development of EMIS/SMPP in the MMOE. It is not easy to identify the need for change and to define an appropriate level of ambition. The objectives of developing EMIS/SMPP (see section 1.3c) in the MMOE were clearly set by the EMIS/SMPP technical committee, with the agreement of the ministry's top management prior to engaging external services. It was not too ambitious from the MMOE management point of view for EMIS/SMPP developers to make the system as *the* database for the MMOE, which can be utilised by users at all levels in education system, from schools up to the ministry level. However, it was too high an expectation for the developers to have this objective achieved within the second year of implementation, with the information needs of not only the top management but also of more than twenty divisions to cater for (DS4, DS11, SM5). The objectives of every division within the ministry differ, and the information needs of these divisions vary according to their work specification and the vision or objectives (DS5, DS6). For EMIS/SMPP to accomplish its objective, it was felt that there was still a long way to go (DS4, SM2, SM5). In an effort to satisfy the needs of users in other divisions, the system developers had to establish a balance between flexibility and complexity within the system. Aziz's (1997) study carried out at the EPRD, one SED and two DEOs in the state of Selangor supported this notion. His study shows that EMIS/SMPP was not used by any of the departments because it was too complex to operate and the database did not suit the departments' requirement in terms of harnessing up-to-date data.

The findings of this current study are consistent with those of Rodriguez-Diaz et al. (1997) and Hockey and Wellington (1990) on users' understanding of the system. The decision-makers were aware that among other problems encountered in implementing EMIS/*SMPP* in the MMOE were the lack of understanding of the implementation of the system (DS11), and, the lack of total commitment from the head of departments as well as the top management, in particular regarding the need to invest time in developing the system (DS8). What happens currently is that the system developers often have to struggle within the existing constraints; time, manpower, physical facilities, support from all levels, to mention a few, in order to improve EMIS/*SMPP* application so that it fulfils the expectation of the decision-makers. It was expected by EMIS/*SMPP* users that the system might provide the most current education information to the decision-makers and that it might cover information for the entire education spectrum. At the same time, the system also had to be acceptable and functional to all users at different levels in the education system where the needs of these levels were obviously varied. In order to achieve this, the system should then meet two requirements which are often in conflict. It must be sufficiently user-friendly, yet it must include all variables and possibilities to be used by top managers in making decisions (DS4, DS11).

The process of implementing EMIS/*SMPP* reflects the findings of Riis et al. (2001) where people especially the decision-makers were more concerned about achieving EMIS/*SMPP* objectives than the process of implementing it (DS5, DS11, SD3, SM3, SM4). After its fourth year of implementation, it is expected that EMIS/*SMPP* should already be able to provide all information needed to make decisions, and the MMOE should already have an integrated system accessible to users at all levels (SM2, DS10, DS11). The effective implementation of EMIS/*SMPP* today is impeded by a lack of understanding of the current functioning of the system, which does not, as yet, cover the entire education spectrum. Besides this, there is also a lack of understanding of the constraints in its development such as commitment and support from all levels, manpower, and infrastructure particularly at grassroots level (SD2, SD3, SD4).

The information retrieved from EMIS/*SMPP* has been used to produce Malaysia's demographic, economic and education indicators besides several World Education Indicators (EPRD, 2001). Hence, at present, EMIS/*SMPP* appears to be capable of providing information for planning purposes and as early warning indicators as suggested by Visscher and Wild (1997), but is still unable to support the operational needs of the MMOE (DS7, DS8, DS10, SM1, SM3, SM6, SM7).

1. Awareness and sensitivity towards the importance of data

It was claimed during the interviews that the awareness and sensitivity of users towards the importance of data particularly at grass roots level remained low. The decision-makers strongly felt that this was why EMIS/*SMPP* data did not receive optimum use.

One of the interviewees claimed that before the nation-wide implementation of EMIS/*SMPP*, heads of divisions did not seem to question the reliability of data provided by the EPRD for the top management (DS11). With the implementation of EMIS/*SMPP* there seemed to be an increase in awareness and sensitivity towards data among division heads (DS5, DS11) and this signals a positive change in the ministry. However, sense of awareness and sensitivity particularly at the grass roots level was still discouraging. The decision-makers felt that the administrators at that level were not mindful about the quality of data keyed in by the Data Teacher or the school clerk (DS5, DS11, SM1). The problem was a symptom of lack of understanding on the system functions among the school administrators and their limited involvement in prior system planning mentioned by Genus and Kaplani (2002), Rodriguez-Diaz et al. (1997) and Fung (1996). Should there be awareness on the importance of data among the administrators at the grass roots level, the interviewees felt that EMIS/*SMPP* implementation directive making school principals/headmasters or the senior assistants responsible for updating the school data in the system would have been adhered to (DS5, DS11, SM1, SM2).

5.1.2 Organisational/management issues

The issues in this grouping relate to those areas of the organisation and its management that the MMOE organisation has direct control over, and that are non-culture specific.

a. Human resource management

It was found from the interviews that decision-makers felt very strongly about the division of work between the administrators and professionals within the MMOE. The administrators believed that the management of ISs was their concern. Yet the professionals claimed that they too should be given the trust and opportunity to staff ISs, particularly when the system contained educational data which were more familiar to them than to the administrators. The interviews show that there was disagreement among the decision-makers about the rightful managers of ISs in the ministry.

The pertinence of additional support systems to the introduction of change in an organisation, as mentioned by Visscher & Wild (1997), is supported by Venkatesh (2000). Genus and Kaplani (2002) further recognise that managerial and human resource issues can shed light on the realities of operational management and technological innovation in any organisation.

The speed and force of change currently taking place within the operating environments of public and private sectors, manufacturing and service organisations have created a need for a much more focussed approach to management related issues. As a public organisation, the MMOE too has to adopt a more appropriate approach to dealing with issues such as human capital i.e. collective judgement, knowledge, experience and ability of all staff within the system (SM2, SM7). Although some, particularly the professionals, may not be recognised as IT or system specialists, their experience, knowledge and skill gained through informal learning and observation in such fields, possibly unavailable among IT specialists, may be useful in coping with organisational change. The professionals' skill and ability in

this area has been proven when in the 1970's educational data was processed on the mainframe using a system, *EPRDB4*, developed by the professionals in the Data Unit (*DS11*). Hence, it is important for the top management to recognise the human capital of the *MMOE*, regardless of whether they come from the professionals or the administrators group (*DS3*, *SD2*, *SM5*, *SM7*).

From the inception *EMIS/SMPP*, efforts have been made to provide as much support as possible to help users at all levels handle the system. In developing *EMIS/SMPP*, support staff, including external consultants, were made available by the *EPRD* to gain the confidence of other divisions in the system.

As Loeffen and Wortmann (2000) and Aziz (1997) stress, there is still considerable improvement needed in implementing *EMIS/SMPP* in the *MMOE*. Empowerment issues for instance, have long been mentioned by almost all top managers of the ministry, but little has been realised (*DS3*, *SD2*, *SD4*, *SM7*). In implementing *EMIS/SMPP*, a certain amount of empowerment needs to be given to the information officers at *SED* levels so that they may obtain reliable data from schools more efficiently. This is often hindered by the unwillingness of some school administrators to co-operate and the lack of authority of *SED* officers to impose directives on these administrators who at times occupy higher post grades than the officers themselves (*SD1*, *SD2*, *SD3*, *SD4*, *SD5*, *DS11*). Thus, *SED* officers are not able to get the message across to these administrators and the quality of data from these schools is nearly always questionable.

In the case of the *MMOE*, people at different levels and divisions have their own ways of looking at the introduction of *EMIS/SMPP*. These varied perspectives exist because most of them already have their own existing systems within their boundaries managing information pertinent to their levels and divisions. The divisions do not want to let go of the system, manual or computerised, that they have been using for so long, and are not willing to share with others the 'domain' they have been dealing and "no other system can provide what we need". In such

circumstances, there is little chance for anyone to impose a new system on these levels and divisions (SM1). The top management of the MMOE does believe, however, that in an effort to introduce an IS, the human aspect is the critical issue, whilst the technological system remains secondary (SM1, SM3, SM5).

b. Absence of manager of IT/ISs/change

Although not mentioned by the interviewees, it was implicit that all levels lacked experts to manage IT/ISs. One member of the top management, however, indicated that the MMOE did not have a manager of technology/change to cope with the introduction of ISs such as EMIS/SMPP. Three, meanwhile, suggested that the MMOE seriously needed a manager of system/databases.

One of the factors which makes the implementation of IT difficult, according to Crowe and Avison (1980) and Riis et al. (2001), is that organisations may have little experience in planning and implementing major organisational changes. Fullan (1993) claims that change is non-linear, loaded with uncertainty, and if people do not venture into this uncertainty, no significant change will occur (p. 24-25).

In the case of the MMOE, the introduction of EMIS/SMPP brought administrative changes to the ministry. The interviewees noted, for instance, that EMIS/SMPP seemed to have created some disagreements among the division heads within the ministry itself. The problems were due to the failure to understanding the concept of EMIS, which is a misnomer (see section 6.2.9), dissatisfactions about the management of the system by professionals (DS5, DS11, SM4) and resistance to the system at all levels in the education system nation wide. Other divisions are also seen to prove to the top management that they have a so-called system for obtaining the most current data. However what seems obvious in the MMOE is that it has neither a manager of technology nor a manager of change to manage the transformations that take place in the organisation (SM1). As mentioned by a member of the top management, most of the heads of the divisions do not have the experience, nor the theoretical background with regard to the management of

information, resulting in confusion over the introduction of a stable, effective IS in the MMOE (SM1). The introduction of EMIS/*SMPP* has, however, created a degree of awareness as to the importance of information among the division heads in the education system as a whole (DS5, SM5).

Thierauf (1984) has identified the second most significant problem in developing ISs in organisations as being the cost and complexity of a database management system. In order to minimise this problem, an organisation should have a database administrator or system manager to educate users as to database management. A similar problem may be observed in implementing EMIS/*SMPP*. It was highlighted in Thierauf's study that the absence of full time data or system managers at all levels becomes one of the main issues in the implementation of EMIS/*SMPP* (SM1). On a similar note, it was also mentioned by a decision-maker that there is lack of continuity in terms of people handling the system, particularly at the SED level (SM5).

The ability of the existing EMIS/*SMPP* to collect, maintain, and supply relevant, reliable and timely data and information to educational planners, researchers, analysts, and decision-makers has not kept pace with the continuing expansion of the education sector (DS11, SM2, SM8). Presently, interest in improving existing education ISs has been increasing. Computer-based ISs, particularly integrated systems, are viewed as critical to more efficient and effective delivery of education (DS6, DS8, SM1, SM3, SM6, SM7, SM8). The absence of a system manager, meanwhile, serves as one of the main hindrances to the development of integrated IS in the MMOE (SM1, SM3, SM7, DS6). This particular problem is exacerbated by administrators' lack of keenness in allowing professionals to manage the system (DS5, DS8, SM5).

c. Single division initiating and manning the system

Thirteen decision-makers were aware that it was difficult for the EPRD to manage the EMIS/*SMPP* single-handedly without co-operation and involvement from other division heads and people at all levels.

Riis et al. (2001) state that a further factor that hinders the smooth implementation of ISs/IT in an organisation is the presence of inertia with regard to setting a change process in motion. Because of the complex interplay between sections and departments, it is difficult for a single department to initiate a given process.

It is known to all divisions in the MMOE that the EPRD has been given the responsibility to develop EMIS for the whole ministry. Nevertheless, being one of the divisions in the ministry without any superior authority, it is not easy for the EPRD to impose their will on others with regard to optimum use of the system (SM4, SM8). The resistance towards EMIS/*SMPP* seems less intense. However, divisions continued to collect data from schools at all levels i.e. schools, DEOs, SEDs and MMOE divisions; development of separate and different systems to cater for their own needs although some of the information required could be retrieved from EMIS/*SMPP*.

In developing EMIS/*SMPP*, the system developers took into consideration elements of the developments projects model; the background of the organisation, the initial phase of the IS, the development/implementation stage of the IS, and the dissemination of information, which also served as the basis for the study carried out by Riis et al. (2001).

In terms of background, the organisation history should be included in planning new development initiatives. In the MMOE situation, studying the development of ISs (manual and computerised), reflecting on successes and failures of other systems, and examining the reasons why some of the long-existing systems are not

functioning effectively served as a strong foundation for the development of EMIS/*SMPP* (SM1, SM2).

In the initial phase of introducing ISs, it pays to gain broad acceptance of the need for change. According to one senior manager, it is normal in public organisations in Malaysia, when the government is going to implement a system, for there to be no meeting with the staff to explain the system and what is expected of the users. People are, thus, often caught unaware, and are ill prepared for the change to take place. As a result, they become sceptical about the system and frequently they are alienated long before it is implemented (SM1). Such practice is in contrast to what has been mentioned by Fullan (1991). It is essential that the management know the perspectives of stakeholders with regard to the change to be introduced, in order to understand their reaction towards the change. Indeed, the views of these individual situations must be combined with an understanding of organisational and institutional factors that influence the process of change at each level in the education system.

At the initiation stage, meetings about EMIS/*SMPP* were regularly held to announce the introduction of the system to all levels in the education system. Consultants, the MMOE top management and other officials involved shared their views and concerns about EMIS/*SMPP* during the consultants' visits to the ministry. During this time, the steering committee, *JMPK*, succeeded in establishing support and encouraging work relationships between all levels and divisions in the MMOE (DS4, DS10). Here, division heads and SED directors seemed to welcome the idea of introducing EMIS/*SMPP* in the MMOE.

The development/implementation phase involved the creation of a collaborative vision of the future solution. Structurally the MMOE is made up of several levels and divisions or departments. These levels and divisions obviously need to work together to ensure the smooth flow of information both vertically i.e. between levels, and horizontally i.e. between divisions or departments in the ministry, and to avoid

duplication of work, particularly when collecting data (DS8, DS9, DS11, SM1, SM4, SM7).

Since it was implemented nation-wide in 1997, the EPRD, as custodian of EMIS/*SMPP*, has gone through bottlenecks in terms of human resources, finance allocation and gaining people's support and commitment, to mention a few, in order to accomplish the objectives of developing the system. Since the ministry is a very large organisation, with a dynamic turn-over of officials and top management involved when projects are initiated, the EPRD has to work all the harder to convince people of the capabilities of EMIS/*SMPP* (DS11). Concerns about EMIS/*SMPP* and other existing systems in the MMOE were discussed in the *JMPK* committee meetings. With continued co-operation and support from the division heads, it was then possible to develop a vision that might serve as a guideline in integrating the different information needs of various divisions and conveying the idea of an integrated system to a larger group of users (SM1).

Dissemination of information is a crucial factors in determining the success of ISs/IT in organisations. Through the researcher's observation, in the implementing EMIS/*SMPP*, the most commonly adopted method of disseminating the progress of the system is through meetings. Among the objectives of these meetings are reducing uncertainty among people about the introduction of change, i.e. the implementation of EMIS in the MMOE which may well affect their working conditions, and overcoming resistance amongst users at all levels. Thus, as Riis et al. (2001) suggest, EMIS/*SMPP* developers often resort to dialogues and discussions with those at the grassroots level, that is, the primary providers of EMIS/*SMPP* data. Until now there have been monthly meetings among the heads of SEDs Information Unit and the EPRD officials. During this meeting, the former are updated with the latest development of the system and verifying mechanisms and further discussions about the implementation of the system at grassroots level are held (DS11). However, there is little discussion and dialogue with division heads and the top

management of the ministry, whose commitment and support are crucial to allow EMIS/SMPP to function effectively at the MMOE level (DS5, SM1, SM8).

d. Organisational culture and structure

Three decision-makers believed there was a need to restructure the MMOE organisational hierarchy to reduce the bureaucracy that was felt to contribute to the slow development of ISs in the MMOE. These three interviewees believed that organisational structure of EMIS/SMPP required a reshuffle to accelerate its development and facilitate implementation.

Most organisations have definite departmental boundaries and divisions of formal responsibility. With the introduction of MIS, changes to these boundaries will occur (Crowe and Avison, 1980). By conducting an organisational analysis, Riis et al. (2001) were able to understand the organisation's infrastructure, operations, and subsequently, develop data model to design database processing requirements and file structures for the organisation and organisational strategy set which should coincide with the organisation's business plan and policy. In designing EMIS/SMPP, most of the initial organisational study, which included interviews with executives and observations of organisation's operations, was carried out by external consultants and a number of senior middle management officers. The time constraint faced by EMIS/SMPP developers and consultants, and the movement of senior officials involved, both to other departments in the MMOE or to other ministries, created a gap in the knowledge of what had been done previously and also the continuity of the work process (SM7). The result of one such analysis carried out by the consultants i.e. the needs assessment among the MMOE top management, was still a question to the top management (SM3) as well as system developers even after the consultants completed their task in the ministry.

As in the development of EMIS/SMPP, the activity of identifying the organisation's business functions and identifying the potential computer application needed to support the processes to be computerised, and developing an application profile were

carried out during *EMIS/SMPP* meetings. Nevertheless, there were setbacks in having these activities done during meetings. Firstly, the divisions involved in the meeting were limited in number and they were then chosen on the basis of their high utilisation and request of information from the EPRD. Secondly, representatives from these divisions were not regular, meaning different officers turned up at each meeting held. And thirdly, there were often time constraints regarding the secretariat's conducting of surveys during the meetings. Alternatively, the representatives were requested to contact the secretariat with the required input, and almost always, the latter found it very difficult to gain full support or response from all divisions in such practice (DS11).

The major issues highlighted by the interviewees in the researcher's study are in line with the factors in the framework of analysis used by Visscher and Wild (1997). These authors' last factor, also advanced by Avgerou (2001), remains applicable to the introduction of IS in the MMOE, where the context within which *EMIS/SMPP* is introduced is one which is indeed very complex (DS6, SM1, SD4, DS9, DS11, SM4, SM6, SM7, SM8). The complexity is due to the fact that the structure of the Malaysian education system comprises four different levels for the majority of the states, but three for others, as explained in Chapter 1. Moreover, each level, except that of the school itself, comprises separate divisions and/or units, which perform completely different tasks. Because of this complex structure, a large number of people will be involved particularly when a change such as the introduction of EMIS is brought into the organisation. As such the EPRD in general and the Data Unit in particular have to undertake the tasks of orienting people's minds and securing the head's confidence so that the *EMIS/SMPP* can be effectively developed.

With proper implementation, Visscher and Wild (1997) have explained that the use of management ISs in educational institutions could lead to more efficiency and effectiveness where it could provide information to match specific organisational and functional needs. This particular function of IS was indeed one of the objectives of setting up *EMIS/SMPP* in the MMOE (EPRD, 1997). However, with the wide

education spectrum of the Malaysian education system, EMIS/*SMPP* has not reached the ability to provide information for organisational and functional needs of each division in the MMOE (DS11). This is merely due to the reason that functional needs of the MMOE on the whole are very varied and diverse (DS4, DS5, DS6, DS11, SM5, SM8). For EMIS/*SMPP* to be able to achieve this objective, EPRD would need the full backing in terms of manpower, financial, technical support and commitment from all divisions as well as heads of divisions and top management alike (DS4, DS5, DS11, SD2, SM8).

e. Additional workload for DEO officers and Data Teachers

During the interviews, a further issue, namely that of the implementation of EMIS/*SMPP* creating an extra workload for the DEO and Data Teachers with EMIS/*SMPP* data collection was raised. Although there was a suggestion from the professionals that the teaching load of Data Teachers was lessened, the administrators seemed to disagree. The latter voiced their concern that whilst teachers were expected to teach, they were at the same time directed to do tasks, such as collecting and updating data, that they were not trained for.

According to Watson (2001) one of the principles underlying the success of IS implementation is the extent to which IS use is determined by the degree to which it improves task performance. The results of the computerisation in the MMOE, however, remained unclear in terms of whether they were task-assisting or task-altering. The implementation of EMIS/*SMPP* at a grass roots level seemed to contradict the principle above. It was a common cry, for instance, that DEO officers and Data Teachers were burdened with extra workload when they had to manually update the data in the system due to the absence of on-line application (DS8, DS11, SM1, SM5, SD4).

f. Absence of information/IT/ISs policies and unimplemented system implementation directives

Two of the senior managers agreed that the absence IT/IS/information policies in the MMOE led to the constant misinterpretation and ignorance of directives at the grass roots level. The decision-makers felt that, to make matters worse, the management was not particularly serious in seeing that the directives on the implementation of ISs were adhered to.

For any computer-based IS to work effectively, the top management of an organisation must agree to the pertinence of setting a clear policy on the management, maintenance, evaluation and the utmost utilisation of the system (Cassidy, 1990, Hockey and Wellington, 1990).

A Management Information Technology (MIT) report: *Planning, Installing and Using Information System* (1991) states that when introducing a new system, everything changes and everything must be considered anew. To adapt a new system to people involves far more than designing a good human-machine dialogue. Furthermore, it takes much planning and above all, much understanding and communication. For this to happen the report suggests that the top management has to formulate a policy concerning the new system for as mentioned earlier, the top management has a strong influence on the attitudes and behaviour of others in an organisation. Similarly a FEU report (1987) has recognised the compatibility of hardware and software within an organisation as an important issue, as it would allow some standardisation of approach. An organisation-wide IT policy should be drawn up to serve as a guideline for managers/administrators, developers and users alike to follow the introduction and implementation of IT within the organisation. From the start, equipment and software or applications should be bought or developed with the considerations mentioned in the policy in mind. The guidelines can therefore not only suggest applications for IT that require funding, but also indicate how to spend funds to maximum benefit and the appropriate procedures of executing the system.

One of the flaws in implementing EMIS/*SMPP* is the translation of policies and directives. The interviewees suggested that such implementation should be looked into more seriously. There should be a monitoring mechanism to ensure that the policies and directives are observed by the implementers. These policies and directives should be implemented successfully, though there are bound to be many other emerging problems the management will have to face as the result of their implementation (SD2). An example of such an unimplemented directive is the need for teachers on transfer to take along with them the diskette containing personal data/information to new schools. Although the directive has been printed and circulated to all levels in the education system it is still not observed by school administrators and teachers for reasons unknown to the policy makers (SD4).

g. Utilisation of data

It was revealed during the interviews that the utilisation of EMIS/*SMPP* data among the decision-makers and users at the grass roots level was not encouraging. There were two contributory factors in this regard: the decision-makers felt the system was not able to provide useful input for decision making, and the grass roots level believed that the system was meant for decision-makers.

Although the necessary data was available in the system, several school administrators opted for a headcount of teachers in their schools whenever there was a request for number of teachers from the top management. This proved that they were not aware that EMIS/*SMPP* database could be useful to them for their daily administrative purposes (DS2, DS11, SD1, SD2, SM2).

With the prime objective of the IS in mind, namely to inform decision-makers, both database managers and the management should play their roles effectively (Mumford, 1972; Mehra 1981). However, what seemed to happen in the MMOE reflected the study of March in Paton et al. (1984) where decision-makers and organisations did not use the information gathered, asked for more, and ignored it (see section 2.2.18). Indeed, the MMOE seemed to continue collecting massive

information that had little or at times no bearings to decisions due to numerous ad-hoc projects and requests from the top management (DS3, DS5, DS11, SD1, SD2, SD3). Very often the top management found that the requested data was unreliable and inaccurate because the data did not seem to offer immediate solutions to their problems (DS5, DS11, SM7, SM11). This seems to contradict Drucker (1955) who claims that decision-makers do not necessarily have all the facts to make good decisions. The management has to be cautious of the possibility to collect more information than it can use to advantage (Elbourne, 1914; Drucker, 1955).

5.1.3 Technical issues

Technical issues are those related to IT and systems management, including the procedures and processes involved in the development and implementation of ISs. The issues are non-culture specific: being correct and acceptable in one setting means it is also correct and acceptable in another.

a. Pre-system planning

The decision-makers unanimously agreed that pre-system planning was the most crucial stage in any IS implementation. They claimed that EMIS/SMPP planning was not comprehensive, and that this contributed to its failure to provide data to the MMOE decision-makers.

Inadequate pre-systems planning, as identified by Thierauf (1984), is seemingly one of the problems that affects the smooth development of EMIS/SMPP (DS5, DS6, DS8, DS10, DS11, SM1, SD2, SM2, SM3, SM6, SM7, SM8). Although during the analysis and design stage, every possible issue was taken into account to produce an IS envisioned in EMIS/SMPP objectives, it was later realised that the users' expectations were far beyond the capability of the system designed (DS4, DS5, DS11, SM7). Due to its inability to fulfil their needs, the users then found EMIS/SMPP to be less functional and unable to perform as an effective IS (DS8, DS10, SM1, SM3, SM6).

It was observed by the interviewees that recruiting qualified and committed technical or professional personnel is not so much a real difficulty for the MMOE, as it has its own division responsible for computer and information services whereby the staff comprise administrators, computer specialists and other technical people (DS3, DS5). On top of that, there are also personnel from other professional divisions who have adequate computer knowledge, skills and the associated ability to manage ISs. The main problem in developing effective ISs in the ministry seems to be the ability of these two groups; administrators and professionals to work together, trust each other, and compromise in performing the task of developing ISs for the MMOE (DS5, DS6, DS7, SD2, SM5, SM7, SM8).

b. Integrated IS

The interviewees seemed to be more enthusiastic about having an integrated IS so that they could gain access to any data/information they required for decision making. They raised concerns as to EMIS/SMPP failure to fulfil their information needs and envisioned the development of an integrated system, where all the existing separate and isolated ISs in the MMOE were merged or linked to form a comprehensive EMIS for the MMOE.

Heeks' (1987) findings from a study involving academic staff, as well as the administrators of a learning institution, are similar to those found in the MMOE though the work nature of the two organisations may not be similar. Although the use of computers in these two settings may differ, the aim of introducing computers within organisations is comparable to developing an integrated computerisation system in order to enhance the information flow in the organisation.

One of the primary objectives of setting up EMIS/SMPP in the MMOE is to coordinate all efforts in collecting educational data into an integrated system (EPRD, 1994). EMIS/SMPP should enable the merging of all information sources related to educational planning and management activities, and then supply the data in a format

that is easily comprehensible and used by end users, particularly the policy brief writers and the decision-makers (DS4, DS6, SD1, SD2, SD3, SD5, SM5).

However, the rapid movement of education personnel creates an environment where it is not easy to develop a complete system that could cover the entire spectrum of education systems (SM5). The dynamic movements involve people transferred from one school to another and one division to another, people taking leave (possibly paid and unpaid) and pursuing study abroad and locally. These movements must be captured in time, and this determines the kind of IS to be developed within the MMOE and other levels so that the management could capture these activities every day and then utilise the integrated method before making related decisions (SM5). When rigid procedures and paper work are involved in the movement of personnel it makes it difficult for a system such as *SMS* to capture these changes. Nevertheless, *EMIS/SMPP* is able to record such changes because its data entry is done on certain dates and schools are to update the actual data of the school as of the particular dates in the system (DS5, DS11).

c. System analysis/evaluation

Although many decision-makers interviewed touched on this aspect, none mentioned it as technically as the authors in the literature (see Table 2.4). It was clear that the interviewees' main concern was for *EMIS/SMPP* developers to improve the capability of the system so that it could produce output to the level of their expectation.

As far as *EMIS/SMPP* is concerned, it is perceived that no particular system evaluation has been carried out to evaluate the effectiveness and efficiency of the functioning of the system (DS6, SM1). What has regularly been done is to build on or make necessary changes to the existing programme to fulfil the needs of decision-makers at different levels (DS11). Hence, it is rather inappropriate for the MMOE top management to place a high expectation on *EMIS/SMPP* to cover the whole spectrum of the education system, and to produce the most current information

during its early years of implementation. What is needed on the part of system developers is the opportunity and support to re-evaluate the effectiveness of the system after every data collection cycle, before it can be developed to cover a wider scope of educational information (DS5, DS6, DS11, SD2). However, the analysis in terms of describing, identifying and tracing every element of data in the total system is carried out annually when the Data Unit officers meet the SED and DEO information officers, as well as the data teachers during the verification of data meeting.

Having carried out the suggestions put forward by Jones (2002), one can be sure of the smooth functioning of an IS as soon as it has been implemented on a full scale. However, it is unfortunate for the MMOE that such ideas were not given serious consideration. The understanding of the working of EMIS/*SMPP* is restricted to the circle of its developers, several officers of EPRD, SEDs and DEOs, and certain officers of the Data Unit in the EPRD. Considerable efforts were made to deepen users' understanding of the system, particularly those at the grass roots level, but it was observed by the researcher that very little was or rather could be done to disseminate the idea to the decision-makers. As has been observed during the initiation stage of EMIS/*SMPP*, there have been formal paper prototype systems being circulated during meetings with the external consultants as well as during the *JMPK* meetings. Nevertheless there has not been any actual working model piloted prior to its implementation.

Ironically, before the success of EMIS/*SMPP* could be determined the MMOE management gave approval to the introduction of another system specifically designed for the use of smart schools throughout the country called Smart School Management System (SSMS). The SSMS is yet another newly introduced system containing quite similar information to EMIS/*SMPP*, with some modifications and additions, implemented at smart schools level. One of the heads of divisions claimed that SSMS implementation is 'a necessary transition' where ISs in the education sector is concerned (DS8). Although the administrators of the MMOE believed that

this system may be able to produce better output in terms of educational data for smart schools (DS8, SM3, SM6), the educationists on the other hand found the system redundant with the existing EMIS/*SMPP*... “Now, like the Smart Schools they have their own system, SSMS, but we cannot link to it. So, you see the problem is they can’t service us, and we still have to go to them and collect data from them. Meaning that now they have two systems to update. But if they could provide us the data then our problem is solved and we don’t have to go to schools to collect data anymore. SSMS is meant for schools not DEO, SED or the ministry. It’s meant for school administration but it’s not linked to other schools either” (DS11).

Until the time of this study, EMIS/*SMPP* developers used no specific tools or programmes to evaluate the system. System evaluation is very much dependent on the feedback gained from users at SED, DEO, and, school levels (SD1, SD2, SD3, SD4, SD5). Their feedback enables EMIS/*SMPP* applications to be improved to suit the needs of the users. Besides this, serious notice is also taken by system developers of comments and remarks on EMIS/*SMPP* made by top management and division heads made during meetings (DS4, DS11). However, it is discouraging to discover that the MMOE still lacks cross-divisional collaboration as well as feedback loops and dissemination channels particularly at division level in the ministry. Several division heads (including some of those interviewed) remain unaware that certain information which their officers hand to them as input for meetings or for making divisional level decisions comes from the EMIS/*SMPP* database. This proves the importance of working together and the need for a thorough discussion of the exchange of information between workstations internally, as argued by Serafeimidis and Smithson (2000), Willcocks (1994), and, Riis et al. (2001) to be inevitable. It seems evident that the management are clearer about the desired results and objectives of the project than the methods to be used to obtain the results, as occurs in the MMOE. The lack of any feedback channel, very little communication among people in the organisation pertaining to ISs management, and the lack of system evaluation, seem to contribute to the poor reception of EMIS/*SMPP* among the decision-makers in the ministry.

There is a complex relationship between IS evaluation and organisational change (Ciborra and Lanzara, 1994; Jones, 2002 and Irani et al. 2001). Firstly, individual evaluation should consider the organisational changes resulting from the introduction of IS. Secondly, the evaluation itself may cause organisational change as the final recommendations may imply further changes in the allocation of resources, the structure of the organisation, the roles and tasks of various groups of people and, consequently, the overall balance of power within the organisation. With the current formal and highly bureaucratic structures and culture firmly established in most public organisations in Malaysia such as the MMOE, new options of IS evaluations were unlikely to attract support easily. Such major changes are sources of satisfaction and dissatisfaction, and the object of internal political conflict in the ministry (DS3, SM7).

d. Training, exposure of users to EMIS/SMPP and marketing of the system

The decision-makers interviewed were aware that EMIS/SMPP training was an on-going activity, and that there was training for those doing data entry as well as for trainers themselves.

One of the most crucial factors involved in the successful introduction of computer-based ISs in any organisation is the education and training of staff (Bentley, 1981; Heeks, 1987; Visscher and Wild, 1997; Hockey and Wellington, 1990). Disregarding the importance of the communication, education and training of people involved has significant implications for successful installation even for a well-designed system (Brooks, 1972; Bikson et al., 1985). Fuerst and Cheney (1982) and Drew (1994) suggest that training should encompass both general and specific application systems. Similarly, Baharudin (2000) found there was a significant positive correlation between users' education and training and the success of computerised system application in public organisations in Malaysia. Aziz (1997) suggests that the responsibility of conducting training in the implementation of IS in the MMOE should be entrusted to the respective education department.

Ever since the system was implemented nationwide, training of officers at SEDs and DEOs, and teachers as well as supporting staff at school level have been made an on-going activity for the Data Unit (DS4, DS5, DS11). Training for the data entry personnel was usually carried out at the respective SEDs, where the clerks or the Data Teachers in the particular state would be called to attend sessions for keying-in and verifying data of their respective schools. Over time, this effort has succeeded in improving the quality of the data provided by schools. The training of trainers on the other hand could often not achieve its target because the participants sent for training were almost always those who were not involved with the use of the system in their work place. Even if they were, they occupied the lower grades and had little authority to tell the department or school that in-house training should be conducted so that they could disseminate the knowledge gained to others. The setback of this phenomenon was that new knowledge was not spread organisation-wide, and the same errors would recur in the next data collection exercise due to poorly trained data checkers (Cassidy, 1994).

As for the supporting staff in the Data Unit, SEDs, DEOs and schools, support from trained EPRD, SED and DEO officers was provided as they went through EMIS/*SMPP* training organised by the division. However, the training or exposure to the system for the top management at all levels in the education system was lacking, namely the school headmasters/principals, the SED directors, heads of MMOE division/department and the MMOE top management (DS5, DS9, DS10, SD2). With such exposure, the entire organisation will have better understanding as to the functioning of EMIS/*SMPP* and hence would have a different perception and expectation of the system (Walker, 1968).

e. Availability of appropriate machines and supporting facilities

The interviewees indicated that the decision-makers were unhappy with the provision of basic supporting facilities, particularly at the grass roots level. They argued that this was one of the main factors affecting the smooth implementation of ISs in the entire education system.

Literature on the implementation of MIS in both public and private organisations shows that the availability of standard equipment; hardware and software, are necessary for the reasons of consistency, quality and compatibility (GIS Development Guide, 2000; MIT report, 1991; Bentley, 1981; Heeks, 1987; FEU, 1987; Rodriguez-Diaz et al., 1997; Wright, 2000). The literature states that the compatibility of hardware and software is a crucial factor that should not be taken for granted for any organisation intending to implement computer-based IS.

According to Heeks (1987), physical problems include lack of hardware, lack of sufficiently powerful hardware, lack of portability, and the incompatibility of different machines. The FEU (1987) recognises the compatibility of hardware and software within an organisation as an important issue and will allow some standardisation of approach. Rodriguez-Diaz et al. (1997) reveal that one of the major barriers to the spread of a system has been the inappropriate selection of the appropriate technology i.e. the choice of hardware and software, which has a major bearing on the acceptance of a system to suit executive demands. Visscher and Wild (1997) mentioned that there should be sufficient IT facilities which would make the system easily accessible by users throughout the organisation where the system is implemented.

The procurement of equipment in the MMOE to support the implementation of EMIS/*SMPP* came in stages. At the initial stage, when EMIS/*SMPP* was first introduced nation-wide, the SEDs and schools were already supplied with computers by the CSD to support the *SMS*. However these machines were linked only to the CSD. With the implementation of EMIS/*SMPP* the grassroots were provided with stand-alone computers to run EMIS/*SMPP* applications. At that point of time the machines provided were sufficient for the schools to update EMIS/*SMPP* data and then send the diskettes to the respective DEO and SED for verification. Similarly the SEDs have the machines to validate the data sent in by schools under their jurisdiction.

However, when there is higher expectation from decision-makers of the accuracy of educational information, the idea of electronically linking up schools to SEDs and the ministry was given very serious consideration. Schools and SEDs were provided with computers. Nevertheless there are other constraints and problems that have not been addressed seriously, like the availability of basic physical facilities in schools. There are schools without electricity supply and no telephone lines (SM1, SD1, SD4, SD5). Besides, there are also problems of the malfunctioning of systems supplied to schools, lack of maintenance and monitoring of hardware and application provided (SD1). Schools have very limited budget allocations and most do not have the privilege of spending even a small amount on maintenance of computers (SD3).

f. System manuals and documentation

From the perspectives of the decision-makers, the system developers were responsible for the absence of a complete EMIS/SMPP manual and documentation. With the high turnover of staff, they strongly felt that system manuals should be made available at any time, to ensure continued and effective system management.

In order to minimise the problem of failures in the development of ISs in organisations, Thierauf (1984) has mentioned providing adequate database management documentation. According to Mark & Judy (1994) and Mirel (1998), developers should provide sufficient documentation to users to enable the latter to make reference to them. System manuals too serve as a guide and support for people under training (Bentley, 1986; Li & Chen, 2001). A point to consider in preparing system manuals or documentation is that they must be concise, readily changeable, and independent of any particular information technology, so that they can be evaluated and updated at least once a year (Li & Chen, 2001).

In implementing EMIS/SMPP, the intention was that there should be a production manual and instructional materials for 150 training centres. The instructional material would be prepared by the EPRD, and would be likely consist of the following:

- EMIS/*SMPP* concept;
- A code book;
- Data variables and definitions;
- Sample collection forms;
- Procedures and schedules for updating EMIS/*SMPP* data;
- EMIS/*SMPP* application manual;
- A log book;
- Application diskettes;
- A data verification manual;
- A data verification application module;
- A statistics book;
- Training programmes and schedules (EPRD, 1999).

Although some of the above materials have been produced, they did not incorporate any latest changes. Indeed, a definitive EMIS system manual containing the overall system documentation, programme documentation, database documentation, system administrator documentation, and network administration documentation (Mark & Judy, 1994; Mirel, 1998) is still far from complete. Furthermore the dissemination of the materials produced is not widespread. Hence, users often lack reference material (DS7). One of the weaknesses of EMIS/*SMPP* is that people, particularly the top management, are not exposed to the system and it lacks effective documentation for people to study the system on their own (DS9).

*g. The EMIS/*SMPP* business cycle*

The interview findings revealed the decision-makers' awareness that the organisation comprised several levels, contributing to the prolonged EMIS/*SMPP* business cycle. However there was a contradiction among the interviewees on this issue where three of them felt that the delay in the cycle was due to the improper data collection mechanism adopted.

As mentioned by Dalin (1973), implementing change in large organisations, such as education, requires time. This is a time consuming process that needs to be repeated many times when the change typically involves the performance of the smallest organisational unit, which (in the case of education) is the school. Obviously, the time frame varies significantly according to the objectives of the projects and projects designed to change the educational objectives, organisational structure, and professional roles typically take longer to accomplish.

Thierauf (1984) supports Dalin's point of view regarding the time constraints experienced by top management. According to the former, top management should be closely associated with MIS from the start to ensure a high computer pay off. However it is found in the MMOE that the top management unwillingness to spend the time required to follow through MIS development phases in their organisations contributes to poor MIS performance (DS5). The significance of the presence of a committed, informed executive sponsor with a realistic understanding of the capabilities and limitations of the system, and who values the system enough to spend considerable time and energy in guiding its development, is further highlighted by Rodriguez-Diaz et al. (1997). Drucker (1955) claims that useful information is often hidden in a mass of irrelevant data. Trying to define which information is of value, and which is not, is a difficult and time consuming task and the top management is unaware of it, or perhaps not interested in knowing such information (DS11).

Implementing the system is just the beginning of many phases in the development of MIS. There is, thus, a process of evaluation which concerns how the evaluation is carried out i.e. the methods and techniques used to mediate it and the way it plays itself out over time. This is an important process, as the outcome of the evaluation provides information to the system developers as to the success and impact of the system on the organisation (Farbey et al., 1993; Walsham, 1993). The pertinence of system evaluation is also discussed by Cassidy (1990), Riis et al. (2001), Irani et al. (2001), and Ross (1970). These authors suggest that not all IT/IS introduced in an

organisation could produce the output expected by that organisation's management and Irani et al. (2001) argue that the system needed time to 'settle down' before efficient and effective IT processes could be achieved.

There are opinions among the decision-makers in the MMOE that the EMIS/*SMPP* business cycle is too long, so much so that by the time the data is validated, it is no longer current (SD1, SM2, SM4, DS11). Rightly, the top management in the MMOE need to consider seriously the views of the authors discussed above. It is a well-known fact that data management is tedious in nature, and as in the case of the Malaysian education system, it cannot be a one-man show (DS11). Rather, it involves many people, from the ministry down to the large number of primary data feeders, that is, the schools themselves. Hence, it is easy to perceive that EMIS/*SMPP* requires time for the system developers to improve the system, to meet the demands of users at all levels and to verify the educational data before the system is able to settle down.

*h. Quality of EMIS/*SMPP* data*

The most outstanding issue in the discussion of EMIS/*SMPP* was its data quality. It was seen from the study findings that decision-makers were dissatisfied with the quality of EMIS/*SMPP* data. This resulted in scepticism and a rejection of the system among the decision-makers. However there were decision-makers who strongly felt that the EMIS/*SMPP* data did provide useful input in their decision making processes.

The decision-makers interviewed agreed that information was needed for planning and management purposes at all levels in the education system (SM1, SD3, SM3, DS10, SM4, SM6, SM7). Educational data provides feedback on how to improve and evaluate a particular activity. The prerequisite of making good decisions is through the use of information. Reliable, comprehensive and timely data is essential for effective educational planning, and this reliability of data depends on its validity and timeliness (SM3, SM7, DS11). Thus, the availability of comprehensive, reliable

educational information and the effectiveness of educational development and management will be made possible through the use of EMIS/SMPP. This objective can only be achieved when the decision makers are able to prioritise their information needs, as set against the abundance of educational information available, and are willing, rather than sceptical, as well as able to use the information provided in their decision-making processes (DS4, DS5).

In theory, decisions are made after full examination of the relevant information and the prevailing circumstances: in reality, however, many decisions are taken with whatever information happens to be available at the time (Drucker, 1955). To ensure IS meets the management's needs, information must be available when a decision is made. This highlights the importance of the timeliness of information flow.

Many people in top management, particularly in commercial organisations, are finding that information is a source of competitive power. It gives them the ability to make decisions so as to out-manoeuvre their rivals at critical times. This seems to be a familiar scenario among the divisions in the MMOE, whereby the top management are often provided with conflicting information on the same issue by different divisions, and ironically, from the same database i.e. EMIS/SMPP database either in the EPRD or the SEDs (DS5, DS11). With regard to this, it might be worth considering March's (1984) comments:

It is a common occurrence that we see decision makers as perversely resistant to advice and information. In fact much highly regarded advice and much generally accepted information is misleading. Even where conflict of interest between advice givers and advice takers is a minor problem, advice givers typically exaggerate the quality of their advice; and information providers typically exaggerate the quality of their information. And, decision makers seem to act in a way that recognises the limitation of 'good' advice and 'reliable' information (pp.97).

Although the decision-makers strongly feel that EMIS/SMPP data is inaccurate and unreliable, it has nevertheless been used internally for projection purposes (DS5,

DS11) and externally, providing the OECD, for the world education indicators (DS11; EPRD, 2001).

There are clearly many significant trends which are likely to affect the development and deployment of technology in the years to come. One such trend, and the most frequently mentioned by the top management, was the increase in 'real time' management, where one of the aspect of this is the use of computers to identify bottlenecks, delays, and problems before they become serious. In other words, the information retrieved from the IS in the organisation should serve as an early warning indicator system to alert the management to the likely favourable or unfavourable consequences. Although information has long served as an indicator to the development of the education system in the Malaysia, real time data for real time management in education system seems a long way ahead, as the collection of data is still on a periodic basis. For such a system to function, there has to be a total commitment from the top management, continuous support in terms of human, material and financial resources, and the adoption of two-way communication between the technology specialists and the professionals in the MMOE. However, in the case of the MMOE, one member of the top management revealed that at this point in time, the ministry does not really require such real time data for planning purposes (SM5).

i. Scope of EMIS/SMPP data

There were mixed views among the interviewees about the scope of EMIS/SMPP data collected by the EPRD. It was highlighted by one of the decision-makers that the large amount of data collected by the EPRD through EMIS/SMPP application was considered to contribute to the problem of data timeliness (DS6). Nevertheless on the contrary, there were other decision-makers who claimed that the scope of EMIS/SMPP data was limited in nature and hence the system was not comprehensive enough to serve the needs of all divisions (DS8, SM4).

j. Interpretation of terms and coding system

The interview findings showed that the decision-makers were aware of a serious problem of non-standard interpretation of terms and coding system used in the existing ISs in the ministry. They had no doubt that this issue was one of the causes of them receiving conflicting data from different divisions.

A related issue to the crucial need for system manual/documentation is that of the standardisation of the interpretation of terms, which should be one of the components of a complete system manual. The lack of consensus as to data definitions and lack of agreement as to a standardised coding system were two of many threats to data quality (Cassidy, 1994). Regardless of the number of IS available within an organisation, all systems should conform to standardised codes and interpretation of terms. In so doing, information produced by one system will not conflict with similar information produced by another. The advantage of using standardised codes is it will help to ease the process of merging when the need to integrate systems arises.

It was evident from the interviews that the two threats mentioned by Cassidy (1994) led to the problem of EMIS/*SMPP* data reliability. EMIS/*SMPP* had its own list of codes and interpretation of terms, which may or may not be the same as those in the *SMS* (*BPPDP* & *BSM*, n.d.). As a result, there is frequent disagreement as to the interpretation of terms and conflicting figures when the same information is extracted from both systems (SD1, SD2, SM8). Nevertheless the preparation of a standardised code book for both EMIS/*SMPP* and *SMS* was underway when this study was carried out (SM4, D11). It was believed that there would be few changes to make in a EMIS/*SMPP* code book should the system developers have used most of the codes in the *SMS* during the former initiation stage (DS6, SM1, SM2). However, the effort seems to be a positive move in reducing conflicting information output for decision-makers within the MMOE.

k. Compatibility of technology

A further technical issue that the interviewees were concerned about was the compatibility of IT as used to support ISs. This was found to be one of the issues that impede the implementation and use of EMIS/SMPP organisation- and nation-wide.

Organisational standards, particularly in communications, are very important to link systems and for the design and development of computer equipment and software (Rodriguez-Diaz et al., 1997). Standards are essential if systems are to be consistent and compatible and if they are to produce high quality results. Standards provide the basic rules that lead to high quality and also provide a way in which performance can be assessed (Irani et al., 2001). Machines and equipment must be compatible before they can be linked. The compatibility of hardware and software is a crucial factor that should not be taken for granted for any organisation intending to implement computer-based information system (Bentley, 1981; MIT report, 1991; Visscher and Wild, 1997; Rodriguez-Diaz et al., 1997).

This study found this issue emerging in implementing ISs in education system nation-wide. The decision-makers revealed that one of the major barriers to the wide-spread use of a system was the inappropriate selection of technology (DS8, SM1, SM7). It was discovered that many a school was facing a situation whereby the machines available were not compatible, due to their having a different type of configuration, software and hardware. This issue of incompatibility of technology also existed in several divisions in the ministry since different machines were meant to support different systems (SM1, SM7, DS5). Since isolated ISs in the MMOE were not able to 'talk' to one another, there was no way for users to share information, when this was the very purpose of having computer-based IS in an organisation (DS8, DS11, SM4).

5.2 Summary

From the literature, as well as through observation, it may be seen that ISs can alter patterns and responsibilities within an organisation. Indeed, because of their revolutionary potential, ISs can threaten traditional organisational structures. Unless those structures are redefined, traditional objectives, rules and procedures may cease to be relevant, or may even be ignored. In such circumstances, work appropriate to the new computers will tend to move towards those users who are the most competent, but not necessarily those specific organisational responsibility it is to deal with the work.

The introduction of an IS proved more difficult than anticipated. Although several issues discussed in Chapter 2 were specific to studies carried out within business organisations, similar issues were identified as affecting the implementation of ISs within the public organisations such as the MMOE. The introduction of EMIS/*SMPP* in the MMOE can be regarded as an introduction of change in an education organisation. It was seen by the EPRD, in particular, as a positive measure to provide the ministry with mechanisms to smooth the flow of information within the ministry. However, it seems obvious that a large number of issues emerge in the process of implementing EMIS/*SMPP* in the MMOE. In summary, among the most serious of those issues discussed in this chapter are:

- peoples' attitudes towards the system;
- lack of co-operation and collaboration among the division heads;
- lack of understanding about the system;
- the lack of commitment and involvement of stakeholders in the organisation, especially the top management;
- inadequate planning and system evaluation;
- the inability of the decision-makers to use their past experiences in the implementation of ISs in the MMOE to improve their strategies in the introduction of another system;
- absence of manager of IT/IS/change in the ministry.

Although the language of empowerment and ownership may be used and heard frequently, its implementation seems to be “in the gift of management”. The attitude of not wanting to let go of the system already in use and not willing to share information with others obviously creates a barrier to the implementation of *EMIS/SMPP* and information flow within the Ministry. Allowing the system developers to learn and improve their performance from mistakes made while developing the system would be one way of reducing scepticism towards new ISs, while a proper documentation of the system reinforces users’ confidence towards the system.

It is obvious that in implementing *EMIS/SMPP*, the training aspect does not emerge as one of the critical problems. This is due to the fact that *EMIS/SMPP* developers provide training as an on-going process, and that training is one of the main components in implementing the system. However for the training of trainers, divisions or schools must be cautious in sending the right candidate, to ensure that knowledge and skills might be disseminated to a wider circle of users.

From the above discussion, and consistent with the writing of Crowe and Avison (1980), Fullan (1991) and Riss et al. (2001), one of the most important issues that has been overlooked by the decision-makers in the MMOE, as well as *EMIS/SMPP* developers in the implementation of the system, is the absence of a manager of change within the MMOE. It is strongly felt that there is a crucial need for the MMOE to have a manager of change; one who will be responsible in supervising and providing appropriate guides throughout the development of the system. The significance of this issue will be discussed in depth in the next chapter.

CHAPTER 6: ANALYSIS OF FINDINGS AND PROPOSED EMIS MODEL

6.0 Introduction

The previous two chapters gave the perspectives of decision-makers as to the implementation of EMIS/*SMPP* within the MMOE. This chapter will be divided into six sections. The first section categorises the human, organisational/management and technical issues as described in chapter 4. The second section focuses on the relationships between the issues described in previous chapter. The third section highlights the underlying issues in implementing EMIS/*SMPP* from the perspectives of the researcher, based on the findings of the study, literature review and discussions with knowledgeable people in the area. The fourth section describes what was proposed and what actually happened when the system was implemented through a description of EMIS/*SMPP* implementation process model. Here an alternative model for implementing EMIS is proposed, and the feasibility of the model is examined. Section five discusses the implications of the study and section six is the summary of the chapter.

6.1 Human, organisational/management and technical issues

From the discussion in the previous chapter it is possible to categorise the issues raised by the decision-makers into human and organisational issues (Irani et al., 2001). The human related (H) issues are:

1. people's attitudes towards the introduction of EMIS/*SMPP*;
2. people's awareness and sensitivity towards the importance of data;
3. the involvement and commitment of top management and people at all levels;
4. an understanding of the system and its implementation;
5. co-ordination and collaboration among divisions;
6. decision-makers' information needs;
7. learning from experience;
8. the perceived return benefits of IT investment;
9. communication between IT specialists and professionals;

10. bottom-up initiated improvement process.

The organisational/management (O) issues, on the other hand, comprise the following:

1. the reaction of the MMOE towards data from schools;
2. the additional workload for people at grass roots level;
3. the rigid rules and procedures within the MMOE;
4. the issue of organisational structure/culture, and the nature of work being compartmentalised;
5. the utilisation of EMIS/*SMPP* data;
6. EMIS/*SMPP* as a source of information;
7. The need for a manager of IT/ISs/change;
8. human resource management, in terms of having sufficient manpower;
9. the need to reconsider a single division manning the system;
10. management style;
11. incentives for learning – transfer of skills and knowledge;
12. implementation of policies and directives;
13. the development of separate systems/databases;
14. outsourcing of work/projects.

Besides the two categories above, this study shows that there are issues that may be categorised as technical (T) issues:

1. quality of EMIS/*SMPP* data;
2. scope of EMIS/*SMPP* data;
3. standardised interpretation of terms;
4. data updating;
5. adequate provision appropriate machines and supporting facilities particularly at grass roots level;
6. length of the EMIS/*SMPP* business cycle;
7. the training and exposure of users to the system, especially among the top management;

8. the users' information needs – needs assessment;
9. EMIS/*SMPP* development phases;
10. comprehensive pre-system planning/design;
11. system analysis/evaluation and monitoring;
12. system manuals and documentation;
13. standard system platforms/compatibility of technology;
14. built-in data analysis in the system.

These issues are not discrete. Rather each issue raised by decision-makers seems to relate to and affect others. For instance, H1 is related to O6 and T1. The commitment and involvement of top management is affected by the management styles adopted by the managers in the MMOE, whether this be autocratic, democratic, laissez-faire or participative leadership. If the management style were more participative, then the MMOE would have been able to fully understand the problems faced by IS developers. This would have provided feedback at each stage, ranging from the pre-system planning until implementation. The involvement of top management either secures the implementation of policies and directives, or seems to do the converse. H6 is closely linked to O8, and in turn has an effect on T7. The directives drawn up for smooth implementation of EMIS/*SMPP* were not carried out by people at all levels, and consequently, the quality of EMIS/*SMPP* data was affected. However, appropriate action was never taken and measures to ensure these directives are being followed were also not taken.

6.2 The effect and the relationship of the issues raised

In order to understand the relationships between the issues raised by decision-makers in the implementation of EMIS/*SMPP*, it is more meaningful to illustrate them in multiple cause diagrams. In their discussion of such diagrams, Watson and Watson (1989) state as follows:

Multiple cause diagrams are capable of representing much more complex situations. The form of the diagram is very simple – words or phrases linked by arrows, usually without any labels on the arrows. The meaning of the arrows is somewhat imprecise – 'follows', 'leads to' and

'enables' are used as well as 'causes' – and the words or phrases may well include events, activities and decisions rather than physical or organisational components (p1-21).

Figure 6.2, a multiple cause diagram of EMIS/SMPP implementation, illustrates the relationships of the issues discussed in chapters 4 and 5.

The diagram was designed by writing down the issues raised and joining them with arrows, wherever appropriate, to show the connections which emerged through a close study of interview responses. At this point, the focus was on connections. It was not the researcher's concern to prioritise the importance of one issue over another. The diagram shows the links between issues associated with the slow progress and limited utilisation of EMIS/SMPP. It highlights the fact that information is indeed crucial for management and efficiency in education at all levels. The diagram shows that a defect in one part of the implementation will lead to a problem in another, and this will affect the smooth functioning of the entire system. This is illustrated in the following examples.

6.2.1 Absence of manager of databases/systems

The diagram reveals that the absence of a manager of databases/systems is associated with other issues such as the development of separate and isolated databases, the lack of complete system manuals, limited communication between IT specialists and users, prolonged EMIS/SMPP business cycles, and a non-standard coding system and interpretation of terms, to mention a few, which in turn lead to further problems. The absence of a manager of databases/systems creates the problem of lack of co-ordination and collaboration among division heads (see sections 5.1.1e, 6.2.4), which then affects the communication of IT specialists, working in one division, and other users or system developers in other divisions (see section 5.1.1i). The communication gap between these groups results in the generation of a non-standard coding system and non-standard interpretation of terms for different ISs within the ministry, also the direct effect of the absence of a manager of databases/systems. This issue of non-standard coding system and interpretation of terms leads to poor quality data for decision-makers. Only of late have the two groups (i.e. the technical

people and the professionals), managed to sit down together to compare and agree on using the same codes for the same variable (*BPPDP & BSM*, n.d.).

6.2.2 Poor quality of EMIS/SMPP data

One of the objectives of setting up EMIS/SMPP in the MMOE was to provide input for decision-makers. Thus, in general, the whole purpose of the system was to produce high quality, timely data. Although it was observed that EMIS/SMPP developers did their best to produce such data, almost always the quality of EMIS/SMPP data was still considered questionable by decision-makers. They strongly felt that EMIS/SMPP was unable to produce information as accurately as the decision-makers would expect (DS2, DS7, DS8, DS9, SD1, SD2, SD4, SD5, SM1, SM6, SM7). Figure 6.2 shows that there are a number of issues which contribute to the poor quality of EMIS/SMPP data. Several decision-makers put the blame on the people at grass roots level for providing poor quality data to the decision-makers (DS2, DS6, DS11, SD1, SD5). They believed that data feeders' disinterest about the implementation of the system was the cause of the problem. Interestingly, at the same time, there were also decision-makers who felt that it was the attitudes of the decision-makers at the ministry level that caused the data-feeders to respond indifferently towards implementing EMIS/SMPP (DS5).

From the perspective of the decision-makers, too, the fault lies within the system developers' inability to make available a complete system manual and documentation for the users. One of the obvious results of the absence of such documentation is that there is a lot of misinterpretation of terms. Indeed, the use of unacceptable codes occurred in the process of updating EMIS/SMPP data. Consequently it could be expected that the information retrieved from the system did not tally with what was on the ground.

6.2.3 Insufficient basic and supporting facilities

From the diagram, the study findings suggested that insufficient basic and supporting facilities, which lie beyond the control of those at the grass roots level, contribute to

the provision of poor quality EMIS/*SMPP* data. In fact, the decision-makers were well aware of this particular issue of insufficient provision of basic facilities in implementing EMIS/*SMPP* (see section 5.1.3e).

Although hardware is not the main factor in determining the success of IS, the provision of hardware in IS implementation in organisations should not be taken for granted (Heeks, 1987). Without appropriate physical infrastructure and reliable machines to support the system, IT-based innovation could never be sustained (see section 2.2.11).

In implementing EMIS/*SMPP*, the researcher observed that the basic physical facilities and supporting system such as reliable machines to run the system was still not available in many schools, and also in several DEOs. This observation was supported by the response from interviewees (DS5, SM1, SM7). The problem of insufficient facilities led to poor information flow in the education system (Aziz, 1997). The rigidity of equipment procurement procedures in the MMOE was believed to have created a further obstacle to achieving an integrated or online information system within the education system (DS3, DS11) envisioned by decision-makers. This practice contradicts the suggestion of fully exploring the capability of technology to enhance ISs performance (Wright, 2000).

6.2.4 Lack of co-ordination and collaboration among heads of divisions in the development of ISs

The lack of co-ordination and collaboration among division heads in the development of ISs led to limited communication on matters related to the development of systems between IT specialists and users or the professionals. There was very limited discussion between the IT specialists and users during the process of developing systems either in their divisions or while assisting other divisions to develop one (SM5). Besides the formulation of a non-standard coding systems and a non-standard interpretation of terms for all the existing systems in the MMOE, the lack of co-ordination and collaboration among division heads also created an equally

serious problem of developing separate, isolated systems within the ministry. The functions of each division are specialised, but there are systems readily built which contain basic information that can be shared by several divisions. However due to the lack of co-ordination and collaboration among division heads, new systems were developed to cater for individual divisions' needs. Discussion among the division heads and their technical people prior to the development of new systems could have facilitated sharing or accessibility of information in existing systems.

6.2.5 Commitment and support from top management

The top management commitment towards the implementation of ISs (see section 2.2.3) is essential if the introduced system is to function efficiently and effectively. It is clear from the diagram above that the lack of their support leads to a serious issue of lack of co-ordination and collaboration among division heads, as already discussed in 6.2.4. The issue of top management commitment also seems to be one of the main concerns of EMIS/*SMPP* developers within the MMOE. Through observation and as mentioned by the interviewees (see sections 4.4.1 & 5.1.1b), it is particularly difficult to compel division heads to sit together and to thrash out differences in information and ISs. The discussion involves a large group of decision-makers, and to make matters more difficult, such decision-makers are sometimes unable to differentiate between their needs and their wants where matters of information or ISs are concerned (DS8). This is not to suggest that decision-makers in the MMOE are naïve about the complexities of ISs; most are, indeed very mindful of these. Yet top management are usually surrounded by experts, most of whom have particular biases and opinions that colour their judgement on information gathered through systems developed by other divisions (see sections 5.1.2a, h). Top management needs to be fully committed to the development of EMIS/*SMPP* and have a strategy for its implementation.

6.2.6 Absence of information/IT/ISs policies and unimplemented IS implementation directives

In referring to the interviewees' responses pertaining to the existence of information policy and the realisation of related ISs implementation directives, it can be generalised that such policies did not exist and directives were not implemented as expected. This stemmed from the above-mentioned problem of lack of commitment from the top management. The absence of any information/ISs policy and unimplemented directives created other issues such as lack of enforcement and monitoring of the system implementation and additional workload for data teachers, and DEO officers which then leads to a serious issue of motivation, discussed in section 6.3. Failure to adhere to procedures or rules when implementing EMIS/SMPP resulted in an unfair workload burden. For example the internally appointed Data Teachers in schools have to take extra responsibility, besides their normal teaching load, for keying in the school data into the system, supposedly the task of the school's senior assistant or the school clerk. It had been agreed upon that a school data teacher would carry out such tasks only when a certain amount of his/her teaching hours were taken out of his/her personal timetable. Despite the written directives endorsed by the top management and circulated to all schools nation-wide it was discovered that the directives were not followed. As a result, the EPRD continued to obtain data which were not updated during the data collection process itself.

Another example of a directive which was obviously not implemented by the division heads, was that which stated that the EPRD should be *the* one-stop information centre for the MMOE. Supposedly, for the purpose of decision-making or making press statement, other divisions within the ministry had to use the data provided or approved by the EPRD. However, the EPRD data was disputed because other divisions could produce "the most current" data as input for the senior management to make educational decisions. This practice severely affected information officers at the SED and DEO levels and also schools which had to carry out the redundant task of providing the same or similar information to different

divisions at different times. This had a damaging effect on EMIS/*SMPP*, as well as on the ministry itself, where people at grass roots level complained that the ministry did not use the data they provided through EMIS/*SMPP*.

As mentioned by Wright (2000) most Commonwealth countries still have much work to do when it comes to improving the quality and reliability of more disaggregated data or other critical categories of data. That is often because data is typically aggregated at various levels, for example at the district/province and state level, before it reaches the central ministry. Wright, however, believes that many countries have made progress in the collection of school-level data that can facilitate disaggregated indicators at the ministry level. The EMIS/*SMPP*, for instance, as was discussed earlier, is able to provide such disaggregated data for the ministry as well as international agencies (see section 5.1.2h). This is because the system collects data from schools at specified dates (January, June and October) during the school year (EPRD, 1998a). It is this issue of aggregated versus disaggregated data that often causes conflict among the divisions. Other divisions in the MMOE such as the School Division normally obtain aggregated data from their sources, whether they be schools, DEOs or other units in SEDs, but not the SED Information Unit. The outcome enables a contrast to be made between data from different divisions on the same issue. This problem of conflicting data stems from the fact that the directive stating that the EPRD as *the* information centre in the education system (EPRD, 1998b) has not been adhered to.

6.2.7 Lack of data analysis in the system and insufficient manpower

Other than the analysis carried out with the aim of providing feedback for the World Education Indicators (WEI) project by the OECD, EMIS/*SMPP* data had not been put to clear use. This posed another problem to the organisation-wide acceptance of EMIS/*SMPP*. Frequently, schools lacked the motivation to update EMIS/*SMPP* data accurately, as the ministry did not seem to be responsive to data returns. For example, the data collected by the system was not used as a signal to highlight the acute problem the schools faced in the shortage of critical subject teachers (SD2).

Several users and decision-makers often questioned what was being done to the data collected (SD3, DS10). As a result of a discussion among the Data Unit personnel pertaining to this issue, it was found that the unit had insufficient staff to carry out the data analysis. As the accuracy of EMIS/SMPP data was often the central issue among the decision-makers, and the EPRD division head frequently queried the reliability of EMIS/SMPP data, the accuracy of data became a more critical issue than the usage itself.

6.2.8 Attitudes towards EMIS/SMPP

Being very sceptical about the reliability of EMIS/SMPP data deters decision-makers from using information retrieved from the system as input for decision making (DS7, DS8, SM3, SM6). Although the main reason for collecting and analysing data is to inform policy decisions and strategic action relating to the education system, the link between data analysis and policy decision in the MMOE tended to be poor. Here the issue has more to do with the interpretation and judgement of EMIS/SMPP data and, to a certain extent, also has to do with the constant change in decision-makers' information needs.

6.2.9 Lack of training and exposure of the system

Limited exposure to the system among users at all levels is another reason why people have less confidence in the capability of the system. Judging by its name people would expect EMIS/SMPP to cover information within the entire education spectrum in Malaysia. Although that has been the ultimate target of the system developers, as stated in the objective of setting up EMIS/SMPP, the constraints mentioned in earlier sections have slowed down the system development process to the extent that it is only able to deal with data for government assisted schools. The fact that the system needs to be stable before spreading its wings to other domains such as private education, teacher education, technical and vocational education, religious education, school curriculum and the like is not made known to other users. Hence, misconceptions of what the system covers, diminishes users' and even several top managers' confidence in the capability of the system. Cassidy, (1990)

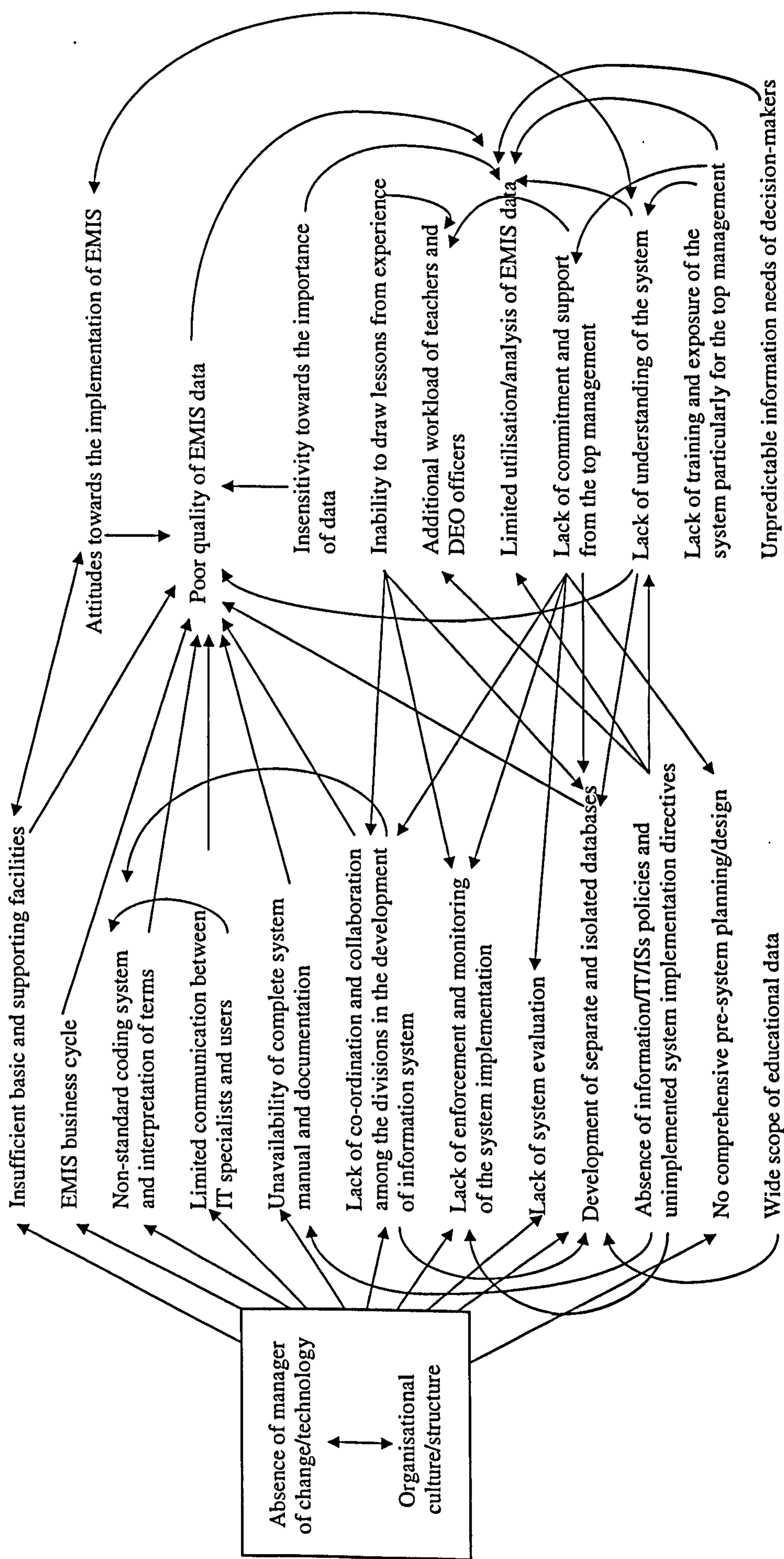
claims that the term “education management information system” and the acronyms EMIS are misnomers. Although discussions of EMIS almost always centre on issues of data collection and the establishment of an education system database, the implicit, often explicit, expectation is that EMIS will contribute to improving the quality of decisions at the highest levels in education. Hence the author suggests that the title “education decision support system” would more aptly describe the expectations most people have when they discuss EMIS. With regard to this issue, the EPRD, particularly the system developers, have to convince the users of their targets for the future development of the system and keep them informed about its new developments.

The problems discussed in this section have direct and/or indirect effects on the quality of data in EMIS/SMPP. Although the EPRD had been criticised for producing “consistently inconsistent” data, Figure 6.2 shows that those at the grass roots level right up to the top management are also responsible for producing such data.

6.3 The importance of a manager of change and the influence of organisational culture/structure

Having listened to and analysed the decision-makers’ perspectives on the implementation of the EMIS/SMPP, the researcher stepped back to examine how these issues were related. In analysing the relationship between issues, it was important to determine the central issue(s) that affected or led to the emergence of other related issues. Based on the literature review, the knowledge gathered through the researcher’s observation, the researcher’s experience as a member of the organisation, an analysis of interview findings and discussions with her research project supervisors, as well as with knowledgeable people in the area, the researcher strongly believes that the problems discussed earlier remain symptoms of the absence of a manager of change/technology and the enduring bureaucracy of the ministry. The significance of these issues is presented in Figure 6.3, which is a modification of Figure 6.2.

Figure 6.3: Multiple cause diagram illustrating the significance of the absence of a manager of change/technology and the influence of organisational culture/structure in EMIS/SMPP implementation



From Figure 6.3 it can be seen that an absence of a manager of change/technology and the organisational culture/structure are interrelated, both having a direct impact on the following issues:

- provision of basic and supporting facilities;
- length of EMIS/SMPP business cycle;
- coding system and interpretation of terms;
- communication between IT specialists and users;
- availability of complete system manuals;
- co-ordination and collaboration among division heads ;
- enforcement and monitoring of the system implementation;
- system evaluation;
- development of separate and isolated databases;
- pre-system planning/design;
- scope of educational data captured in the system.

Knight and Silk (1990) comment as follows on the pertinence of a manager of change:

The introduction of ISs into organisations can have very wide consequences, affecting every aspect of the organisation and the people in it. Such change needs very careful management by managers who may themselves may be affected by the change. Therefore there is a real need for the affected organisation to appoint someone from the top management level to manage change (p 207).

The introduction of computerised ISs should lead to many changes in an organisation, for instance in the working environment, budget allocation such as for procurement of equipment, training, and also the creation of new posts (Carnall, 1995). However, when EMIS/SMPP was implemented in the MMOE, no significant changes took place apart from the additional number of newly purchased computer units coming in particular to the EPRD, the on-going training of trainers, data verification sessions and an increased sense of sensitivity towards data among the division heads. The researcher strongly felt that in implementing ISs, the MMOE lacked a manager of change/technology and the system implementation was greatly

influenced by the organisation bureaucracy. This section further discusses the significance of these central issues and how they affected the success of ISs implementation.

Technology plays a role in enhancing an effective and efficient educational management of ISs. However, it is clear that technology alone is not a remedy for all the complex problems in such situations as EMIS/*SMPP* in the MMOE (Cassidy & Cresswell, 1997). It can also be inferred from figures 6.2 and 6.3 that the introduction of technology or EMIS/*SMPP* has caused unavoidable changes in the entire working system of the ministry, which has consequently created some inevitable problems in the system implementation. Against this background of system implementation, weaknesses, and problems, it is particularly important for the MMOE to consider having a manager of change/technology, also known as the Chief Information Officer (CIO), within the organisation. The CIO or manager of change/technology (henceforth used interchangeably) will guide and facilitate the management towards overseeing the development and implementation of the system, take charge and be in control of the changes taking place (Cunningham, 1982; Fullan, 1991; Gray et al., 1994; Riis et al. 2001) as a result of the implementation of ISs in the organisation. Although the issue of the absence of a manager of change/technology seems to be crucial in considering the implementation of ISs, as suggested by the authors and as shown in Figure 6.3, only one decision-maker was aware of the need for the MMOE to have a manager of change/technology to pull the loose ends together. However, three others did implicitly raise similar issues (DS5, DS6, SM7).

The researcher's years of experience in implementing the system intensify her viewpoint that the presence of a manager of change/technology in the MMOE is of crucial importance. She strongly believes that the manager of change/technology must be someone who has the qualities of a manager, initiator, and mediator. The researcher considers a good manager of change/technology to be one who is responsive, and exercises participative leadership. He/she needs to be forceful and

proactive, able to attend to different attitudes of staff, react to problems, motivate and empower staff in cases where operations at the lower level of the organisation require quick actions. Above all, a manager of change must be able to develop a learning organisation culture within the MMOE, and hence encourage a bottom-up management system within the organisation.

Gray et al. (1994) claim that many firms have created the position of CIO, a position of responsibility associated with the organisation's top management group. Rather than needing just technical computer skills and knowledge, CIOs also need personal, managerial and business skill, as is the case with business organisations. With the requirement of these extra capabilities and skills, not all CIOs have handled this transition well. Indeed some have found it difficult to grow beyond their technical interests, training, and experience. Gray (1994) reports that more than one organisation has put a non-information-systems person in charge of managing its ISs. This suggests that non-information-systems personnel such as the professionals in the MMOE are capable of handling the task of managing ISs normally carried out by IT specialists.

Figure 6.3 suggests that with the presence of the CIO, a number of key issues related to the implementation of ISs discussed earlier could be overcome. They can be summarised as follows:

a. Developing an information architecture.

An information architecture is a high-level map of the information resources of the ministry, which comes from either the divisions or the grass roots level. It is more of a blue-print that can be used to guide the development and acquisition of data, technologies systems, and application on a cost-effective basis. It includes the rules and policies that govern the distribution and use of information resources throughout the ministry. The feedback from the decision-makers during the interview shows that the existence of overall information and IT policy in the ministry is not known to those interviewed although there is already a policy drawn up for EMIS.

b. Making effective use of the data resources.

Making effective use of information without being overwhelmed by its sheer volume is a continuous concern both for EMIS/*SMPP* developers and the MMOE decision-makers. The fact that CIO possesses high-level authority could justify the top management information needs and limit the duplication of work among the divisions and consequently reduce the workload of data feeders.

c. Improving IS strategic planning.

In the case of EMIS/*SMPP*, its strategic planning is to translate the MMOE objectives and strategies into system terms so that appropriate system, application, data, and other information resources can be developed to support the MMOE decision-making and plans. Other existing systems in the ministry may possibly have similar planning functions, if not for the ministry for a particular division. The merging of systems or information sharing among the divisions would enable expenses on the procurement of computers and supporting facilities to be reduced. This issue is one of the main concerns of a CIO as it has direct effect on the functions of an organisation.

d. Facilitating organisational learning and use of IS technologies.

It is undeniable that there is a continuing need for individuals and the ministry to learn to effectively employ ever-changing IS technologies and applications within their everyday work. The sharing of knowledge and skills among individuals and divisions is of great importance in enhancing learning within the organisation and improving the functioning of IS in the ministry, resulting in better information flow in the MMOE.

e. Building a responsive IT infrastructure.

It is necessary for the MMOE to consider creating an IT infrastructure throughout the education system which can address current needs, but remains sufficiently flexible to adapt to the rapid change of technologies. This clearly involves the adaptation of an infrastructure of computers, applications, and the

networks that were not originally implemented with the need for such flexibility in mind. This issue of computer or system incompatibility seems to be the current and most widely felt problem in implementing IS within the education system in Malaysia. The systems and computers available in schools and several DEOs are not able to support systems and applications other than the ones they were initially installed for.

f. Aligning the IS organisation with that of the ministry.

The issue of centralisation versus decentralisation of the IS function has been a matter of concern to decision-makers long before EMIS/SMPP was developed and it was still of concern up till this study was conducted. The expertise and experience of the CIO could provide an aid to alleviate the problem of misunderstandings of ideas among the decision-makers. Although EMIS/SMPP steering committee members have tried to work out this problem, it did not go far as the committee lacks authority to impose decisions made during EMIS/SMPP meetings on other divisions.

g. Planning and implementing a telecommunication system.

Communication has always been a part of the overall information processing in an organisation. Now that telecommunications systems and computer systems are interlinked, the domain of a CIO has expanded to include the planning and implementation of an effective telecommunication system for his or her organisation. Although the MMOE is still many steps away from acquiring an efficient and effective telecommunication system within the ministry, this is worth considering as it plays a role in improving communication and collaboration not only among divisions in the ministry but also among the administrators and professionals. And of equal importance is a two-way communication between the IT specialists and the professionals as well as between the top management and the grass roots level. With the CIO as a neutral mediator and the chairperson of the MMOE Information and Computerisation (JMPK) committee meetings, such telecommunication systems

could be created so that the existing communication gap could be improved and hence many issues could be tackled.

The study finds that information and information technology are organisational resources that must be managed in an integrated way if they are to be useful. The CIO of an organisation is not only able to facilitate the implementation of IS but also has the authority to resolve differences among decision-makers and manage the changes IT/IS has brought into the organisation (Taylor and Singer, 1983; Rodriguez-Diaz et al., 1997). This demonstrates the significance of having a manager of change for an organisation such as the MMOE, where IT is introduced to serve the management information needs in the process of decision-making. However, regardless of its pertinence, the absence of a manager of change/technology in the ministry is not an unusual phenomenon in public organisations in Malaysia. As was mentioned by one of the top management:

We don't have a manager and we don't prepare people for it. Sometimes when the government is going to implement a system, there's no such thing as meeting the people telling them what the system will provide them, how they should react, what the people should do, what's the implication of the system introduced. We should first defreeze people from the shock or fright. Provide training, exposure, guide them and slowly let go of their hands. Unfortunately, that doesn't seem to happen. So the result, people are shocked with the newly introduced system and are scared or skeptical about the system.

(SM1)

It can be seen from the response above that the MMOE has a poor record with regard to preparing people for and involving them in the organisation change process. This runs counter to the suggestions by Fullan (1993), Gray et al. (1994), Knight and Silk (1990) and others that people need to be prepared and involved in the change process. The above response indicates that the management are less concerned about people's reaction towards change. In a wider context, something for which there is not the time and space to investigate in depth in this report, this might be seen as part of a general culture of management in Malaysian organisations. Whatever the case, the MMOE management perceived that there was no particular need to have a

manager of change as eventually people were expected to adapt to the change themselves.

Nonetheless, the responsibility of CIOs is not to be underestimated, regardless of the type of ISs they are in charge of or the size and culture of the organisation. Cunningham (1982) argues:

...though it often seems overlooked or misunderstood by planners, even when a change involves minor matters such as the rerouting of information, for information in a bureaucracy is power – not just for making decisions but also for trading for other information (Devons, 1968). To be effective, the management must carefully assess the effect of potential changes on the bureaucracy, being ready to do battle on some points and make trade-offs on others (p. 46).

The problems caused by the absence of a manager of change are exacerbated by the structure and culture of the organisation (Carnall, 1995; Humphreys & McHugh, 2001). For instance, in the implementation of EMIS/SMPP the lack of communication between levels and lack of co-ordination and collaboration among divisions are results of the existence of hierarchical levels and departmentalised work culture in the ministry (DS3, DS5, SM1, SM7). The effects of the development bureaucracy rules (see section 2.2.9) are still much in evidence and constitute potential blocks in terms of planning for change. Consistent with the argument made by Wright (2000), it was apparent that the introduction of change in the MMOE was in some respects affected by the organisational culture/structure, as in other organisations practising centralised system. Cunningham (1982) discusses similar issues claiming that “The internal structure of the organisation tends to favour things as they are, both because this is more comfortable for the incumbents and because change may well challenge the status, prestige, and power of an office” (p.46).

Even though the work nature of divisions in the MMOE is departmentalised, where the implementation of ISs in the organisation is concerned it is crucial for the decision-makers in the ministry to seriously consider the emphasis of General System Theory (GST). The theory emphasises that not only it is necessary to

examine and analyse individual parts of the system or organisation, but also it is vital that the system is viewed as a totality where the whole is greater than the sum of the parts, known as the holistic approach (Lucey, 1990), which is the basis of information synergy concept in EMIS (see section 2.3). It would, then, be meaningful if the decision-makers in the MMOE view the functioning of ISs as the organisation itself whereby the ministry consists of departments and units, just as the systems are composed of sub-systems, and these parts interact and are interdependent. Hence, in implementing EMIS/*SMPP* it is necessary to consider these interrelationships, otherwise the system or organisation as a whole will not function efficiently, and will be slower to adapt to changing conditions, itself is a primary requisite to survival.

There are several strategies that could be adopted with regard to information management within an organisation. In a bureaucratic organisation such as the MMOE, the style adopted has always been the top-down approach, where senior managers decide what should be done, in broad terms, and impose it as a series of directives. This can sometimes be valuable as a means of enabling radical innovations to be adopted, but it is fraught with danger where senior managers are not experts in what users need at a detailed level, or of what IT makes possible. As a result there are often problems of unfulfilled expectations and non-functional systems within the organisation. In contrast, a more decentralised system where ISs are operated (Cunningham, 1982; Riis et al., 2001; Aziz, 1997) may better ensure that the system is fully utilised at all levels. For this to happen, the manager of change/technology should be able to take decisions with regard to developing a system, possibly an integrated system, which is more relevant and applicable (see 6.3f).

It is important that information management in a human context, such as the management of EMIS in the MMOE, is given serious consideration by the top management of an organisation, so as to avoid further conflict and more tension among those involved in the management of ISs. Broadly speaking, in information

management, at least three groups of people need to be involved; the senior managers, the IT specialists, and the middle- and lower-level staff (see section 2.2.5). It is clear from the interviews in this study and through the researcher's participant observation that these three groups do not have the same perspective on the problem, and it is not as easy as one could imagine to get them to agree on an effective solution for a particular problem.

The departmentalised nature of work makes matters worse, since people are more concerned with their work, and are very guarded about the information they have. In order to reduce these problems, every division/level has to be "a borderless world" and more "transparent" to each other in the sense that there is free flow of shared information, unrestricted exchanges of knowledge and skills and unlimited communication between, as well as within levels (Riis et al, 2001). Improving communication and interaction between groups of people involved; senior managers, the IT specialists, and the middle- and lower-level staff, could reduce non-essential bureaucratic procedures, thereby impeding the implementation of EMIS/SMPP. Without such adjustment within the MMOE, each division continues to work independently and unrelated to the others which eventually leads to the reinforcement of uncoordinated organisation. This is of a particular concern in the MMOE, which is composed of divisions administered by two groups as mentioned in Chapter 1; one is the administrators, where the technical experts come from, and the other is the professionals, which EMIS/SMPP developers are categorised as. At this point the CIO has an important role to play in maximising communication between the management and the employees (see sections 2.2.5 and 6.3g).

The development of cross-functional ISs (see 6.3b, c, e) allows sharing of information between divisions and eliminates the problem of data duplication and conflict, as well as enabling transparent work system within the MMOE (SM7). When an organisation learns to share information cross-functionally, employees at all levels are empowered to make better, and higher quality decisions for the organisation (Bentley, 1981; Martino, 1999; Serafeimidis & Smithson, 2000;

Avgerou, 2001; Genus & Kaplani, 2002). At this point, the employees are aware of the inter-relatedness of one division or level to the other, whereby misleading information provided by one could result in poor decision making for the entire education system. The implication is that in order to develop a new IS, it is necessary to be aware of the functions of all divisions, as well as levels that are likely to be potential users of the system, and be sensitive to their decision-making requirements. In such circumstances, the system developed allows information to flow cross-functionally, so as to support and improve decision making. As argued by one of the top management an organisation that does not share information cross-functionally will end up with “the left hand not knowing what the right hand is doing” (SM7).

It is undeniable that individual behaviour within organisations is affected by leadership styles and leadership behaviour. Although there is no doubt that leadership is a vital factor and greatly influences the whole organisation, it is difficult to lay down general rules for effective leadership to fit all situations. As in the case of the MMOE, it was mentioned by one of the decision-makers interviewed that the management seems to lack the ability to create an atmosphere that encourages positive motivational effects. It was also highlighted during the interviews as well as through observation that the ministry lacks motivating managers who readily accept errors as learning processes (DS5, DS8).

From a general point of view, motivation can be explained as the driving force or commitment people have for doing things, and the results of having motivated people in an organisation are obvious and highly beneficial (Miller & Lee, 2000). As a consequence, managers have to try to understand the conditions and influences that motivate people so that they can manage, organise and create an organisational atmosphere that encourage positive motivational effects (see section 2.2.6). It is shown that successful managers built their success on tightly knit groups of staff whose co-operation had been obtained by close attention to a range of lower and higher order motivational factors (Lyytinen & Robey, 1999; Loeffen & Wortmann,

2000; Irani et al., 2001). In these cases participation is encouraged and supportive relationships within and between groups of people involved are fostered. These features lead to full commitment to the organisation's goal and high performance levels.

In addition to senior management commitment, successfully implementing IS also requires managers to be relatively relaxed and capable of trouble shooting and responding flexibly to problems. This is more so because unpredictability is a feature of implementation of IS. Reasonably relaxed managers allow team members to be more observant, more flexible and more creative and this does not happen under strained working conditions. Team members need to feel free to experiment with the new technology or system to find out what, in their setting, it is really good for. This requirement is missing in the implementation of EMIS/*SMPP* or other ISs in the MMOE for there are always stringent, though at times unacceptable, deadlines to meet.

A CIO would be able to facilitate organisational learning and the use of IS technologies (see 6.3d), as he/she is vested with the authority to apply rules to encourage learning in the implementation of ISs in an organisation. In implementing EMIS/*SMPP*, the CIO could help to ensure that the initial plan of EMIS/*SMPP*, which was based on a learning model and organised as a learning process, is realised.

6.4 EMIS models

In this section EMIS is reconsidered in the light of two models of implementation. The first describes the original EMIS/*SMPP* model proposed by EMIS/*SMPP* developers and external consultants. The second introduces an alternative EMIS/*SMPP* model which takes on board the findings of the study and addresses the concerns thrown up by decision makers. The feasibility of this second model is discussed.

6.4.1 *EMIS implementation process model for the MMOE*

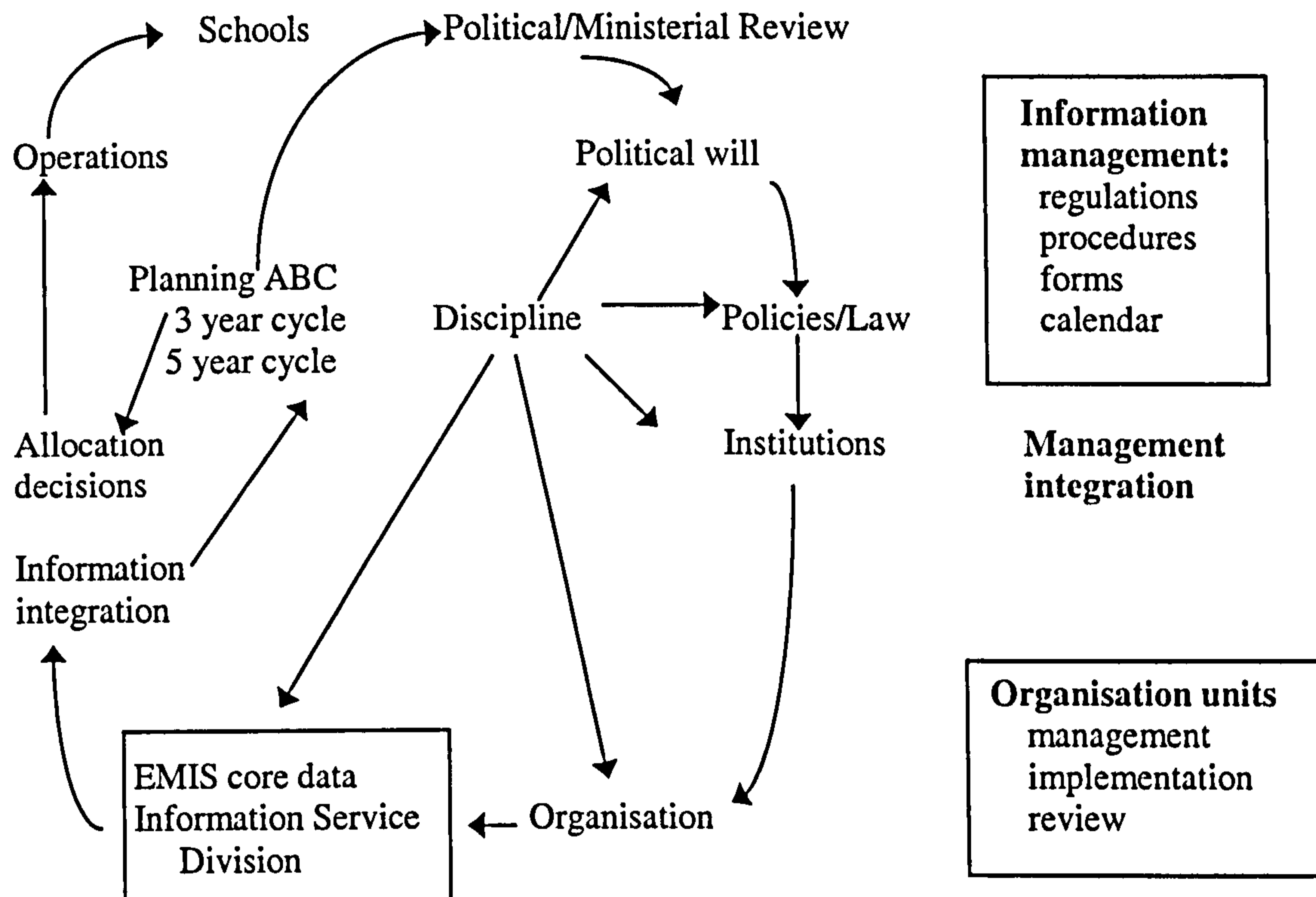
Figure 6.4.1 provides the conceptual model used by the MMOE to map the relationships among the various policy and management dynamics in which EMIS operates. As with any relatively complex intervention in any complex organisation such as the MMOE, successful implementation depends in large measure on the degree of political will demonstrated by those in senior positions throughout the system. Equally important is the extent to which discipline and consistency can be instilled into the process. Discipline is conceived of as the institutionalisation of the implementation process, as embodied in the relevant laws and regulations; in the standardisation of operational processes and procedures; and the extent to which management and operational activities, e.g., planning are synchronised, integrated, and sustainable over time.

The model proposed by EMIS/SMPP developers and consultants is, indeed, an ideal one. It seems to encompass all dimensions necessary for the successful implementation of the system in the MMOE. However, it has several drawbacks:

- 1) It provides too broad a view of the system implementation.
- 2) It does not specifically state the stage or level when the management integration or the review should take place.
- 3) The integration mechanism and the phase of implementation for both the management and information integration are not clearly stated.
- 4) The involvement and commitment of the management in the implementation process has not been defined clearly.

A readily comprehensible model would have provided a clearer picture of the system implementation both for system developers as well as the organisation management to work on the pre-system planning. A clear understanding of the theoretical framework underpinning the model is crucial, and without this, reforms are likely to fail because of faulty and overly abstract theories not related or relatable to practice. As a result, innovations have become ends in themselves, as the reformers lost sight of the supposed central questions of the purpose of change (Fullan, 1991).

Figure 6.4.1: EMIS Implementation Model proposed by EMIS/SMPP developers and consultants



Source: A Plan for the Development of an Education Management Information System for the Education Sector of the Government of Malaysia (EPRD & HIID, 1997 pp.26)

The feedback given by the interviewees, other EMIS/SMPP users at all levels and information gathered through observation suggest that the current implementation of EMIS/SMPP seems to lack several of the aspects contained in the model. This will be discussed further below.

The current implementation of EMIS/SMPP in the MMOE

In reality, the current implementation of EMIS/SMPP is far from what has been proposed by its developers and consultants. The interviewees' responses suggest that there are many aspects, which are either missing, which have not been considered or which have been completely ignored in the current implementation of EMIS/SMPP. Many aspects of the model are not readily accessible and some are simply not readily achievable. One of them, also confirmed by the interviewees, was the absence of information/IT/ISs policy of the MMOE.

The drawbacks of the current implementation of EMIS/*SMPP* raised by decision-makers were already discussed in Chapter 4. The drawbacks observed by the researcher and reported by EMIS/*SMPP* external consultants were:

- 1) the Data Unit of EPRD had a serious problem of inadequate staff to develop, maintain and support distributed EMIS/*SMPP* application (EPRD & HIID, 1997);
- 2) unstable staffing which disrupted systematic operation of the system (EPRD & HIID, 1997);
- 3) very limited, if any, flow of information, whether inter-division or between units of the same division;
- 4) the absence of feedback loops which could serve as checking and learning mechanisms on the functioning of the system at every level of the process.

Although a pilot of a revised computer-based census application was tested in early 1997 in an effort to serve the needs of educators at each level (EPRD & HIID, 1997), the EMIS/*SMPP* application seemed to be implemented nation-wide immediately after the test. No grace period was allocated to study the strengths and weakness of the system in depth, and with a larger group of users. In other words, the system lacks evaluation, and this might provide the developers with useful information about the functioning of the system. Consequently the system had to be modified in accordance to the change of needs of the users especially the decision-makers.

Having identified the weaknesses of EMIS/*SMPP* implementation model as proposed by EMIS/*SMPP* developers and consultants, and the current implementation of EMIS/*SMPP*, the next section suggests an alternative model of effective implementation of EMIS based on the findings of the study.

6.4.2 Alternative model of effective implementation of EMIS

The alternative model for an effective implementation of EMIS is a modification of the proposed EMIS model by EMIS/*SMPP* developers and external consultants in

Figure 6.4.2: Alternative model for effective implementation of EMIS/SMPP in the MMOE

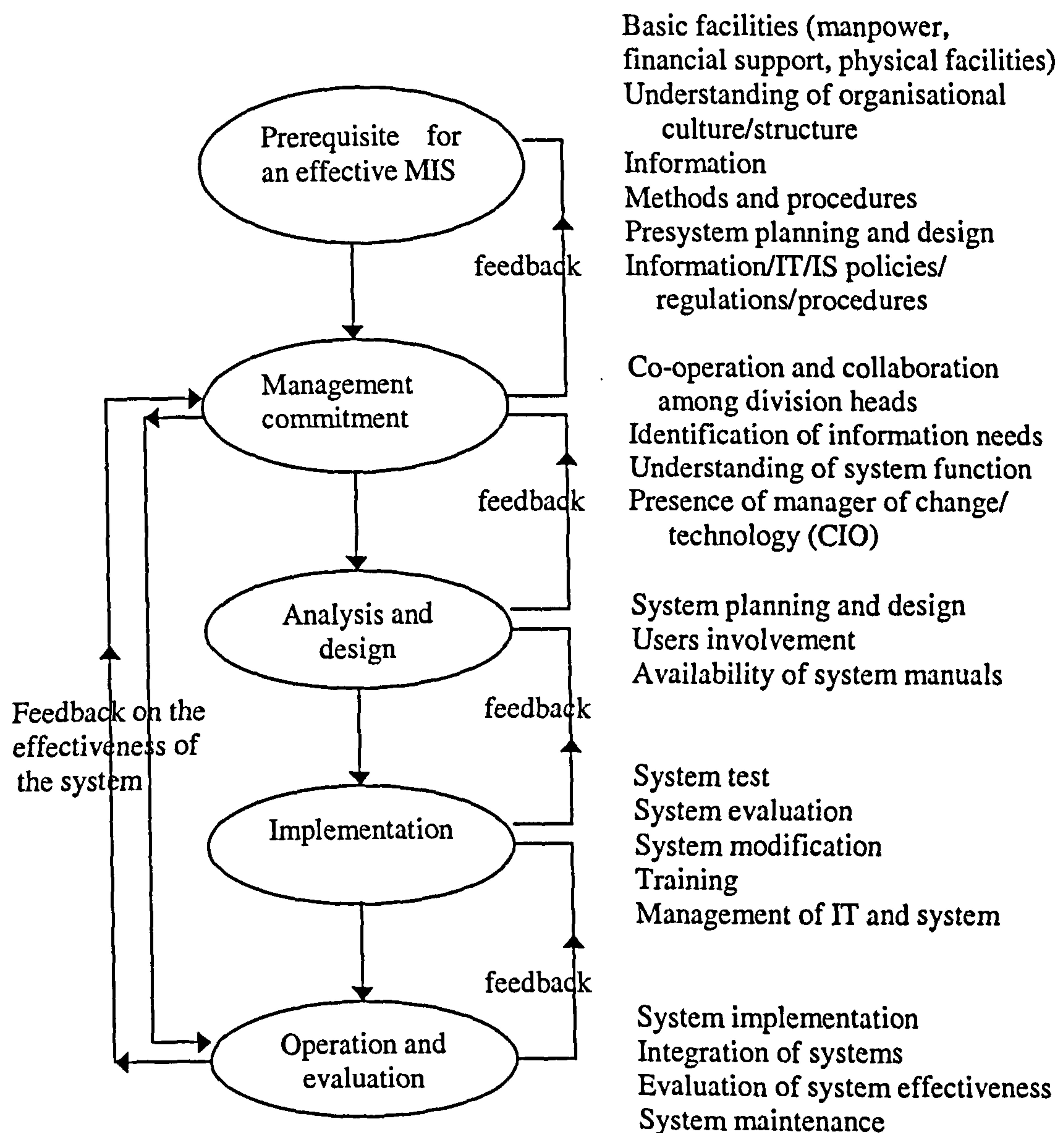


Figure 6.4.1 taking into account the findings from the interviews and information gathered from EMIS/SMPP documents as well as through participant observation.

Figure 6.4.2 shows that there are feedback loops at every level and from one particular level to the other, such as from operation and evaluation to management commitment and vice-versa. These loops point towards and away from one stage to the other just before or after a particular stage, and there are also feedback loops from one end of a stage to the other, such as one mentioned earlier. This indicates that no one stage is implemented in isolation or without the involvement and

commitment of top management. In fact one main focus of this model is the management commitment phase in the implementation process. No doubt the management involvement, particularly the manager of change/technology, in any MIS implementation is required throughout the process in this model; their involvement appears in the second stage of the process. However, the feedback arrows play a role in indicating that the management commitment is present, all the way from the stage of making arrangements for the prerequisites for the system to the operation and evaluation levels, and back. The strength of the model lies in the presence of the feedback loops in the entire implementation process. Although the system seems to function in a linear operation the feedback loops help create a full cycle implementation process which encourages cross-divisional collaboration, extended participation and assignment of resources suggested by Serafeimidis and Smithson (2000) and provides opportunities for users to have better understanding of the system (see section 2.2.16).

As suggested in the literature on MIS, the introduction of ISs in an organisation will no doubt bring changes to bear in both the structure and business or functions of organisation. Hence when an organisation plans to embark on computerising its ISs, the management has to accept the fact that the organisation needs to have people who can take full charge of the introduction, implementation and institutionalisation of the system. At the same time the appointed people will assist the organisation in managing the changes the new system is bound to bring about in the organisation. Clearly they have to be the ones who possess the technical as well as managerial skills, as well as being able to thrash out differences among people in the organisation and remain enthusiastic and committed to seeing the project through. With this in mind the model recognises the significance of a manager of change/technology in the implementation of EMIS, where his/her position is placed among the top management and has the authority to make decisions pertaining to IT/IS as proposed by Gray et al. (1994). The availability of information and ISs policies is particularly pertinent to this model, and it is one of the prerequisites to be observed before the system is implemented.

Since most of the issues impeding the implementation of EMIS stem from the absence of a manager of change/technology (see Figure 6.3), the inclusion of such personnel in the proposed model means that the model would certainly be feasible. Its feasibility is reinforced through the recent creation of a CIO post in the Ministry.

6.5 Implication of the findings

The implications of the findings of this study can be viewed from the point of view of managerial implications.

6.5.1 Managerial Implications

The findings provide a number of implications for overall management practices in the MMOE. Although this research focuses mainly on the implementation of EMIS within the MMOE, insights about MIS design, MIS evaluation, and organisational management offer substantial managerial inferences for other forms of organisations and areas of study. There are three practical guidelines that can be drawn from this research.

a. Managing change

Implementing and managing EMIS in a complex organisation is not an individual or a particular division task (Riis et al., 2001). It involves changes that will even affect the organisation's culture. Once the organisation has decided to embark on introducing computerised IS, the challenge is not just one of technology. This case study aptly illustrates that the changes associated with information and IS result not from the technology itself, but from the new roles and arrangements within the organisation between management and the faithful users of the technology. Obviously some people within any organisation are in favour of these changes taking place while others are not. It seems evident that positive attitudes towards the implementation of IS must be embedded in the process in which people work. The case discussed in this study demonstrates how changes brought in by the implementation of IS may be facilitated through the effective management of change. Indeed, the MMOE management and the system developers have to be

aware that effective approaches to managing change call for combining and balancing factors that do not apparently go together – simultaneous simplicity-complexity, strong leadership participation (or simultaneous bottom up-top downness), fidelity-adaptivity, and evaluation-non evaluation. More than anything else, “effective strategies for improvement require an understanding in the process, a way of thinking that cannot be captured in any list of steps or phases to be followed” (Fullan, 1991, p.67).

b. The need to create a knowledge- and skill-sharing learning organisation culture

The present study also suggests that however successfully an organisation transforms its environment for computer-based IS in the short term, a more daunting task is to facilitate an efficient, functional computer-based IS organisation in the long term. More specifically, the task of the organisation management is to continuously create and maintain the learning organisation culture and community in which people feel comfortable with knowledge and new skills and are motivated (Cassidy & Cresswell, 1997). The MMOE management needs to change their perspectives so as to encourage learning among employees through the projects that they are handling, rather than to expect perfect end-results from every project. The management has to make efforts to break the walls of compartmentalisation in order to enhance sharing and learning among the employees.

c. Improving human resource management

In an attempt to develop a learning organisation that undertakes informed decision-making, the MMOE has to manage the knowledge and skills of the workers in ways that are different from normal bureaucratic managerial approaches. The effectiveness and value of knowledge and skill transfer and sharing depends on the active participation of individuals, including the management of the organisation. Having ISs and tools available is important, but in all probability, insufficient. This study suggests that human resource management practices that are constantly evolving can be applied, to secure an equal emphasis on technology, structure and

learning organisation cultural factors. These practices, alongside the total commitment of managers at all levels, will assist management in identifying the facilitating and inhibiting factors that will ultimately determine the success of organisation-wide IS implementation.

6.6 Summary

There are a number of important lessons that can be drawn from this study. First, the study shows that implementing ISs is more complex than narrowly rational IT/IS models would suggest. This study concludes that EMIS/*SMPP* implementation in a large and complex organisation such as the MMOE requires an integration of five major factors: the total commitment of top management, the involvement and guidance from a manager of change/technology, the co-operation and collaboration of people at all levels, particularly the Division Directors, the availability and implementation of information and IS policies, knowledge- and skills-sharing, and thorough presystem planning.

Secondly, the importance of the organisational and managerial capability in recognising the significance of changes brought in by the introduction of EMIS is also recognised. The focus of the analysis in this study has been on the relationship between technology and organisational management, rather than on technological characteristics. The findings have led to the conclusion that there can be no doubt that human attitudes and organisational management have great impact on the implementation of EMIS in the MMOE. This helps to identify that the issues of management need to be addressed with the same urgency of technological infrastructure. The findings also call for management readiness and capability to cope with inevitable changes that result from the implementation of IS within the organisation.

Thirdly, the research found that developing and implementing EMIS/*SMPP* required flexibility so that the process could take account of environmental uncertainties, subjective human communication processes and other changes taking place in the

organisation, such as educational reforms. In particular, the interrelationships between IS, social and managerial elements are clearly demonstrated in the implementation of EMIS.

Fourthly, the analysis has also shown that the integration of groups in work processes, with wide IT/IS management knowledge infrastructure, has enabled the optimum teaming of collection knowledge. This in turn has created a sustainable advantage for the MMOE. What this study shows is that an organisation that allows its employees free from the bondage of a traditional organisational structure/culture i.e. hierarchy management, and allows a spirit of teamwork to develop within the organisation will be well equipped to gain and sustain its success.

Finally, one of the most important findings of this case study was the significance of a manager of change/technology who has the responsibility of providing guidance to effective and efficient implementation of IS in the MMOE. This study shows that successfully implementing EMIS depends not only on the use of particular technologies but also the successful creation of a motivating management environment with a manager of change/technology as the facilitator and co-ordinator of related activities.

In summary, this study has investigated the effects of implementing IS within a particular organisation. It concludes that such effort involves more than new computerised technology. They also involve a new management approach in which new roles are created such as that of a manager of change/technology at the higher administrative level. Within the MMOE, such changes will improve the communication patterns between technocrats and professionals, between top management and the lower level employees, and also change the design of the organisations by fostering new processes and structures. Learning and competence development, if they are encouraged, will promote the integration of IT/IS knowledge and sustain the success of IS implementation in the Ministry. Undoubtedly, much work remains to be done, but this study lays the groundwork for

further research on the effects of effective organisational management in IS implementation in public organisations, and this will be discussed in the following chapter.

CHAPTER 7: CONCLUSION

7.0 Introduction

This research study set out to highlight issues associated with the introduction of EMIS/*SMPP* in the MMOE, and considered the barriers to the effective working of the system within the Ministry, from the perspective of the decision-makers. The research involved an investigation of the use of the EMIS/*SMPP* database by decision-makers for management and planning purposes, and the issues that impede the effective functioning of the system in the Ministry, by exploring the knowledge of, and attitudes towards EMIS/*SMPP* of decision-makers within the MMOE. The results of the investigation have provided answers to the research questions established at the outset of the study:

- i) How have decision-makers reached decisions?
 - a. To what extent does EMIS/*SMPP* data play a role in educational decision-making?
- ii) What do decision-makers think about the introduction and implementation of EMIS/*SMPP* in the MMOE?
 - a. Does the existing EMIS/*SMPP* database within the MMOE help to provide input for decision-making? If not, why not?
 - b. How could the MMOE ensure a more up-to-date and complete data collection?
- iii) How do decision-makers perceive EMIS/*SMPP* in the future?
 - a. What are the barriers that hinder the effective working of EMIS/*SMPP* in the MMOE?
 - b. Is there a need to develop a comprehensive EMIS database in the MMOE? If yes, are there any suggestions as to how this should be done?

In Chapter 1, the development of IS within the MMOE, and particularly, the implementation of EMIS/*SMPP*, as well as the background of the MMOE, were discussed. The impetus for this study was the literature review (Chapter 2), which

highlighted the factors affecting the implementation of IS from a number of standpoints: MIS in private/commercial organisations, MIS in public/educational organisations, systems evaluation, organisational management and educational change. The methodology used for carrying out the research objectives of this study, along with the strengths and weaknesses of that methodology, were detailed in Chapter 3. Chapter 4 described interviews with twenty-four decision-makers in the MMOE during the main study, and an in-depth discussion of the findings in the light of the literature was reported in Chapter 5. Chapter 6 provided an analysis of the findings, as well as presenting EMIS models proposed by EMIS/*SMPP* developers and a proposal based on the findings and review of literature. It also considered the implications of the study for the MMOE. The purpose of this final chapter is to review the key findings of the case study, suggesting how this study has contributed to the field of study and areas for future research. It also provides recommendations as to how the implementation of IS may be facilitated, particularly the EMIS in the MMOE.

The case study is based on detailed evidence of the implementation of EMIS/*SMPP* in an organisation, the MMOE, and its relation to the processes and practices of technological development and organisational management. The case study highlighted that implementing IS requires a change in organisational management, and concludes that together, the absence of a manager of change/technology in the MMOE and the culture of the organisation have a great impact on the implementation of its ISs. The findings provide insights that both academics and practitioners, particularly in Malaysia, can use to identify similar aspects in other organisations, so that future empirical work might be both comparable and cumulative. Thus, the purpose of this chapter is two-fold: first, to bring together the main ideas emerging from this research, and secondly, to identify the contribution of this study both in practical terms and from the point of view of the literature.

7.1 Key findings of case study

Initially, the researcher believed that the implementation of *EMIS/SMPP* faced critical technology problems. However the observations made throughout her involvement in the project changed her thoughts, a change in view that was confirmed through the interviews with twenty-four decision-makers in this study. This study concluded that it was human and organisational/management rather than technological issues within the MMOE that accounted for the flawed implementation of *EMIS/SMPP*.

It has been shown in this study that while there were decision-makers who strongly felt that *EMIS/SMPP* was not up to the stakeholders' expectation, there were also interviewees who found that *EMIS/SMPP* could provide data only for very limited purposes (question i a). The decision-makers in the MMOE believed that *EMIS/SMPP* was an ineffective system, and was unable to serve the information needs of decision-makers (question ii a). Despite their concern that the system could not perform as expected, the central problem included management tensions and attitudes towards the system. Suggestions for addressing difficulties in the implementation of EMIS included:

- providing sufficient machines and reliable supporting facilities;
- creating the post of a manager of change/technology, with his/her position situated within the top management;
- formulating information/IT/ISs policies;
- making system documentation more widely available;
- empowering system managers at grass roots levels;
- providing greater co-operation and collaboration of all Divisions Directors;
- providing more exposure of users to the system, so as to increase their understanding of the system (question ii b).

The suggestions above point to issues that have to be seriously considered by everyone involved in the system's implementation, to ensure up-to-date and complete data collection (questions ii b).

The decision-makers were particularly enthusiastic about the development of an integrated system within the MMOE to improve information flow within the ministry. From their perspectives, the realisation of this idea requires a restructuring in organisational hierarchy and boundaries, and involves streamlining the organisational functions, as well as developing a cross-functional system (question iii b).

The key finding of the study was the inability of the MMOE management to cope and manage the inevitable changes brought about by introducing ISs. This, it was argued, was due to the absence of a manager of change/technology within the MMOE. It also resulted from a failure to learn from the experiences of implementing ISs, insufficient basic and supporting facilities, the lack of top management commitment and support, the absence of information/IT/IS policies, and people's attitudes towards the system. These issues led to serious problems such as very limited information flow within the Ministry, the creation of functional boundaries between divisions, and a lack of communication between technology experts and the professionals in the development of IS. They also caused a lack of co-ordination and collaboration among divisions, and disincentives for learning. Those issues that most concerned the development of the system were the unavailable, or at best incomplete system manuals and documentation, inadequate system planning and evaluation, and lack of training and exposure to the system for users, particularly top management. However these latter issues required the commitment of the management, and particularly the appointment of a manager of change/technology (question iii a).

These findings seem to match the previous case studies discussed in Chapter 2. Nevertheless, the implementation of EMIS within the MMOE is unique in two ways. Firstly, unlike the organisations discussed earlier, EMIS/*SMPP* is developed in a fully centralised system, in which planning, development and management are controlled by a central agency, the MMOE. One major difference between public and commercial organisations is that commercial users rarely have computerisation forced upon them from top management. Any effective initiative would be likely to

result in better business opportunities for their organisations, and this relative freedom for commercial organisations will almost certainly be more satisfying and less stressful. Public organisation users on the other hand, whether in a learning institution or administrative division/department, may well be told that computerisation is going to happen, and they are given no choice over whether or not to use the computer. In other words, in view of the bureaucratic management of public organisations such as the MMOE, acceptance (with or without inertia) of changes brought in at all levels are almost always top-down in nature. Hence, the success or failure of the system does not have personal significance for the individual, nor is seen as a shared goal of the whole organisation. Should it be otherwise (i.e. bottom-up), the level of acceptance among users should be higher.

Secondly, the implementation of EMIS/*SMPP* did not begin from scratch. Again, unlike the case studies in Chapter 2, the ISs introduced in the case organisations are new innovations. EMIS/*SMPP* was developed from an established computer-based IS foundation, and it was developed in order to strengthen the already existing information system. Hence the implementation of EMIS/*SMPP* is perceived more as a completion of a successful project (Cassidy & Cresswell, 1997) than as an introduction of completely new system. Those involved in the project already possess their own ingrained perspectives of the system and ways of handling it, and these could differ from the views of other users and the top management.

A significant conclusion of the research is that the implementation of computer-based IS involves more than technological capability or of IT training skills. It requires a manager with managerial and technological skills to organise activities connected with IS implementation and development. It also requires serious consideration of the organisational culture and structure where the IS implementation is embedded.

7.2 Literature contribution

The case study has raised a wide range of issues. Although it cautions against generalisation, it raises important lessons about the manner in which EMIS/*SMPP* implementation may be organised, as well as some limitations in terms of existing approaches adopted by the system developers. As was noted in Chapter 2, one of the major weaknesses in current IS implementation is the tendency to focus on technological issues (Heeks, 1987). This study focuses on a wider set of issues affecting the implementation of EMIS within the MMOE, drawing on a multi-disciplinary literature of MIS in private and public organisations, system evaluation and organisational management. In this study, these issues have fallen into three categories: the human-centred issues; the organisational/management issues; and technical issues.

This study contributes to the literature by providing an in-depth study in an under-researched context. It makes the case for a manager of change/technology in implementing EMIS, and takes full account of the importance of organisational structure/culture when introducing change within an organisation. It provides evidence of the impact of developing and utilising computer-based information systems on the Ministry's administrative structure, lacking in a previous study (Aziz, 1997). From the perspectives of the decision-makers involved, it emerges that the implementation of IS does have an effect on the organisational structure of the Ministry. Indeed, there were suggestions by the interviewees that the organisational structure of the Ministry and EMIS/*SMPP* structure should be reviewed, and that the necessary changes are made to improve the information flow in the Ministry and the functioning of both the divisions in the Ministry and the EMIS.

No comprehensive discussion of EMIS implementation was found in the literature. However some linkages between MIS in private and public organisations including educational institutions were identified. The issues highlighted in this study provide perceptions from the decision-makers' point of view on the implementation of EMIS/*SMPP*, specifically used as a tool for administrative purposes in an

educational setting. Based on the findings, an alternative effective EMIS implementation model (see Figure 6.4.2) was developed. The proposed alternative model may provide some ideas or contributions for exploration of EMIS implementation in other educational organisations.

7.3 Methodological contribution

This research is based on an empirical investigation of issues affecting the implementation of EMIS from the point of view of the decision-makers in the MMOE, and participant observation. The work can be characterised as a multi-method, in-depth field research study. Methodologically speaking, the case findings prove to be useful in bridging the gap between an understanding of the MMOE managers occupying different roles with respect to the issues of implementing IS in the Ministry. In an attempt to understand and explain the consequences of IS introduction and implementation, the research adopted an interpretative position, using different sources of evidence to validate the results. In so doing, there are three features in the work's methodological approach.

Firstly, in spite of the progress towards understanding IS implementation initiatives, the practice of IS implementation and management is largely eclectic: managing IS implementation involves cross-functional work across cultural, structural, technical and informational boundaries. The first challenge for the researcher is to decide whether to adopt a single-discipline approach or to examine the factors affecting the implementation of EMIS from a holistic point of view. It seems that the former is more straightforward; but the latter, adopted in the research, is more likely to produce results that reflect the practicality of EMIS implementation and management within the MMOE.

Secondly is the question of data access. The research covered interviews at both the central (the MMOE) and the operational levels (the SEDs). This is the first case study of perceptions of EMIS/*SMPP* among the decision-makers since the system was first implemented some five years ago. In total, twenty-four decision-makers

agreed to an interview, including those within the top management of the MMOE. Decision-makers serve as very important sources of information and it is very important to record their perspectives and management thinking with regard to the system. It is also important to understand whether their personal perceptions on *EMIS/SMPP* are consistent. As a highly bureaucratic organisation, any opportunity to negotiate access into the tight MMOE management daily schedule has to be dealt with carefully, and also in a 'socially correct' manner. The method adopted by the researcher to gain access to the decision-makers in the MMOE seems to suit the culture of a Malaysian public organisation, and proved to accelerate the process of gaining access.

The result of the interviews enabled the researcher to construct relationships between the issues raised (see Figures 6.2 & 6.3). Both multiple cause diagrams suggest that no single issue from the three categories; human-, organisational/management, and technical-related issues, appeared in isolation, and causal relationships between one issue and another were shown. The interconnectedness of issues shed light on the difficulties inherent in the *EMIS/SMPP* model proposed by the system developers and consultants (see Figure 6.4.1) and the reason for an alternative implementation model (see Figure 6.4.2).

Thirdly, the research argues that the issue of flexibility in research design is the key to research on IS implementation and management. As has been clearly demonstrated in this research, feasible research questions need to be determined by access possibilities. This study has adopted a combination of flexible and iterative approaches to research design in an attempt to allow learning to take place throughout the field study. As such, a combination of methods, including participant observation and case study methods, was found to be useful in investigating the complex phenomenon of IS implementation and management.

Hence, the multi-disciplinary nature of the study serves as the main contribution of this research. By adopting a multi-disciplinary perspective on *EMIS/SMPP*

implementation, the findings of this study reveal, and address, the imbalance between technology and human, as well as organisational/management issues normally practised in public organisations.

7.4 Research limitations and future research

In addition to the possible problems in Chapter 3, some limitations of the study will now be discussed. This study has several limitations that provide opportunities and directions for future research.

7.4.1 Narrow research territories, small sample and limited time

Of necessity, the case study had to involve a manageable number of participants to fit the researcher's course schedule. Twenty-four decision-makers from three levels (eight from the MMOE top management, eleven from the ministry Division Directors/Secretaries, and five from the SED Directors) were interviewed. Ideally all decision-makers in the education system would have been involved but the number involved was, in effect, representative. The study could only involve interviewing decision-makers within the case sites in West Malaysia. This approach may have been convenient for exploring factors affecting the implementation of EMIS/SMPP from the perspectives of the decision-makers involved. However, from the view of a wider EMIS, the research limits its attention to one level of EMIS/SMPP users and only one part of the organisational geography. Future studies, therefore, may attempt to cover more territory by extending the study sites to East Malaysia. With an increase in the case sites, the impact of those factors affecting the implementation of EMIS/SMPP would be clearer, and hence, would extend the validity and generalisability of the findings.

7.4.2 Significance of findings through quantitative analysis

A further limitation of this study was that the analysis was more restricted to qualitative research methods, although in the process of analysing the data, the researcher used rigorous data analysis, which at times was quantitative in nature. Future research in this area should consider adopting quantitative records based on

usage of EMIS/SMPP data, to show the statistical significance of interviewees' views. This would be a way of strengthening the generalisations made through the analysis of the findings, using the qualitative method. Evans et al. (1994) consider that one problem in carrying out a small-scale interview study is to ascertain whether the eloquent quotes provided by the interviewees actually represent views widely held in the profession. In assessing the significance of the study, the authors suggest:

We can also make a statistical judgement as to whether the majority holding a view is significant. The simple approach is to compare the majority with the other two groups combined, using the binomial test (Siegel 1956 in Evans et. al. 1994). With twenty-four teachers, if the majority group is twenty-one or more (the other two groups totalling three or less), the two-tailed probability is $p < .001$. This means that there is less than one chance in a thousand that the population of infant teachers as a whole holds no view on the matter, or holds the opposing view. Correspondingly, if the majority group is nineteen or twenty, the probability is one chance in a hundred ($p < .01$) and if it is eighteen the possibility is one chance in twenty ($p < .05$) (the lowest level of statistical significance normally accepted). In any of these cases we can talk of 'most' teachers holding a particular majority view in confidence that this is true of infant teachers as a whole (pp.7-8).

With a small-scale interview study, adopting a statistical judgement seemed to be a relevant means of strengthening the generalisations made through the analysis of the findings from the qualitative method.

7.4.3 Interview biases

Naturally EMIS/SMPP changed over time to match environmental necessity. As a result, any evaluation of the system will change from time to time. In this study the interview responses were biased by the interviewees' current concerns, knowledge and involvement in implementing the system. The interviewees' responses are based solely on their knowledge and perspectives of EMIS/SMPP, although in some instances, it was observed that the interviewees were 'playing safe', insofar as what they said during the interview conflicted with what they generally said about the system during meetings. In terms of future research, a longitudinal study would have the advantage of observing a set of relevant sites for a long time, so as to gather a more comprehensive result regarding issues related to IS implementation.

7.4.4 Measuring the effectiveness of EMIS/SMPP

This research highlights those factors affecting the implementation EMIS/SMPP from the knowledge and perspectives of decision-makers through interview results and participant observations. However, it does not cover a more detailed measurement of the effective use of EMIS/SMPP through user logs or computer-generated statistics on transaction processing such as activity processing, report processing or inquiry/requests processing. Through the researcher's experience and observation, only data requests made in writing would be recorded, whilst decision-makers, particularly the top management often made ad hoc verbal requests, responded instantly and very seldom recorded. Furthermore the interviews provided evidence of low use of the system among decision-makers. Hence the record did not contain a complete list of data requests from decision-makers in the MMOE that the researcher could rely on. Measuring the effective use of the system based on these information sources, a complete list of data requests, is a very important area for future research.

7.4.5 Integration of technology usage

There is also a need to explore issues and concerns further regarding the use of an ICT-based information system. The research suggests that technology plays a transformational role, and remains one of the key elements in establishing computer-based ISs. In many ways it is technology that has made an informed decision making culture within organisations into a reality. Therefore one cannot ignore the importance of information technology access and its utilisation in implementing IS. One important issue for future studies of ICT-based information systems is that there is a need to base such studies on an integrated understanding of the technological design and performance of IT systems. If such integration were to be used within the MMOE, then there would be a need for a study to look at the design, functionality and interface of the technology and the system developed. Specifically, there would need to be a focus on whether there is an improvement in decision-making or client service, as the result of an increase in the quality and timeliness (real time) of IS, could be an area of interest for future research.

7.4.6 Adoption of other research methods

Finally this study suggested that future research should place emphasise on the impact of the introduction of IS on the management of public organisations. In achieving this objective, several methodologies such as hypothesis testing, statistical investigations and comparative studies may be used. By using interdisciplinary approaches simultaneously, future studies can provide more evidence to explain the factors that constitute patterns that hinders and facilitate IS implementation and management in the organisation. As educational systems often consist of levels with different functional objectives and activities, it is evident from the study that the use and the needs of IS are specific to each level. Therefore, future research could also adopt the strategy of action research, where practitioners investigate their own practices and settings in order to examine the particular problems, needs and solutions of each level. Two of the instances listed by Cohen and Manion (1994) for appropriate use of action research included (a) management and control – the gradual introduction of the techniques of behaviour modification, and (b) administration – increasing the efficiency of some aspect of the administrative side. The advantage of conducting action research is that the practitioners will be able to act and react according to their social relations and interactions in the field (Ball, 1993). Hence action research carried out in the implementation of ISs will better ensure the involvement of people and an evaluation of the system at every level and stage of the system implementation process. It would also give participants ‘ownership’ of their relations with the system, and could therefore be directly beneficial to the effectiveness of the system.

7.5 Recommendations

It is appropriate to conclude with some specific recommendations. These recommendations aim to facilitate the implementation of the emerging IT practices particularly EMIS in the MMOE, and to smooth the on-going roles of IS developers. Table 7.3 outlines a number of issues in the implementation of EMIS in the MMOE, with recommended solutions based on the suggestions made by the decision-makers

during the interviews, several authors in the four areas discussed in Chapter 2 and the researcher's own observations throughout EMIS/SMPP development process.

Table 7.3: Issues in implementing EMIS/SMPP and recommended solutions

Issues	Recommended solutions
Coping with and managing expected and unexpected changes brought by the introduction of EMIS/SMPP	<ul style="list-style-type: none"> ▪ creating the post of manager of change/technology with his/her position placed among the top management and the authority to make decisions; ▪ being a "learning organisation" in order to manage inevitable changes.
Departmentalisation of work	<ul style="list-style-type: none"> ▪ restructuring organisational hierarchy, boundaries and streamlining the organisational functions; ▪ developing a cross-functional system to bridge functions across the Ministry; ▪ providing IT training for professionals to reduce dependence on IT experts; ▪ securing the co-operation and collaboration of all Divisions Directors.
Absence of information/IT/IS policies	<ul style="list-style-type: none"> ▪ commitment from the top management; ▪ formulation of National Information and IS policies.
Integrated/cross-functional system	<ul style="list-style-type: none"> ▪ top management commitment; ▪ provision of sufficient and reliable machines and supporting facilities ▪ co-operation and collaboration of all Divisions Directors.
Limited knowledge about EMIS/SMPP	<ul style="list-style-type: none"> ▪ provide training and expose the system to all users particularly the top management.

Issues	Recommended solutions
Lack of communication	<ul style="list-style-type: none"> ▪ create a system planning team consisting of the MMOE technology experts and the professionals and encourage team-building process.
Users' resistance	<ul style="list-style-type: none"> ▪ understand what drives the diffusion of technology and work with natural forces rather than against them; ▪ 'sell' the system to enable users at all levels to have better understanding about the system.
Inadequate system planning	<ul style="list-style-type: none"> ▪ commitment of top management during the analysis and design of the system; ▪ formulation of information and IS policies.
Slow system development	<ul style="list-style-type: none"> ▪ commitment of top management; ▪ availability of system documentation; ▪ on-going system evaluation.
Obstructed system implementation	<ul style="list-style-type: none"> ▪ commitment of top management; ▪ availability of system manuals and documentation.
Poor system maintenance	<ul style="list-style-type: none"> ▪ commitment of top management; ▪ availability of system manuals and documentation.
Poor attitude towards EMIS/SMPP	<ul style="list-style-type: none"> ▪ empowerment of system managers at grass-roots levels; ▪ co-operation and collaboration of all Divisions Directors; ▪ provide more exposure of users to the system to increase their understanding of the system.

7.6 Summary

The original idea of introducing EMIS was by no means a negative one. However it is evident that once it has been implemented and used widely, there tend to be a lot of problems due to discrepancies in the way in which it is implemented. What seems to be lacking in the current implementation of EMIS/*SMPP* in the MMOE is not only the management of IT/IS but, of utmost importance, the management of human factors, particularly the conflicting perceptions of the implementation of IS within the ministry. Hence the ministry top management should take into account the works of Taylor and Singer (1983), Fullan (1991), Gray et al. (1994) and Riis et al. (2001) on the significance of management of change in the implementation of IS in an organisation. Neglecting this factor could only lead to the development of a non-effective IS which would cost the ministry even more to rectify than to start anew. The recent creation of the CIO post held by a member of the top management within the MMOE is seen as a positive indication of effective IS development, as this person will be responsible for addressing emerging information and IS issues, and managing change/technology within the MMOE.

It should be noted here that at the time the researcher was in the process of transcribing the interviews, there was a major reshuffle within the MMOE. This involved considerable movement at the level of top management and among directors, both within the MMOE and SED. This reshuffle also involved the transfer of top management administrators to another Ministry. With the mobility and transfer of senior managers involved in the study, the findings of this study might not concur with the perspectives of the existing MMOE management as regards the implementation of EMIS.

This study provides a deeper understanding of the issues, processes and policies that imbue interviewees' responses. It has also given a fuller appreciation of the complexities and difficulties of change brought into an organisation. Unconsciously, such changes have a direct effect on other factors such as the management of the

organisation, the decision-making procedures and the attitudes of the stakeholders towards the changes introduced.

References

- Abdul Rahman, M.A. (2001). *Towards increasing the use of computerised information systems and data quality in schools – the state of Selangor, Malaysia*. Unpublished Thesis: PhD. The University of Reading, Reading.
- Agryris, C. (1991). Teaching smart people how to learn. *Harvard Business Review*. p.100.
- Avgerou, C. (2001) 'The significance of context in information systems and organisational change', *Info. Systems J.* Vol. 11, No. 1, p.43-63.
- Aziz, Z. (1997). *The Use of Computer-based Information System for Policy Development in the Ministry of Education, Malaysia*. Unpublished Thesis: PhD. The University of Leeds, Leeds.
- Baharudin, A.S. (2000). *Users', management and developers' roles on the success of computerised application systems implementation in the Malaysian public sector*. Unpublished Thesis: MBA. The University of Science Malaysia.
- Ball, S.J. (1993). 'Self-doubt and Soft Data: Social and Technical Trajectories in Ethnographic Field Work', in M. Hammersley (ed) *Educational Research: Current Issues*. London: Open University.
- Barta, B.Z., Telem, M, and Gev, Y. (1995). *Information in Educational Management*. Padstow, Cornwall: T.J. Press Ltd.
- Bentley, T.J. (1981). *Making Information Systems Work*. London: The MacMillan Press Ltd.
- Bertaux, D. (ed) (1981) *Biography and Society: The Life History Approach in the Social Sciences*. Beverly Hills, CA: sage Publications.
- Bhowon, R. and Chinapah, V. (1993). 'Reform of Basic Education in Mauritius: The Process of Information Gathering, Consultation and Decision-making', in D.W.Chapman and L.O.Mahlck (eds) *From Data to Action: Information Systems in Educational Planning*. Paris: UNESCO/IIEP.

- Bikson, T.K., Cathleen, S., and Mankin, D.A. (1985). *Computer mediated work, individual and organisational impact in one corporate headquarters*. Santa Monica, CA: Rand Corporation.
- Bogdon, R., & Taylor, S.J. (1975). *Introduction to Research Methods: A Phenomenological Approach to the Social Sciences*. New York: John Wiley & Sons.
- Bogdon, R., & Taylor, S.J. (1984). *Introduction to Qualitative Research Methods*. New York: John Wiley & Sons.
- BPK. (1989). *Notes on the functions and activities of the Computer Service Division*. Kuala Lumpur: Ministry of Education Malaysia.
- BPPDP and BSM. (n.d., circa 1990). *MOE Information and Computerisation committee meeting: Difference and duplication of teacher information variables in SMPP/EMIS, SMS/JGMG and SISPEN application systems*. Kuala Lumpur: Ministry of Education Malaysia.
- Briggs, C.L. (1986). *Learning How to Ask: A Sociolinguistic appraisal of the role of the interview in social science research*. Cambridge: Cambridge University Press.
- Brooks, F.P. (1974). 'The mythical man-month'. *Datamation*, December.
- Busher, H. (2001). 'The Micro-Politics of Change, Improvement and Effectiveness in Schools', in A. Harris and N. Bennett (eds) *School Effectiveness and School Improvement: Alternative Perspectives*, p.75-97. London: Continuum.
- Campbell, D. and Stanley, J. (1963). 'Experimental and Quasi-experimental Design for Research in Teaching', in N.L.Gage (ed.) *Handbook or Research on Teaching*, p.171-246. Chicago: Rand McNally.
- Carnall, C.A. (1995). *The Evaluation of Organisational Change*. Gover: Aldershot.
- Cassidy, T. (1990). *Data for Decisions in Developing Education System: An Analysis of a Computer-based Educational Management Information System in*

- the Arab Republic of Egypt*. Boston: Harvard Institute for International Development.
- Cassidy, T. (1994). *An outline of threats to the quality and usefulness of data in developing information systems*. Boston: HIID/Education.
- Cassidy, T. and Cresswell, A. (1997). 'Suggestions for future EMIS improvement'. Paper presented to the SMPP/EMIS Seminar, November, Kuala Lumpur.
- Chapman, D.W. (1990). 'The Role of Education Management Information System in Improving Educational Quality', in D.W.Chapman and C.A.Carrier (eds) *Improving Educational Quality: A Global Perspective*. Westport, Conn.: Greenwood Press.
- Chapman, D.W. and Mahlck, L.O. (1993). 'Improving educational quality through better use of information', in D.W.Chapman and L.O.Mahlck (eds) *From Data to Action: Information Systems in Educational Planning*. Paris: UNESCO/IIEP.
- Child, J. (1984). *Organisation: A Guide to Problems and Practice 2nd ed.* London: Paul Chapman Publishing Ltd.
- Ciborra, C. and Lanzara, G. (1994). Formative contexts and information technology: understanding the dynamics of innovation in organisations. *Accounting, Management and Information Technologies*, Vol.4, No.2, p.61-86.
- Cohen, L. and Manion, L. (1994). *Research Methods in Education*. 4th ed. London: Routledge.
- Crowe, T. and Avison, D.E. (1980). *Management Information from Data Bases*. London: MacMillan Press Ltd.
- Cunningham, W.G. (1982). *Systematic Planning for Educational Change*. California: Mayfield Publishing Company.
- Dalin, P. (1978). *Limits to Educational Change*. London: MacMillan.

- Davis, G.B. and Olson, M.H. (1985). *Management information system: Conceptual foundations, structure and development*. New York: McGraw-Hill.
- Drew, E.P. (1994). 'Development of Information Technology in Ireland', in E.P.Drew and G.F.Foster (eds.) *Information technology in selected countries: reports from Ireland, Ethiopia, Nigeria and Tanzania*. Tokyo: United Nations University.
- Dror, Y. (1976). 'Strategies for Advance Reform', in A.F.Leemans (ed.) *The Management of Change in Government*. The Hague: Martinus Nijhoff.
- Drucker, P.F. (1955). *The Practice of Management*. Oxford: Heinemann.
- Ebbutt, E. (1985). 'Education action research: some general concerns and specific quibbles', in R.G.Burgess (ed.) *Issues in educational research: qualitative method*. London: the Falmer Press.
- Eisehardt, K.M. (1989). 'Making Fast Strategic Decisions in High-Velocity Environments', *Academy of Management Journal*, Vol.32, No.3, p.543-76.
- Elbourne, E.T. (1914). *Factory Administration and Accounts*. The Library Press.
- EPRD and HIID, (1997). *A plan for the development of an education management information system for the education sector of the government of Malaysia*. Kuala Lumpur: Ministry of Education Malaysia.
- EPRD. (1994). *Management of Information System and Computerisation Ministry of Education*. Kuala Lumpur: Data Unit EPRD.
- EPRD. (1995). *EMIS Attachment study report to the Ministry of Education Singapore*. Kuala Lumpur: Data Unit EPRD.
- EPRD. (1997). *Short answers to frequently asked questions about the development of Educational Management Information System (EMIS) for the education sector in Malaysia*. Kuala Lumpur: EPRD.
- EPRD. (1998a). *Educational Management Information System (EMIS), Ministry of Education Malaysia*. Kuala Lumpur: Data Unit EPRD.

- EPRD. (1998b). *Discussion notes between Data Unit and Macro Planning Unit, EPRD*. Kuala Lumpur: Data Unit EPRD.
- EPRD. (2001) *Quick Facts 2001 Malaysian Education Statistics*. Kuala Lumpur: Ministry of Education Malaysia.
- Evans, L., Packwood, A., Neill, S.R.St.J. and Campbell, R.J. (1994). *The Meaning of Infant Teachers' Work*. London: Routledge.
- Farbey, B., Land, F. and Targett, D. (1993). *How to assess your IT investment. A study of methods and practice*. Oxford: Butterworth Heinemann.
- Ferrarotti, F. (1981). 'On the Autonomy of the Biographical Method', in D. Bertaux (ed.) *Biography and Society: The Life History Approach in the Social Sciences*. Beverly Hills, CA: Sage Publications.
- Friedrichs, J. and Lüdtke, H. (1975). *Participant Observation*. Portsmouth: Eyre & Spottiswoode Limited.
- Fuerst, W.L. and Cheney, P.H. (1982). 'Factors affecting the perceived utilisation of computer-based decision support systems in the oil industry'. *Decision Sciences*, Vol.13, p.554-569
- Fullan, M.G. (1982). *The Meaning of Educational Change*. Columbia: University Teachers College Press New York.
- Fullan, M.G. (1991). *The New Meaning of Educational Change 2nd ed*. London: Cassel Educational Limited.
- Fullan, M. (1993). *Change Forces: Probing the Depths of Educational Reform*. London: The Falmer Press.
- Fullan, M. (1999). *Change Forces: the sequel*. London: The Falmer Press.
- Fung, A.C.W. (1996). 'An evaluation of the Hong Kong design and development strategy', *International Journal of Educational Research*, Vol. 25, No.4, p.297-306.

- Gage, N.L. (1989). 'The Paradigm Wars and Their Aftermath: A "historical" sketch of Research on Teaching', *Educational Researcher*, Vol.18, No.7, p. 4-10.
- Genus, A. and Kaplani, M. (2002) 'Managing operations with people and technology', *Int. J. Technology Management*, Vol. 23, Nos. 1/2/3, p.189-200.
- Geographical Information System Development Guides. Available at: <http://www.sara.nvsted.gov/pubs/gis/gisindex.html>
 Accessed on April 26th, 2000
- Glaser, B.G., and Strauss, A.S. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine Publishing Company.
- Gray, P., King, W.R., McLean, E.R. and Watson, H.J. (eds) (1994). *Management of Information Systems*. 2nd ed. Orlando: The Dryden Press.
- Great Britain – Further Education Unit (1987). *Information technology support system for education and training*. London: Further Education Unit.
- Heeks, R. (1987). *Computerisation in academic departments*. London: Taylor Graham.
- Heron, J. (1981). 'The Philosophical Basis for a New Paradigm', in P.Reason and J.Rowan (eds) *Human Inquiry*. p.19-35. New York: John Wiley & Sons.
- Hockey, J. and Wellington, J. (1990). *Sheffield's 'information revolution'? IT in Sheffield industry and its implications for employment, education and training*. Sheffield: JISER
- Humphreys, P. and McHugh, M. (2001). 'Professionalizing Change', *Journal of General Management*, Vol. 26 No. 3, p.53-74.
- Inbar, D.E. (1996). *Planning for Innovation in Education*. Paris: UNESCO/IIEP.
- Irani, Z. and Love, P.E.D. (2001) 'Information systems evaluation: past, present and future', *European Journal of Information Systems*, Vol. 10, No. 4, p.183-188.

- Irani, Z., Sharif, A.M., and Love, P.E.D. (2001) 'Transforming failure into success through organisational learning: an analysis of a manufacturing information system', *European Journal of Information Systems*, Vol. 10, No. 1, p.55-66.
- Jones, N. (2002) 'Developing and assessing radical technological changes: lessons from the PBX industry', *Int. J. Technology Management*, Vol.23, No.4, p. 287-303.
- Knight, A.V. and Silk, D. J. (1990). *Managing information: Information systems for today's general manager*. London: McGraw-Hill Book Company.
- Knight, K. How to keep the boss up to it. [A summary of the MANDIT report] *Computer Guardian*, 4 December 1986.
- Lewin, K.M. and Stuart, J.S. (eds) (1991). *Educational Innovation in Developing Countries: Case-studies of Changemakers*. London: MacMillan.
- Li, E.Y., and Chen, H.G. (2001) 'Output-driven information system planning: a case study', *Information & Management*, Vol. 38 No. 3, p.185-199.
- Lincoln, Y.S. and Guba, E.G. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications.
- Locke, L. (1989). 'Qualitative Research as a Form of Scientific Inquiry in Sport and Physical Education'. *Research Quarterly for Exercise and Sport*, Vol.60, No.1, p.1-20.
- Locke, L.F., Spirduso, W. and Silverman, S.J. (1987). *Proposals that Work: A Guide for Planning Dissertations and Grants Proposals*. Beverly Hills, CA: Sage Publications.
- Loeffen, J.M.J. and Wortmann, J.C. (2000). 'It challenges organisational design: how to connect manufacturing concepts to IT', *Int. J. Technology Management*, Vol.19, No.6, p.630-637.
- Lucey, T. (1989). *Management Information Systems*. London: DP Publication Ltd.

- Lyytinen, K. and Robey, D. (1999) 'Learning failure in information systems development', *Info System J*, Vol. 9, No. 2, p.85-101.
- Mahathir, M. (1991). *Malaysia: The Way Forward*. Kuala Lumpur. Malaysia Business Council.
- Malaysia, (1991). *Sixth Malaysia Plan 1991-1995*. Kuala Lumpur: Percetakan Nasional.
- Management Information Technology report. (1991). *Planning, Installing and Using Information System*. Bangkok: AIT.
- March, J. G. (1984). 'Theories of choice and making decision', in R.Paton, S.Brown, R.Spear, J.Chapman, M.Floyd, and J.Hamwee (eds) *Organisations: Cases . Issues . Concepts*. p.91-97. London: Paul Chapman Publishing Ltd.
- Mark, M.M. and Judy A.H. (1994). 'Keys to success with the internet', *The Journal of Systems Management*, November.
- Martino, J.P. (1999). 'The environment for technological change', *Int. J. Technology Management*, Vol.18, Nos.1/2, p.4-10.
- Miller, D. and Lee, J. (2000). 'The people make the process: commitment to employees, decision making, and performance', *Journal of Management*, Vol.27, No.2, p.163-189.
- Millet, I., Mawhinney, H. and Kallman, E. (1992). 'A path framework for executive information systems', in H.Watson, R.Rainer and G.Houdeshel (eds) *Executive Information Systems*. p.127-144. Chichester: Wiley.
- Ministry of Education, Malaysia. (1997). *Terms of Reference for Technical Assistance in the Strengthening of Educational Management Information System in the Ministry of Education, Malaysia*. Kuala Lumpur: EPRD
- Mirel, B. (1988). 'Defining the role of in-house documentation'. *Conference record of the professional conference*. pp: 163-168

- Mishler, E.G. (1986). *Research Interviewing*. Cambridge, MA: Harvard University Press.
- Mumford, E. et al. (1972). 'The human problems of computer introduction', *Management Decision*, Vol.10, Spring, p.6-17.
- Nolan, C.J.P., Ayres, D.A., Dunn, S., and McKinnon, D.H. (1996). 'Implementing Computerised School Information Systems: Case Studies in New Zealand', *International Journal of Educational Research*, Vol.25, No.4, p.335-350.
- Patton, M.Q. (1990). *Qualitative Evaluation and Research Methods*. Newbury Park: Sage Publications.
- Planning, Installing, and Using Information Systems. (1991). In *Managing Information Technology*. New Jersey: Datapro Information Services Group.
- Premkumar, G. and King, W.R. (1991) Assessing strategic information systems planning. *Long Range Planning*, Vol.24, p.41-58.
- Psacharopoulos, G. (1980). *Information: an essential factor in educational planning and policy*. Paris: UNESCO.
- Punch, M. (1986). *The politics and ethics of fieldwork*. Beverly Hills: Sage Publications.
- Radnor, H.A. (1994). *Qualitative/Interpretive research: Collecting and Analysing Interview Data*. Exeter: University of Exeter.
- Riis, J.O., Hildebrandt, S., Andreasen, M.M. and Johansen, J. (2001) 'Implementing change: lessons from five development projects', *Int. J. Technology Management*, Vol.22, Nos.1/2/3, p.13-27.
- Robey, D. (1983). 'Cognitive style and DSS Design: A comment on Huber's paper'. *Management Science*, Vol.29, No.2, p.580-582.

- Rodriguez-Diaz, J., Osorio-Acosta, J., and Alamo-Vera, F.R. (1997) 'Strategic process in universities: methodology development and information systems support', *Education and Information Technologies*, Vol. 2, p.327-345.
- Ross, J.E. (1970). *Management by Information*. New Jersey: Prentice Hall, Inc.
- Schutz, A. (1967). *The Phenomenology of the Social World*. G. Walsh & F. Lenhert, (Trans.). Chicago: Northwestern University Press.
- Seidman, I.E. (1991). *Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences*. New York & London: Teachers College, Columbia University.
- Senior, B. (1997). *Organisational Change*. London: The Pitman Publishing.
- Serafeimidis, V. and Smithson, S. (2000) 'Information systems evaluation in practice: a case study of organisational change', *Journal of Information Technology*, Vol. 15, No.2, p.93-105.
- Strudwick, J. (1996). *Malaysia: Educational Management Information System Project* (a draft report).
- Taylor, D.E. and Singer, E.J. (1983). *New Organisations from Old: How to Survive and Prosper in a Changing Environment*. Bath: The Pitman Press.
- Thierauf, R.J. (1984). *Effective Management Information Systems. Accent on current practices*. Ohio: Charles E. Merrill Publishing.
- UNESCO. (1992). *Educational Management Information System (EMIS): Training manual*. Bangkok: UNESCO Principal Regional Office for Asia and the Pacific.
- Unit Data. (1999). *Workshop report of 1999 Basic Educational Data verification and audit*. Kuala Lumpur: Ministry of Education, Malaysia.
- van Wingerden, R.G. (2001) 'Managing change', *Int. J. Technology Management*, Vol. 21, No.5/6, p.487-494.

- Venkatesh, V. (2000) 'Determinants of perceived ease of use: integrating control, intrinsic motivation and emotion into the technology acceptance model', *Information Systems Research*, Vol. 11, No. 4, p.342-365.
- Verspoor, A.M. (1986). *Implementing Educational Change: The World Bank Experience*. EDT Discussion Paper No. EPT44. Washington D.C.: Education and Training Department, World Bank.
- Villanueva, C. (1990). *EMIS in the Philippines*. Bangkok: Unesco Principal Regional Office for Asia and the Pacific.
- Visscher, A. & Wild, P. (1997) 'The potential of information technology in support of teachers and education managers managing their work environment', *Education and Information Technologies*, Vol. 2, No. 4, p.263-274.
- Visscher, A.J. (1992). *Design And Evaluation of A Computer-Assisted Management Information System for Secondary Schools*. Enschede: Universiteit Twente, Toegepaste Onderwijskunde.
- Visscher, A.J. & Spuck, D.W. (1991). Computer Assisted School Administration and Management: The State of the Arts in Seven Nations. *Journal of Research on Computing in Education*, Vol.24, No.1, p.146-168.
- Vygotsky, L. (1987). *Thought and Language*. Kozulin, A. (ed.) Cambridge, MA: MIT Press.
- Wainwright, D. (1997). 'Can Sociological Research be Qualitative, Critical and Valid', *The Qualitative Report*, July, Vol. 3, No. 2.
- Walker, C.R. (1968). *Technology, industry and man*. New York: McGraw-Hill.
- Walsham, G. (1993). *Interpreting Information Systems in Organizations*. Chichester: John Wiley & Sons.
- Ward, J.M., Taylor, P. and Bond, P. (1996). Evaluation and realisation of IS/IT benefits: an empirical study of current practice. *European Journal of Information Systems*, Vol.4, No.4, p.214-225.

- Ward-Schofield, J. (1993). 'Increasing the Generalisability of Qualitative Research', in *Social Research: Philosophy, Politics & Practice*. M. Hammersley (eds). p.200-25. London: Open University/Sage.
- Watson, L. and Watson, N. (1989). *Coping with complexity*, Block 2 of course P679 Planning and Managing Change. Milton Keynes: The Open University.
- Watson, R. (2001). A Good Theory. *MIS Quarterly*, Vol.25, No.4/December.
- Wellington, J.J. (1996). *Methods and Issues in Educational Research*. Sheffield: USDE.
- Wild, P., Scivier, J.E. and Richardson, S.J. (1992). Evaluating information technology-supported local management of schools: The user acceptability audit. *Educational Management and Administration*, Vol.20, No.1, p.40-48.
- Willcocks, L. (1994). Introduction: of capital importance. In Willcocks, L. (ed.) *Information Management: The Evaluation of Information Systems Investments*. London: Chapman & Hall, p.207-230.
- Willcocks, L. and Lester, S. (1994). Evaluating the feasibility of information systems investments. Recent UK evidence and new approaches. In *Information Management. The Evaluation of Information Systems Investment*. Willcocks, L. (ed.) London: Chapman & Hall, p.49-75.
- Wood-Harper, A.T. et al. (1985). *Information systems definition: the multiview approach*. Oxford: Blackwell Scientific.
- Wright, C. (ed) (2000). Technology for management and efficiency in education. In *Issues in Education & Technology: Policy guidelines and strategies*. London: Commonwealth Secretariat.
- Yin, R. (1994). *Case Study Research: Design and Methods*. 2nd ed. London: Sage.

Appendix I

Participant Coding Scheme

Level	Number of decision-makers involved	Coding
Top management / senior managers	8	SM1 to SM8
Division Directors/Secretaries	11	DS1 to DS11
State Education Department (SED) Directors	5	SD1 to SD5

Appendix II

The interview schedule

You can see that I'm interested in 4 broad areas of EMIS in the MMOE and these areas are:

- a) EMIS/*SMPP* development phases: initiation, implementation, and institutionalisation,
- b) Your reaction and perceptions on its function in the MMOE,
- c) EMIS in the future, and
- d) Your perceptions on the development of integrated system or comprehensive EMIS in the MMOE.

- 1) First of all, may we look into the introduction/initiation of EMIS/*SMPP* in the MMOE. What would you like to say about its initiation?

(timing?)

(well planned?)

(what was intended?)

(support from the top management and stake holders?)

Would you say that its implementation brought about desirable or undesirable change, in terms of information flow, in the MMOE?

(why?)

(conflict between intended and actual plan?)

(feelings about information flow

- vertically
- horizontally
- data integration
- fulfill the needs of decision makers?
- overall improvement from the past?)

Would you say that EMIS/*SMPP* project has come to the stage of institutionalisation?

(why?)

(acceptance by all levels / stakeholders)

(maintenance)

(MMOE information policy)

(relevance/benefits)

What are the factors that hinder its institutionalisation?

What could help its effective implementation?

(physical facilities especially in schools?)

(networking – completed yet?)

(MMOE policy on information flow)

(commitment of the MMOE top management & Divisions, SEDs, DEOs and schools)

(relate the importance of data to finance such as school budget / development)

(emphasise principals / headmasters' accountability for school information)

2) May we now talk about your reaction and perception on its function in the MMOE? Would you say that EMIS/*SMPP* is capable of providing input for decision making? Has it changed the information flow within the education system and has helped to make access of data more convenient or otherwise?

(why?)

(data for decision making - source of data: from grass-roots or EMIS/*SMPP* database)

(too early to expect it to be perfect?)

(how about other constraints

- commitment, esp. at school level?
- physical facilities, hardware at all levels
- network, for it to go on-line
- written information/IT/IS policies)

(definition of current data: data timeliness / punctuality

- timely data is available only in schools (data as of the day)
- SEDs: aggregated data, or
data extracted from EMIS/*SMPP* database in the Information Centre)

3) How would you like to see EMIS/*SMPP* in future?

(suggestions? on-line access, data integration)

(less turnover of personnel handling data)

(create post for Data Teachers to increase commitment and sense of responsibility)

(‘tie’ accuracy of data from school with finance allocation e.g. *KEW 8*)

(reduce bureaucracy / red tape in the process of purchasing relevant and necessary high capacity computers esp. in Data Unit)

4) What do you think of the development of integrated system or comprehensive EMIS in the MMOE?

(how can it be done? integration of all the existing isolated systems and databases, single/several databases)

(factors likely to hinder its development)

(suggestions to develop integrated system)

Finally, is there anything about the EMIS project in the MMOE in particular, and EMIS as a whole which you think you’d like to say?

Express thanks and find out if participant is interested in getting a transcript of the interview for him to comment:

YES (send transcript)

NO (don’t need to)

Appendix III

Analysing qualitative interviews

Step 1: Identifying issues

Human/affective issues

- 1) attitude toward the system
- 2) understanding about the system
- 3) awareness and sensitivity towards the importance of data

Step 2: Coding (see Table 5.1)

The codes used for the identified issues are as follows:

- 1) Human/affective (H)
 - attitude toward the system – H/PA
 - understanding about the system – H/US
 - awareness and sensitivity towards data – H/AS, etc.
- 2) Organizational/Management (O)
 - utilisation of EMIS/SMPP – O/UE
 - EMIS/SMPP as the MMOE source of information – O/EI
 - additional workload – O/AW
 - manager of IT/IS/change – O/MC
 - isolated and separate systems/databases – O/SS, etc.
- 3) Technical (T)
 - training and exposure – T/TE
 - standardised interpretation of terms – T/ST
 - integration of systems – T/IS
 - comprehensive system design – T/SD
 - basic and supporting facilities – T/BF, etc.

The text with a statement about the need for training would be underlined and in the margin 'T/TE' would be written.

Step 3: Placing data under appropriate issues

TECHNICAL*1) Basic and supporting facilities*

The first reason is simply that the fact is that there's no proper information software that has been developed to trap the kind of information needed.

2) Standardised interpretation of terms

So, that where the interpretation comes. Interpretation becomes very different. When you then plan for English teacher for the next 10 years you'll find that the data is inaccurate. That's one particular example how deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter and then the information system will become useful or otherwise it would only be useful in accordance to the interpretation of that particular division. It may not be useful for overall planning for the Ministry.

3) needs assessment among users

That's one particular example how deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter.

Step 4: Writing supporting interpretive statement

Basic and supporting facilities

The first reason is simply that the fact is that there's no proper information software that has been developed to trap the kind of information needed.

The lack of provision of basic and relevant supporting facilities particularly at the grass roots level was seen as one of the major reasons hindering the smooth implementation of EMIS/SMPP in the ministry and at all levels. There is a crucial

need for the development of a stable and appropriate software to capture the required information in the system.

Standardised interpretation of terms

So, that where the interpretation comes. Interpretation becomes very different. When you then plan for English teacher for the next 10 years you'll find that the data is inaccurate. That's one particular example how deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter and then the information system will become useful or otherwise it would only be useful in accordance to the interpretation of that particular division. It may not be useful for overall planning for the Ministry.

Non-standard interpretation of terms or variables used in the different systems developed by different divisions in the MMOE led to a more serious problem of data inconsistency among divisions supplying information to decision-makers. This phenomenon often caused confusion to the data providers at the grass roots level. Hence, system developers should take the initiative to standardise all interpretation of terms used in ISs so that there will be no incidence of conflicting information from different sources.

Needs assessment among users

That's one particular example how deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter.

The system developers have to look seriously into the pertinence of carrying out needs assessment study among the potential system users. The system should cover the information needed by all users to ensure that the system is fully

utilised and achieves its primary objective of serving the information needs of users at all levels particularly the decision-makers.

Appendix IV: Interviews analysis

<p>T/BF O/OW O/SS T/SP</p> <p>H/AS</p> <p>T/ES</p> <p>T/ST</p>	<p>Q: What do you think could be the factors that hinder the smooth implementation of EMIS/SMPP?</p> <p>SM8: The first reason is simply that the fact is that there's <u>no proper information software</u> that has been developed to trap the kind of information needed. They're still left entirely <u>to various sections and divisions</u> to <u>develop their own software required for their own needs</u> and sometimes the software couldn't be integrated because <u>different formats</u> have been used. That's one reason. But more so I think it involves the <u>people involved do not see information in terms of planning</u>. They see information more in terms of getting day to day job done and very often sections or divisions <u>are more concerned about solving day to day problems than to support planning</u> and therefore they <u>don't see very much the reason why they want to get information properly integrated</u>. I think this is one of the setbacks that we have. EPRD has its own information system called EMIS. But this information is based on its own format, <u>its own perceived format which is not necessarily the kind of format perceived by the people operating on the operating ground</u>. Lets take for example the case of <u>defining the specialisation of teachers</u>. The EPRD would think that teachers are made to teach the subjects that are not really their specialisation. EPRD has decided that if a teacher were to teach a particular subject over 5 years continuously then they would consider that to be their specialisation. But in terms of planning for needs of teachers the School Division would say that what they're concerned about is not what happens 5 years later. What they are very concerned about is what is the specialisation that particular teacher is teaching today because of the vacancy in school. So, to send teacher to school then we need information for that particular time. If schools say they're short of 2 English teachers the school would mean that they're short of 2 English teachers capable of teaching English. They're not saying that they're short of 2 teachers who're specialised in English. So, that's where the interpretation comes. <u>Interpretation becomes very different</u>. When you then plan for English teacher for the next 10 years you'll find that the data is inaccurate.</p>
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Appendix IV: Interviews analysis (contd.)

T/NA	
T/CD	
T/SD	
T/IS	
T/ST/ SP	
H/IC	
O/OW	
H/IC	<p>That's one particular example how <u>deciding on information must also mean deciding on what is the basis for the information or what are the parameters governing that parameter so that everyone agrees on one particular common parameter</u>. And then the information system will become useful or otherwise it would only be useful in accordance to the interpretation of that particular division. <u>It may not be useful for overall planning for the Ministry</u>. Perhaps <u>the purpose of setting up EMIS was different then</u>. It aimed at integrating all databases in the MOE but unfortunately <u>till today that doesn't happen yet</u>. I think apart from me saying that <u>we aren't having integrated system</u> we're also having difficulties in trying to arrive at an integrated system. We must <u>agree to a common format, in terms of certain words</u> and more so is there has to be a driving force behind wanting to have a complete information system and that <u>driving force must come from the top management</u>. And I think there's a lack of that kind of commitment to have the information system that is useful. The reason behind that I think they <u>based on their needs in order to carry out their activities, they based on time constraint</u> and they probably do not see the need at least for that moment in time. They sit down and spend hours trying to decide on information system. <u>Unless the top management themselves committed to do it everybody would subscribe to it</u>. I think it would be difficult to get an information system that would become stable and that would be useful.</p>