ICT and Education

A Study of How an Education Management Information System (EMIS) can be Effectively Implemented in the Ministry of Education in the Kingdom Of Bahrain

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Ahmed Al Koofi

Abstract

Successful management of today's education system requires effective policy-making and system monitoring through data and information. Consequently, countries have invested significant resources into collecting, processing, integrating, analysing and reporting data through Education Management Information Systems (EMIS). However, EMIS is important but not sufficient for overall success, if only its design and development has been limited to information technology enhancements and data storage.

The main purpose of this study is to investigate how an EMIS can be effectively implemented in the Ministry of Education in the Kingdom of Bahrain (MOE).

A survey methodology was conducted to examine the quality of data collection, the procedure for collecting the data, the analysis and the eventual outcome. In order to facilitate the survey, 11 questionnaires were distributed to government schools in the Kingdom of Bahrain (KOB) at all levels: primary, intermediate and secondary. According to the study findings, there are several factors which inhibit the effective implementation of an EMIS in the MOE; however, the major factors are a need to understand the importance of data integration from different resources, understand the importance of the collaborative work among directorates, and build an integrated application for data collection, processing and analysing.

Abbreviations

EMIS	Education Management Information System
MOE	the Ministry of Education in the Kingdom of Bahrain
KOB	Kingdom of Bahrain
SEP	Superintendence of Education Planning
SS	Statistic Section
EIDC	Educational Information Documentation Centre
ESS	Educational Statistics Section
ESP	Education Strategic Plan
IEES	Improving Efficiency in Education System
HRD	Human Resources Directorate
MSD	Materials and Supplies Directorate

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Chapter One: Introduction and Background

1.1 Introduction:

As we live in the era of technology and information, success in organising information systems for the development of education depends on the effective use and implementation of Education Management Information Systems (EMIS) (Wako, 2003b). Therefore, educators must understand that efficient information management is an important condition for continued social and economic development (Chapman and Dhungana, 1991). Not using accurate educational information for monitoring development activities and in decision making may result in unexpected problems and hold back development (Wako, 2003b).

This study seeks to explore the accuracy of the EMIS in the Ministry of Education in the Kingdom of Bahrain (MOE), how data are collected, who collects data, why data are collected and do decision-makers benefit from these data. Moreover, this is an account of a descriptive study of the use of the data collected from the public schools. The study was qualitative, involving questionnaires and interviews with a convenient sample of headmasters, headmistresses and educational specialists. The main purpose of this study, however, is to find out why EMIS efforts in the MOE have not been more successful. Consequently, the focus is on the processes of collecting the data and what is being done with the data, rather than focusing on building a coherent and cohesive EMIS.

This study is divided into five chapters. The first chapter covers the introduction and background of the EMIS, and in this chapter the focus is on the definition of an EMIS, the research investigating the problem, the background of the EMIS in the MOE, and lastly, general and specific research aims. Furthermore, the background and the need for this investigation and this study are highlighted.

Chapter two centres on a literature review and focuses on the objectives and importance of the EMIS, why and how data are important and what threats there are to data quality. As the main investigation aim is an effective implementation of an EMIS in the MOE and the secondary aim is data quality, these topics were placed into a chapter together.

Possible research approaches and methodology are discussed in the third chapter. This chapter includes the following topics: why a specific method in research was chosen and why others were rejected, the reasons for choosing a questionnaire tool, information about the survey population, the questionnaire design and the pilot testing of the questionnaire.

Chapter four explores the results and findings, problems encountered during the study and the limitations of this research.

Finally, the conclusion and suggestions for future research are found in chapter five: what is the nature of the EMIS in the MOE, guidelines for effective implementation of the EMIS in the MOE and guidelines for the quality of data collection in the MOE. Furthermore, interesting lines of inquiry for future researchers are highlighted.

1.2 The definition of an EMIS

The definition of Management:

Management is an attempt to coordinate the effort of human and material input in order to achieve set objectives. It coordinates the knowledge and the skills of people involved in EMIS activities to achieve the planned objectives. It refers to all the work we do in organising and systematizing the procedure we follow, the equipment we use, the people involved in building and using an EMIS as well as the relationship between the EMIS as a centre, information and its users (Wako, 2003a).

The definition of Information:

Information is an additional "knowledge" users employ to enhance planning, programming, monitoring, evaluation, review, research for overall management and decision making of educational development. However, information has value only when there is a use for it. The value of information depends on demand; the higher the demand for information, the more value it has (Wako, 2003a).

The definition of a System:

A System is working together to form a relationship and vision of the whole. Each component contributes to the proper functioning of the system. We may have a good data collection procedure, good data processing, and analysis in place, but if the result is never put to use in educational development, the system fails to work properly (Wako, 2003a). It is only when the whole system properly functions together that we attain our goals.

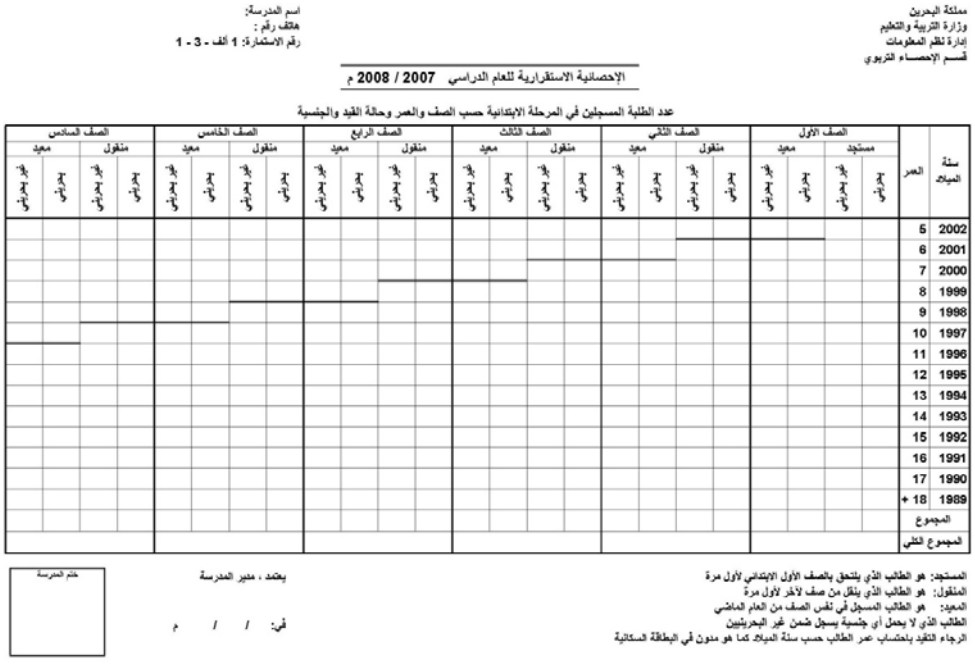
The definition of an EMIS:

An EMIS is an "organised group of information", a centre or a unit that collects, stores, integrates, processes, organises, analyses, manages and distributes information for educational planning and management. It includes the concept of comprehensive data, which are accessible by computer and available for analysis, for processing and decision making purposes. It is responsible for the promotion and use of information for policy planning and implementation, decision-making, and the monitoring and evaluation of an education system. It provides timely, cost effective and user appropriate information to support educational planning and management (Connal, 2005, Wako, 2003b, Hua and Nerstein, 2003, Nunamaker and Konsynski, 1982).

1.3 What is the research problem being investigated?

There are an increasing number of countries which have adopted the EMIS and have already failed (Wako, 2003b), maybe because the EMIS structure is insufficient in coping with the fast growing demands for information (Moses, 2000). As a result, the development of the EMIS as an aid to planning and policy formulation has received considerable attention in literature; however, the introduction of the EMIS has not necessarily led to increased or more effective use of data. Low data quality is a more serious constraint on data use in educational level management and policy formulation. There is confusion about how to structure interventions to encourage data-based decision making (Chapman and Dhungana, 1991).

The MOE routinely and annually collects data from public schools, as well as external providers, as part of its regular operations. Such data include: location of schools, condition of school facilities, number of grades offered, numbers of students by sex and age, numbers of repeaters, number of teachers by sex, qualification, etc (Figure 1) (MOE, 2004). Although the MOE distributes forms to collect data from public schools and it builds software to ease the job of the MOE, there is still no comprehensive programme to collect and analyse the educational data.



مملكة البحرين
وزارة التربية والتعليم
إدارة نظم المعلومات
قسم الإحصاء التربوي

اسم المدرسة:
هاتف رقم :
رقم الاستمارة: 1 ألف - 3 - 1

الإحصائية الاستقرارية للعام الدراسي 2007 / 2008 م

عدد الطلبة المسجلين في المرحلة الابتدائية حسب الصف والعمر وحالة القيد والجنسية

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المعيد: هو الطالب المسجل في نفس الصف من العام الماضي
الطالب الذي لا يحمل أي جنسية يسجل ضمن غير البحرينيين
الرجاء التقيد باحتساب عمر الطالب حسب سنة الميلاد كما هو مدون في البطاقة السكانية

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Figure 1: A data collection form from the MOE

The main problem being investigated is: why have EMIS efforts in the MOE not been more successful? To find possible solutions for this problem, other areas must be investigated, such as: the procedure of collecting data, cooperation among the directorates in the MOE with regard to data collection and information exchange, the data analyses, and the method of dissemination of data.

1.4 Background about the EMIS in the Ministry of Education in the Kingdom of Bahrain

The MOE has realised the importance of statistics since 1967, when it established an administrative unit under its umbrella called Superintendence of Educational Planning (SEP). SEP includes several sections: the Statistics Section (SS) is one of them. The SS has taken over the responsibility of collecting basic data regarding the number of students and the number of teaches and their nationalities from all schools.

The SEP became a directorate according to the ministry's administrative structural re-ogranisation of 1972. This was a considerable changing point for the SS's role in the task of collecting and preparing all the educational statistical data required by educational plans or any other study in education in the KOB. Therefore, more attention has been given to the SS to provide accurate and efficient statistical data to study educational status, aiming at developing it and supporting urgent planning needs. In 1975, the MOE re-organised its organisational structure and established a new centre called the Educational Information Documentation Centre (EIDC), which includes three sections, namely the Educational Statistics Section (ESS), the Educational Documentation Section and the Computer Section.

The ESS's role has broadened to cover the providing of facts and the giving of numerical information about the education status in the KOB to predict how the situation may develop in the future. The main duties of the ESS are defined as follows:

1. Preparing and designing statistical forms, according to the basic needs of statistical data, in order to collect educational data from various sources in the KOB.

2. Disclosing, clarifying and tabulating statistical data which have been collected.

3. Preparing the annual educational statistical report, including a detailed account of the annual expansion of the different units, schools and institutes of the MOE.

4. Publishing the periodical and summary statistical statements.

5. Completing the questionnaires of national, regional, Arab and international sources with educational statistics.

6. Analysing statistical data to serve the needs of studies and research concerned with the development of education in the KOB.

7. Conducting statistical and comparative research to find out the standard of education in the KOB and the direction of its growth at various levels of education in order to compare it with the growth in other countries.

8. Linking population statistics with education and working out the ratios and indicators related to the process of education.

9. Providing scholars, researchers, and other bodies inside or outside the MOE, as well as official national and international bodies, with available statistical data.

10. Following up publications from various sources (research centres, etc.) and auditing data and information mentioning education in the KOB (MOE, 2004).

1.5 The general research aims and objectives

In view of the importance of the EMIS in the educational environment, especially in the MOE, this study on the EMIS, in strengthening education management decisions, has been chosen. The purpose of this study is to investigate the scope of application of the EMIS in supporting critical decisions in the MOE. Developing a useful EMIS would improve the insight of the decision makers and school administrators and allow them to make appropriate decisions.

The general objectives of this study are:

1. To critically investigate current usage of the EMIS, by decision makers and school administrators in the MOE, in making educational and administrative decisions.
2. To critically analyse the gaps in applying the EMIS by the MOE in arriving at decisions concerning educational and administrative tasks.
3. To conduct an investigation regarding the possibility of using an EMIS to help the MOE to disseminate relevant information in order to make decisions regarding education and administrative tasks in the MOE.
4. To recommend an appropriate course of action in developing and implementing effective usage of an EMIS that will facilitate relevant decisions regarding education and administrative tasks in the MOE.

1.6 The specific research questions to be addressed

The main question to be investigated in this study is:

Why have EMIS efforts in the MOE not been more successful?

However, in order to answer this question, there is a sub-set of questions which should be investigated:

1. How can we assure more successful initiatives in the MOE in the future?
2. What is the most effective and efficient way to collect data?
3. What strategies should be used to disseminate data and information?

Chapter Two: Review of the Literature

2.1 The objective of the EMIS

Educational goals and objectives in many countries have shifted from focusing on access, expansion, maintenance and control to quality, development, efficiency, effectiveness, equity and performance; this shift offers a more complex collection of policy choices. Understanding these choices requires data which come from multiple sources and from multiple levels. Collecting, organising, integrating and analysing these data will require more cooperation across directorate levels within the MOE and between the MOE and other private schools and agencies (Hua and Nerstein, 2003, Cassidy, 2006).

An emphasis on quality, equality, equity, performance and development requires significant changes to the functioning of education systems, how they are managed, and the kinds of data and information that education leaders and mangers need to fulfill their responsibilities. Therefore, monitoring a system's progress against this set of goals, and adjusting education policies to assure successful attainment of goals and objectives, requires access to much more detailed data and information. These data and information need a comprehensive system that can analyse and process the data for decision making purposes (Cassidy, 2006, Nunamaker and Konsynski, 1982).

The objective of an EMIS, however, is not only to collect, store, process, analyse, manage and disseminate information but also to help education policy-

making by providing relevant and accessible information. The EMIS is gradually being recognized as an indispensable tool and support for the formulation of policies, management and evaluation in the education system (Carrizo et al., 2003).

2.2 The importance of the EMIS

Information supports strategic planning for education and acts as a diagnostic tool to assess the existing capacity and characteristics of the education system. These attributes assist with setting priorities for future development and identifying areas of greater need for resource allocation. Information also acts as a monitoring and evaluation mechanism that enables planners and policy makers to assess if the Education Strategic Plan (ESP) is achieving its stated goals (McHugh, 2007).

There is an inevitability about the move to computer-based information in education because efficient information management is a necessary condition for continued educational, social and economic development (Chapman, 1991a). In addition, the use of computers to support a wide variety of managerial matters and work functions has become an accomplished fact in the MOE (Burack and Sorensen, 1976).

A distinguishing feature of the EMIS is its emphasis on the flow of information within the MOE because information is the common link binding the MOE and schools. As the MOE grows in size and complexity, the need for efficient information and for improved decision-making techniques becomes critical. Recent

advances in computer and communications technology mean it is practical to integrate planning and control with data and information (Nunamaker and Konsynski, 1982).

Moreover, there is evidence that the EMIS can potentially provide a powerful management tool capable of contributing to the improvement of educational performance. It enables decision makers to identify problem areas, reduce operational costs and provides a systematic way of addressing educational challenges. If effectively implemented, the EMIS is capable of raising educational awareness, motivating employees to search for innovative solutions and increasing educational efficiency (Gunningham, 2007). Furthermore, the EMIS makes efforts to assess the performance of the MOE system. It monitors the distribution of resources, and plays an active role in providing information to the decision makers (Wako, 2003b).

In addition, another major function of the EMIS, other than collecting, storing and processing information, is to facilitate detailed analysis and synthesis of data in order to draw upon the most relevant information to help in educational planning and policy decision-making (Carrizo et al., 2003). The EMIS causes a shift from how to measure and analyse, to what to measure and how to present the information to management (Chapman and Boothroyd, 1988).

However, the assumption that if better information were available, better management and resource allocation decisions would follow is not necessarily correct. The introduction of an EMIS has not necessarily led to increased or more effective use of quantitative data in planning and program evaluation (Chapman, 1991a). The main purpose of an EMIS is to integrate information related to the

management of educational activities, and to make it available for the decision makers, as well as the other parties, to use in helping them to make the correct decision (Connal, 2005). In other words, the purpose of an EMIS is to provide the necessary information to the right person, at the right time, for use in management decisions (Yuen and Duo, 1989).

2.3 Why and how are data important in this context?

The education system in many developing countries is highly centralized. Data are a tool to help the MOE to make resource allocation and planning decisions (Chapman, 1991a). Consequently, education highlights the need for disaggregated and integrated data and information; however, collecting, managing and processing disaggregated data requires more systematic operational procedures and practices than has been the norm in the past (Cassidy, 2006).

Therefore, the emphasis on improved data for decision making has arisen from the explosive growth in the size of the education system in the MOE, from the increased demand of society for quantitative data due to pressures of accountability (Farnsworth, 2002, Harvey, 2004), and from the increased complexity of education systems as the MOE undertakes more complex programs and pursues multiple objectives (Chapman, 1991a).

Furthermore, there are several reasons why the quality of data is overlooked. The analysers are not the data collectors, and therefore they are not aware of the problems encountered in data collection phases, and because the data is operated and

analysed through a computer, it lacks the social interaction analysis. Moreover, as the demand for quantitative information in support of policy decisions increases, there is a greater emphasis on the collection of more data over the collection of better data (Chapman and Boothroyd, 1988). Therefore, a practical means of enhancing the EMIS is to find ways of strengthening both the practice of record keeping at schools and the processes and tools involved in collecting those records from schools (McHugh, 2007).

In addition, those who generate the data, the teachers and staff of schools themselves, may have little idea whether their reported information has been of use, has been retained, or in fact has even reached the decision makers. In many countries, it is likely that the MOE is one of them, the flow of information is only one way, upwards to the centre (Figure 2) (Moses, 2000). Moreover, headmasters have little use for the data largely because they do not receive any feedback from the MOE after the data are analysed (Chapman, 1991a).

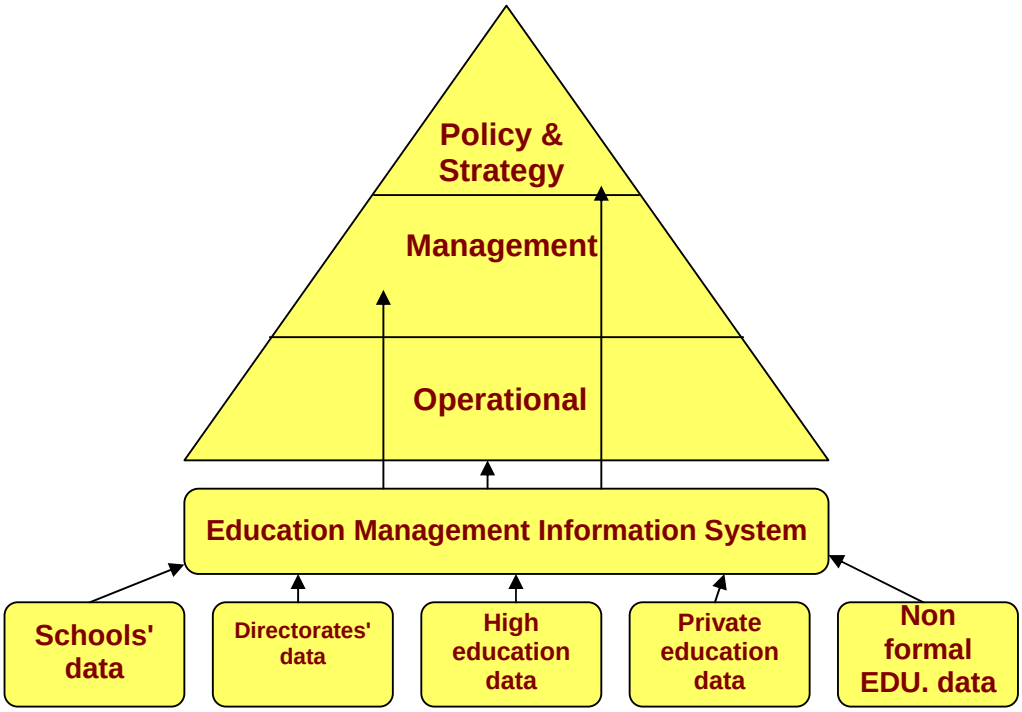


Figure 2: The one-way information flows

2.4 What are the threats to data quality in this context?

The threats to the quality of data are many and varied. Assuring a supply of relevant and reliable data and information from all schools requires the careful management of a set of challenges that begins with the definition of data elements and the development of good data collection instruments. It also includes the development and delivery of effective training for data providers (Education, 2006), the development of effective procedures for data verifications, data entry, data merging, effective mechanisms for data maintenance and security, the development of useful reporting formats, and effective strategies for data dissemination. Careful management of the data supply chain is essential to the collection and dissemination of the quality of data (Cassidy, 2006, McDonald et al., 2007).

However, it is believed that the greatest threats to data quality are the headmasters' failure to keep accurate records and/or to report accurately the data they do have. The problem seems to be based in the schools. The MOE generally does not believe that its procedures for collecting data from the schools are much of a contributing factor (Chapman, 1991a).

Accuracy, timeliness, and availability of education data have also been identified as key constraints to education data use in the MOE. They are characterized by duplication of information gathering activities, lack of coordination among those efforts, and a failure of data managers to anticipate how data from one directorate can be of interest to decision makers in another. It has been frequently shown that more data are collected than are ever analysed or used (Chapman and Dhungana, 1991).

In addition, the MOE publishes the results of the school census and education in general in the KOB in heavy statistical yearbooks, often raw, fragmented and without accompanying analysis (Figure 3 & Figure 4). Yet, policy-makers and planning managers need easily and clearly understandable, comprehensible and interpretable data on which to base their policies (Carrizo et al., 2003, Chapman and Dhungana, 1991).

Table No. 26 00 01 جدول رقم

عدد الطلبة والفصول وكثافة الفصل الواحد في التعليم الابتدائي حسب الصف والجنس للعام الدراسي 2001 / 2002م

Number of Students, Classrooms and Class Size in Primary Education by Grade and Sex: 2001 / 2002

Grade	Sex	كثافة الفصل Class Size	عدد الفصول Number of Classrooms	عدد الطلبة Number of Students	الجنس	الصف
First	Male	28	183	5141	ذكور	الأول
	Female	27	189	5191	إناث	
	Total	28	372	10332	المجموع	
Second	Male	28	183	5156	ذكور	الثاني
	Female	29	188	5374	إناث	
	Total	28	371	10530	المجموع	
Third	Male	28	190	5390	ذكور	الثالث
	Female	28	193	5420	إناث	
	Total	28	383	10810	المجموع	
Fourth	Male	29	183	5390	ذكور	الرابع
	Female	30	184	5488	إناث	
	Total	30	367	10878	المجموع	
Fifth	Male	30	186	5517	ذكور	الخامس
	Female	30	178	5258	إناث	
	Total	30	364	10775	المجموع	
Sixth	Male	30	170	5163	ذكور	السادس
	Female	29	174	5023	إناث	
	Total	30	344	10186	المجموع	
Total	Male	29	1095	31757	ذكور	المجموع
	Female	29	1106	31754	إناث	
	Total	29	2201	63511	المجموع	

Figure 3: A data presentation table from the statistical yearbook 2001/2002

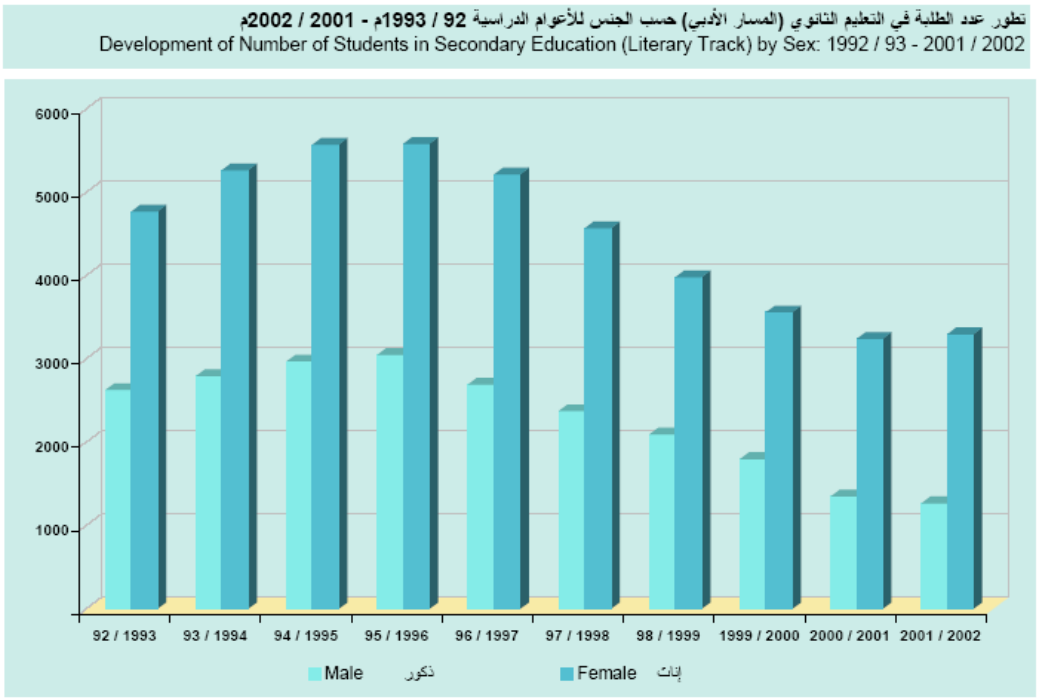


Figure 4: A data presentation chart from the statistical yearbook 2001/2002

Chapter Three: The Research Methodology

3.1 Discussion of possible research approaches and methods. What methods could have been used but were rejected and why?

In this section, the differences between qualitative and quantitative research methods will be highlighted, compared and contrasted. It will also explore why a quantitative research method was rejected, why a qualitative research method was accepted and why it was suitable for this study.

Although there are many similarities between qualitative and quantitative research methods, some procedures, analysis, samples, and populations are very different (Malterud, 2001, Boulton and Fitzpatrick, 1997, Jones, 2007, Thompson and Panacek, 1998); this is because of the different natures and assumptions of the data and questions to be answered (Malterud, 2001).

The idea behind qualitative research method is that "you cannot transform human behaviour into numbers"; that is criticised by the quantitative researchers, who believe that qualitative data are unscientific and knotted with the opinions of the researcher (Nastasi and Schensul, 2005). In contrast, quantitative research is based on a statistical analysis of numerical data, which is simply descriptive and capable only of reporting associations, whereas qualitative research is based on conceptual analysis of narrative and description (Boulton and Fitzpatrick, 1997, Jones, 2007). Since this

study is based on human experience, it is the opinion of the researcher that the qualitative research method is best suited to the task.

In addition, rather than achieving a quantitative research outcome of generalised findings, a description of the findings has been generated so they can be transferred to other situations. The responsibility of the researcher includes providing enough description about the context of the sample so that others may adequately judge whether the findings apply to their own situations (Byrne, 2001, Westerman, 2006). Moreover, qualitative studies focus on creating a picture of the whole, whereas quantitative studies may be more focused on measuring the parts and lack the interpretation role (Wilkinson et al., 2004, Thompson and Walker, 1998).

Furthermore, participants in qualitative studies are selected because they are knowledgeable about or have experienced the phenomenon under discussion and are able to share that knowledge with the researcher (Thompson and Walker, 1998). That makes the findings more reliable, unlike quantitative studies where the sample is randomly selected and the participants may lack experience and/or information about the topic.

Moreover, qualitative research is concerned with exploring new topics about which little is already known and that is the case with this research. If it is possible to specify hypotheses in advance, a quantitative approach may be more appropriate (Boulton and Fitzpatrick, 1997, Dreachslin et al., 1993).

3.2 What methodological approach was finally chosen? Why it was chosen?

In qualitative research, the sample size is purposeful and comparatively small in contrast to the samples used for a quantitative study. As outlined above, the participants are often chosen because of their ability to describe their experience, because of their unique position of involvement in the phenomenon, or because they have direct experience with the phenomenon of interest as expressed in the research question. Therefore, issues of the study can be investigated "in depth" and detailed data are collected (Kneale and Santy, 1999, Boulton and Fitzpatrick, 1997, Pickler, 2007, Byrne, 2001, Nastasi and Schensul, 2005, Thompson and Walker, 1998, Kelley et al., 2003).

Moreover, as mentioned earlier, a qualitative research study may be the most appropriate approach when little or no knowledge of variables exists that may be related. Qualitative research examines events or experiences in context from the perspective of the individuals experiencing the phenomenon. This approach allows the depth and complexity of a phenomenon to be explored and identified, its components and their relationships to be described, and a picture to be developed of the whole that can enhance and guide practice and future research (Thompson and Walker, 1998, Thompson and Panacek, 1998, Kneale and Santy, 1999).

Furthermore, qualitative research methods understand research as a systematic and reflective process for development of knowledge that can be challenged and shared. Findings and interpretations can be questioned instead of taken for granted; the effect of context bias can be examined without belief that knowledge is untouched

by the human mind and the processes of analysis can be displayed and discussed instead of automatically believing that they are trustworthy (Malterud, 2001).

Finally, a qualitative research method can alert educational policy-makers to any unforeseen constraints (Vulliamy, 1990) because there is a tendency to focus on senior leaders such as school headmasters and headmistresses (Bryman, 2004). It is also suitable to provide the necessary information which mangers need most during implementation (Rist and Joyce, 1995), because it represents large amounts of information (Malterud, 2001) which accomplishes research of high quality (Freeman et al., 2007). In addition, some of the most precious features of qualitative research are "freedom from error" and "accuracy" (Bailey, 2002). Its analysis consists of identifying, coding, and categorizing patterns found in the data (Byrne, 2001).

3.3 What specific research method was selected?

The research method used in this study is a survey because it is a highly structured system for collecting specific information to describe, compare, or explain knowledge (Inoue, 2003, Nastasi and Schensul, 2005). Surveys, like all research methods, have both strengths and weaknesses. They offer the opportunity to examine large-scale patterns in educational reform (Desimone and Le Floch, 2004), they produce data based on real-world observations and they produce large amounts of data in a short time for a fairly low cost (Kelley et al., 2003, Inoue, 2003, Desimone and Le Floch, 2004, Havard, 2004). They cannot, however, provide the depth of understanding that interview and observational techniques provide (Desimone and Le Floch, 2004, Kelley et al., 2003, Havard, 2004), although interviews also have some

limitations (Griffee, 2005). Securing a high response rate to a survey can be hard to control (Kelley et al., 2003, Havard, 2004) and, furthermore, surveys are affected, if they are sensitive, by respondents' willingness to participate (Singer et al., 1992).

On the other hand, surveys have been used in research evaluation and policy analysis to provide critical information about education systems, school conditions and the effectiveness of reforms. There is sufficient evidence to suggest that, when designed and used correctly, surveys can provide meaningful and informative data that may enrich our understanding of educational processes. In addition, surveys play an increasingly important role in helping to evaluate whether policies are having their intended effect (Desimone and Le Floch, 2004). Furthermore, surveys are used to explore aspects of a situation or to seek explanation (Kelley et al., 2003). That is why a survey research method has been deemed suitable for this study, because the aim is to examine a situation by describing important factors associated with that situation.

3.4 What research tool was chosen?

Questionnaires can be described as a medium of communication between the researcher and the subject. In the questionnaire, the researcher articulates the questions to which he/she wants to know the answers and, through the questionnaire, the subjects' answers are conveyed back to the researcher (Brace, 2004).

The role of the questionnaire is to elicit the information that is required to form an answer to the objective of the survey. It represents only one part of the survey process, however it is a very vital part of it (Brace, 2004, Lindstrom, 2000).

Moreover, questionnaires make the participants' task straightforward; there are specific questions to be answered (Brace, 2004). Therefore, questionnaires are a practical and economical method for obtaining many types of information from participants (Inoue, 2003) and they are still the most common data gathering instrument used in research (J.Gill, Unknown, Havard, 2004).

It is believed, however, that data entry and analysis can be time consuming (Havard, 2004). Moreover, it is said that if questionnaire items are translated from one language into another, one cannot assume that the translated items are valid simply because they were translated. Furthermore, the syntax of one language sometimes has no equivalent in another language. Also words in one language do not have exact meanings in another language, as a word in one language can represent a spread of meanings that do not cover the range of meanings in another language, and words that can be used figuratively in one language cannot be used figuratively in another language (Griffee, 2001).

Nevertheless, it is always better for a participant to be interviewed in his/her native language, because interpretation can lead to misrepresentation of the question and the answer. Questions in multiple languages are said to be functionally equivalent if they are measuring the same construct, though a certain degree of linguistic interferences (e.g., cultural, semantic, lexical, or phonological) should also be expected (Carrasco, 2003).

3.5 The research design

Two questionnaires were written: one was designed for the headmasters and headmistresses of schools to discover their views on the issue of the EMIS, and the other was for the specialists who receive the data in the MOE. The two questionnaires were designed in English and then translated into Arabic. The researcher showed them to some colleagues for further discussion, then made alterations and sent the questionnaires to an associate in the KOB to be distributed. The first was sent to government schools and the second dispersed in the MOE. The associate is required to visit schools for the purpose of his work and he asked the headmasters and headmistresses to participate. The participants' are aged from 40 years and above.

The actual questionnaires are provided in the appendix for others to inspect the items and to use them if needed. Providing the questionnaires allows replication and subsequent reanalysis, which increases validation (Griffee, 2001).

Nevertheless, there appears to be no general agreement about size in qualitative studies. Some describe single-person studies, while other commentators suggest sample sizes ranging from 6 to 30 (Burnard, 2004). It was felt that 11 participants should be able to supply varied and detailed accounts for the purposes of this study. A sample of 11 headmasters and headmistresses were invited to take part in the study. They were selected from different educational stages: primary, intermediate and secondary schools.

The second questionnaire was for educational specialists, whose role is to collect and analyse the data in the MOE. Unfortunately, the educational specialists in

the MOE were prevented from answering the questionnaire by their manager, because it is forbidden to publish anything about the subject, even though the questionnaire only addressed their opinion and sought personal views. Therefore, only one of the educational specialists, a friend of the researcher, answered and returned the questionnaire.

3.6 Discussion of the questionnaire design

The first questionnaire's items were designed according to the aims and objectives of the study, to explore the situation and to discover the headmasters' and headmistresses' viewpoint on the topic. After distribution of the first questionnaire to the headmasters and headmistresses, it was transcribed into a computer file. The researcher took care to assure the participants that they and their place of their work would remain anonymous in this study (Burnard, 2004). The second questionnaire's items were taken from an article by Chapman (1991a) and altered to adapt it to the needs of the study.

The results from the first questionnaire are intended to discover how data are collected, why they are collected, who collects the data, has the same data been collected more than once for different directorates, and why data are needed. The second is intended to show whether the data are analysed, what issues and concerns are priorities, and the accuracy of the data in the MOE.

In general, it is hoped the study will address whether the EMIS in the MOE is used effectively and to what extent the MOE uses the collected education data in decision making.

3.7 Pilot testing of the questionnaire

A questionnaire should be tested on a pilot sample of members of the target population (Kelley et al., 2003). It is a useful method for addressing quality issues such as focusing on increasing the validity and reliability of measures and items, and decreasing bias and measurement error (Desimone and Le Floch, 2004, Griffee, 2001, Tarver and et al., 1995). This process also allows the researcher to identify whether participants understand the questions and instructions and whether the meaning of the questions is the same for all of them (Kelley et al., 2003, Inoue, 2003, Christal et al., 1999, Griffee, 2005). While this method is a useful way of finding problems with particular items, its value is often limited because it does not allow each item to be examined individually in an in-depth manner (Desimone and Le Floch, 2004).

For the piloting of the questionnaire, the researcher first interviewed one of the headmasters, via the Hotmail Messenger system, while engaging in the "thinking aloud" process. The process of revising problematic questionnaire items consisted of a careful procedure of review, re-testing, and final revision (Desimone and Le Floch, 2004, Christal et al., 1999). After that, the data was analysed for each item.

Chapter Four: Discussion of Results and Findings

4.1 Data analysis

In this chapter, the findings are interpreted and discussed. This discussion chapter does not simply reiterate the findings; it provides a critical reflection upon both the findings and the processes of data collection. This discussion assesses how well the study met the research question, describes the problems encountered in the study, and honestly judges the limitations of the work.

However, it should be noted that the data collected in this study are always "findings" and not "results". The findings are adhered to and the researcher tried not to interpret what the participants meant. The findings are presented in a flat and factual way and offer a discussion which adheres to the limitations of the data (Burnard, 2004).

Finally, the questionnaires were coded and transcribed. The data were sorted into a range of categories, which are reported below. A colleague was asked to verify the accuracy of the category system (Burnard, 2004) and, after a discussion with him, minor modifications were made to it. It is possible that the findings may have much to offer in understanding the phenomenon.

4.2 The results and findings

There is an attempt to provide descriptive statistics for the questionnaires as a whole, as well as for each item. This is helpful because readers can see for themselves the overall results, in addition to how each item performed (Griffee, 2001).

Table (1): represents the data which are collected from the first questionnaire, which was distributed to government school headmasters and headmistresses

The question	The result
Is there a department or a unit in the Ministry of Education (MOE) responsible for collecting and analysing data? Yes, No.	63% NO and 37% YES.
(If your answer is No): Do you think establishing a department or a unit in the MOE is necessary? Why?	YES because: - The information will be centralized in one place. - To collect data faster and easier. - Not to submit the same data in different forms to different directions. - To use the data when it is needed in a faster and easier method. - To easily measure the annual changes. - To ease the connection between schools

The question	The result
	and the MOE in data collection. - To compare between schools' achievements. - To help in writing the future plans of the MOE. - To know the strengths and weaknesses of the students.
(If your answer is Yes): Has establishing a department or a unit in the MOE helped to increase the performance of the country's educational development?	It is regrettable that this department has a limited and ineffective role, however, it recently started to implement a programme for primary schools regards students' grade, information and statistics.
How does the MOE collect the data from schools? Do you think it is the best way of collecting data? If not, what is the best way of collecting data?	By posting, email, faxes and handing. They can collect the information from a department or a unit that it is established to collect and store the data. The best way is to implement technology, a database or to have a network to connect all schools with the MOE.
If the MOE collects data from schools about a specific topic, does it tell you why it collects the data, or does it inform you about the findings?	81% NO and 19% YES.

The question	The result
Do you think creating a database system connecting schools to the MOE is necessary in collecting data? Why?	100% yes because: - It will help to store the information in one place. - It will facilitate schools and the MOE with their basic information needs. - It will help in transferring students' information and exchange shareable activities. - To analyse the data. - To supply the directorates of the MOE with the information they need. - It saves time, energy and money.
Is exchanging data among schools from one side, and between schools and the MOE from another side appropriate?	- 45% suitable and 55% not suitable.

Table (2): represents the data which are collected from the second questionnaire which was distributed to educational specialists in the MOE

The question	The result
How important are the following types of data in ministerial decision making? - Students enrolment	- Very important

The question	The result
- Students' information (number, sex, nationality, etc) - Education costs - Teachers' information (number, sex, nationality, qualifications, etc) - Schools' information (stage, number of classes, etc)	- Very important - Very important - Very important - Very important
How much of a problem are the following issues for decision makers? - Receiving data on time - Accuracy of the data - Mistakes in data analysis - Results not clear - Not sure how data were analyzed - Not sure how to interpret data	 - Very important - Very important - Very important - Very important - Very important - Very important
In your judgement, how accurate are the education data that currently are available to the MOE decision makers? And can they take decisions on them without going back to ask schools?	The accuracy of the information depends on the direction which collects and checks this information. Every year, the MOE collects the information from public and private schools, higher education, special education needs and unsystematic learning sections. The collection is done by hand like students'

	and school information. Other information, like school staff and the MOE staff information, are taken from the databases available in the MOE. The information that the MOE collects is accurate to a large extent because it is being checked directly when the school hands it to the MOE. One staff member from the school with one person from the MOE checks the data and changes anything needed. But the information which comes from the private education, is not checked because private schools only administratively belong to the MOE, but if a mistake is found, a call to the school is made to amend the mistake and that takes time and effort. Decision makers can take decisions on this data without returning to the schools. But these data reflect only the one static day and for a set period of time. Therefore, decision makers need a system which reflects the daily status of schools and they also need more information than is collected now.

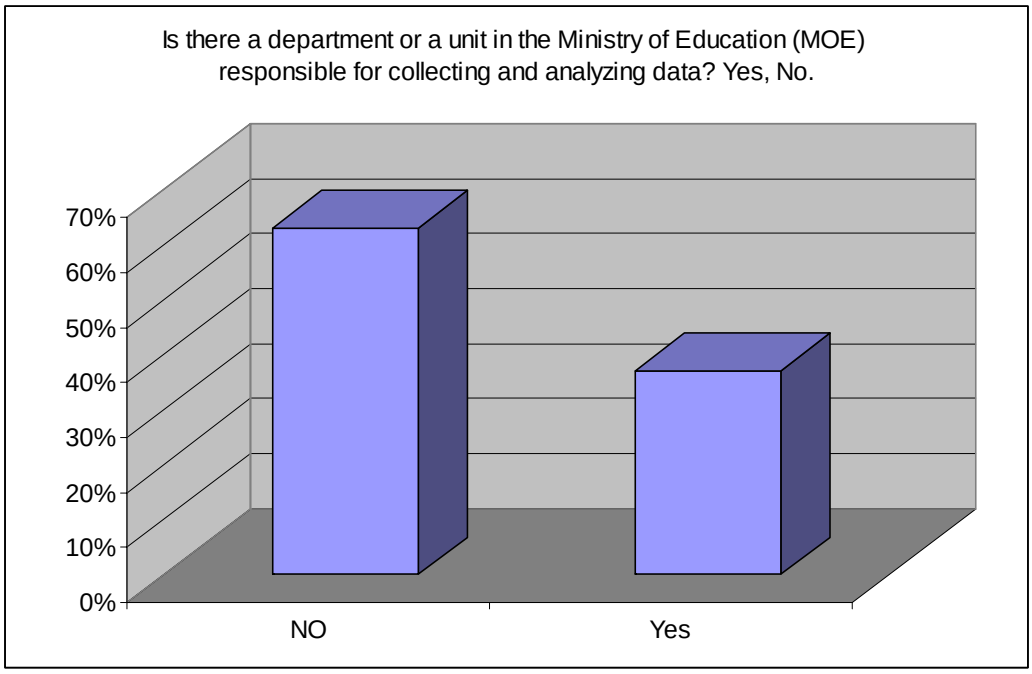
The question	The result
In your opinion, what percent of error presently occurs in collecting and analyzing data in the MOE? And what are the reasons for these errors?	There is no percentage but the data which are in the MOE are correct to a large extent and the reason for some errors are - There is no comprehensive system which ties all the schools and the departments in the MOE. - The lack of awareness of the importance of the data quality from those who collect and store these data in schools and with some directorates in the MOE. - Analysis and interpretation of the data from unqualified people.
In your opinion, what percentage of error is acceptable?	Around 5%
Rate how serious you believe data quality problems related to data collection to be? - Schools don't keep accurate records - Schools don't report the data they do have accurately - Errors occur in transferring the data from the schools to the MOE - Errors occur in the analysis stage	It is difficult to differentiate among them with regard to their importance in affecting the quality of the data and it is thought that all of them are important.

The question	The result
- Errors occur in the interpreting stage	
How important is it to improve the quality of education data in the MOE? Why?	It is important because the wrong data leads to wrong decisions.
In your opinion, do you think that the statistical yearbook has enough information to base decisions on? Or do you think it needs to analyse the data and give interpretations? Why?	The statistical yearbook has lots of information covering the educational system but all this information is without any analysis or interpretation and in its shape now doesn't help a lot the decision makers because the decision makers need analysis not numbers. They need some analysis to interpret the numbers and tie all the educational items: the political, emotional, psychological, social etc.
In your opinion, do you think that the statistical yearbook should not only contain data, but also analyse and give the right interpretations?	It should not only have data and numbers, it should also have analysis either inside it or attached with it.

One of the most remarkable findings of this study is the weak data collection method, which is frequently cited as a major impediment to improving education quality and delivery (Chapman, 1998).

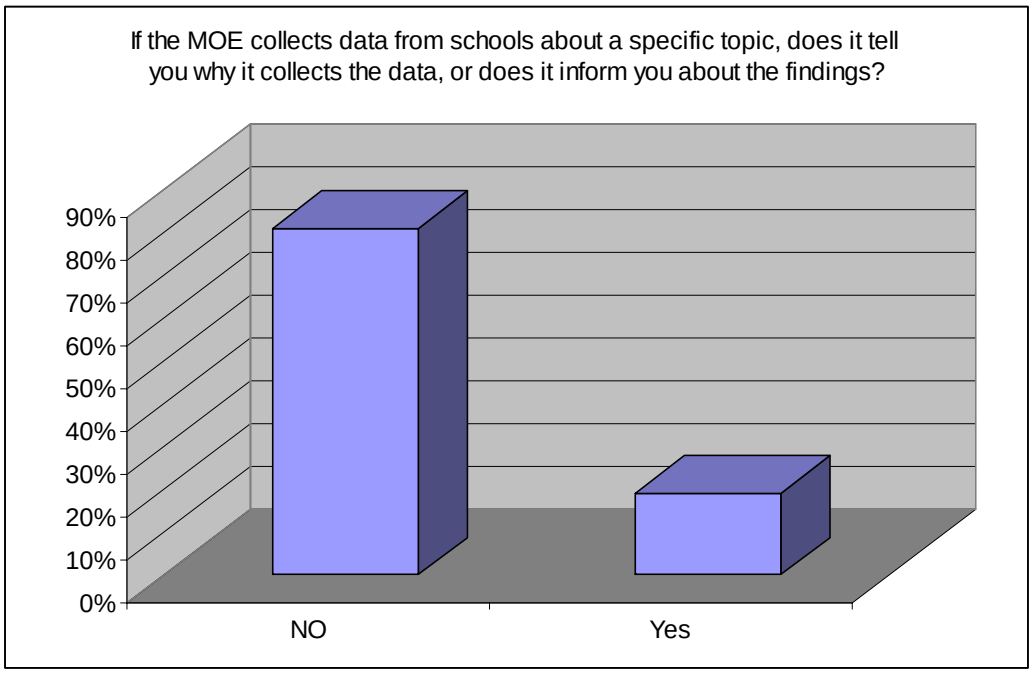
63% of headmasters and headmistresses do not know whether there is a department in the MOE responsible for collecting data, even though it was established in 1967, and those who know that there is a department admitted that its role is very limited and not very effective (Chart 1). However, all of them understand the importance of creating a comprehensive database capable of handling all the data that the MOE needs.

Chart 1: The percentage of knowing whether there is a department responsible for collecting and analyzing data in the MOE



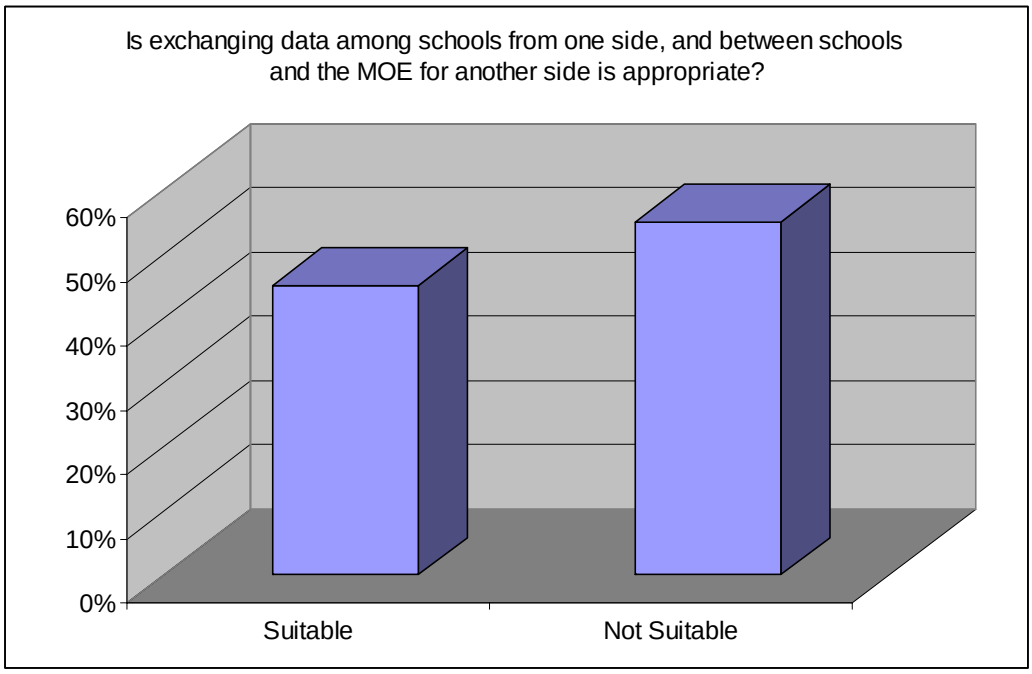
Moreover, when data are collected, schools rarely know the reason for the collection and they are rarely given feedback after the analysis (Chart 2). This affects the quality of the data collected because the schools do not know why these data are important. Also if the findings are given to the schools, they may use them in their strategic planning.

Chart 2: The percentage of knowing the reason when the MOE collects data from schools



In addition, headmasters and headmistresses understand that there is a better way of collecting data and that is through building a comprehensive database (Chart 3). They are willing to cooperate in that project and help because they suggest that they need it.

Chart 3: The percentage of the appropriateness method in exchanging data



On the other hand, from the MOE point of view, all the data that they collect are important and the accuracy depends on the directorate that collects the data. This means that more than one directorate collects the data from schools; however, it is believed that the data which are collected from schools have high levels of accuracy and the ones which are collected from the private sectors have a lower level of accuracy because, unlike the public schools, the data are not checked immediately when they are collected from the private sectors.

Furthermore, the importance of the data quality is understood in the MOE and it is known that the statistical yearbook lacks an analysis section. Therefore, the outcome which the statistical yearbook provides does not help the decision makers to make decisions (Figure 5 & Figure 6).

Table No. 26 10 13 جدول رقم

تطور عدد خريجي التعليم الابتدائي العام حسب الجنس للأعوام الدراسية 92 / 1993م - 2001 / 2002م

Development of General Primary Education Graduates by Sex: 1992 / 93 - 2001 / 2002

Year	المجموع Total	إناث Female	ذكور Male	السنة الدراسية
1992 / 93	8619	4210	4409	1993 / 92
1993 / 94	8600	4299	4301	1994 / 93
1994 / 95	8772	4458	4314	1995 / 94
1995 / 96	8991	4598	4393	1996 / 95
1996 / 97	8913	4455	4458	1997 / 96
1997 / 98	9150	4787	4363	1998 / 97
1998 / 99	9125	4577	4548	1999 / 98
1999 / 2000	8893	4618	4275	2000 / 1999
2000 / 2001	9554	4790	4764	2001 / 2000
2001 / 2002	9738	4931	4807	2002 / 2001

Figure 5: A data presentation table from the statistical yearbook 2001/2002

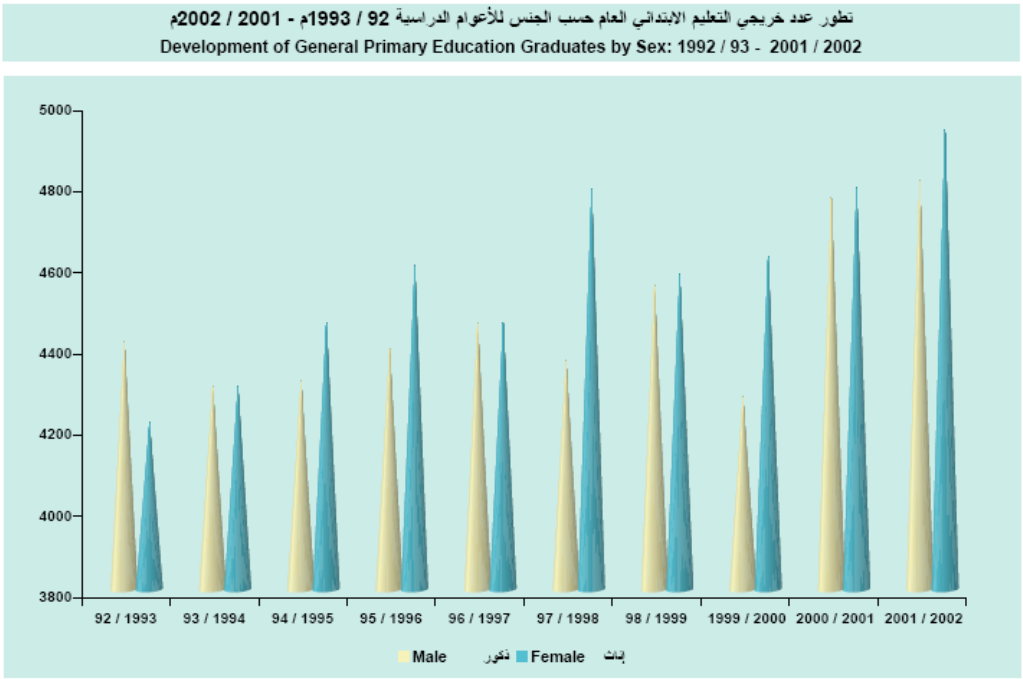


Figure 6: A data presentation chart from the statistical yearbook 2001/2002

4.3 Problems encountered

There were many problems encountered whilst conducting this study, some of which include: time limitation, experience in designing questionnaires, translation into Arabic, and distribution of the questionnaires.

Firstly, time limitations restricted wider and deeper research on the subject, as stated in this text. Time constraints also restricted the design and development of the EMIS.

Secondly, although a research method module course was audited at the University of Leeds and the researcher had some ideas about designing questionnaires and the purpose of them, and followed the Guide to the Design of Questionnaires by (Burgess, 2001), he does not have specific training in questionnaire design, and therefore the questionnaires tend to be inefficient as data-gathering instruments (J.Gill, Unknown).

Thirdly, another problem encountered was the translation, which is always a potential source of misunderstanding and misinterpretation. It imposed time delays and it led to differences in meaning between the various versions of the questionnaires (J.Gill, Unknown).

Fourthly, as an associate of the researcher distributed the questionnaires, problems encountered in the data collection phases were not catalogued (Chapman and Boothroyd, 1988) and that may affect the analysis phase. Finally, the second

questionnaire was taken from the participants while they were answering it; hence it received only one response, on which the findings are based.

4.4 The limitations of this research

Because the events are very personal, situation-specific, and there is no attempt to generalize to a larger population, this type of research is often accused of being subjective (Kneale and Santy, 1999). Neither the research participants nor the researcher can be neutral, because qualitative data and information are already interpretations made by participants as they answer questions, or by the person who writes up the analysis; they are always positioned culturally, historically, and theoretically (Freeman et al., 2007).

Nevertheless, an EMIS is necessary but it is not sufficient by itself to improve the efficiency of an educational system. An EMIS will not bring about improved efficiency, but is one component in a set of conditions which is most likely to bring about efficiency improvements; however, Improving Efficiency in Educational System (IEES) strategy argues that the development of an EMIS must be the foundation for any long-term restructuring of policy (Messec, 1990). Contradictorily, it is debatable whether the use of the EMIS has increased productivity at all and it is arguable that, under some circumstances, an EMIS can actually reduce the effectiveness of decision-making because they focus on the measure and measurable rather than critical. In addition, it is unclear whether information actually leads to better management and, if so, whether it tends to affect the quality and quantity of education services provided to the population (Crouch).

Moreover, one cannot make generalisations about how people will act in all circumstances from what they write in any particular context; especially one whose features are rather untypical, such as answering a questionnaire (Nastasi and Schensul, 2005, Walsh and Downe, 2006, Jones, 2007, Hammersley, 1981).

Lastly, any particular event, to be understood properly, must be viewed in the context of the other actions and events to which it is related; rather than being treated in abstract as an instance of a type. In order to guard against a particular attitude or type of personality, it is necessary to study the responses in the context of the interview itself; the kind of relationship which develops between the interviewer and respondent (Hammersley, 1981). This research might lack that perspective because someone other than the researcher distributed the questionnaires due to geographical distance at the time of the questionnaire distribution.

Chapter Five: Conclusion and Suggestions for Future Research

The findings have been summarized and applications have been suggested for those findings. Clearly, there are many questions that cannot be answered and it is possible that the study does not answer all the questions; indeed, it might not answer any conclusively (Burnard, 2004). This section is divided into four headings: what is the nature of the EMIS in the MOE, guidelines for effective implementation of an EMIS in the MOE, guidelines for the quality of data collection in the MOE and what interesting lines of inquiry researchers should consider in future.

5.1 What is the nature of the EMIS in the Ministry of Education in the Kingdom of Bahrain?

Education management in the MOE follows a pyramid model, in which everything is formulated by the MOE. The directorates largely duplicate the structure of the MOE and are responsible for ensuring that MOE polices are communicated and implemented in schools (Chapman, 1998). However, changes do not happen unless something happens at the school level and this changes the transactions between schools and the MOE, because educational quality is defined as student achievement (Chapman, 1998, Chapman and Adams, 1998, Wako, 2003a, Farnsworth, 2002).

Moreover, before asking to collect more data, educational specialists should determine whether the data already available can be used to meet an emerging information need (Christal et al., 1999). The additional data overwhelms the ability of educational specialists to analyse, interpret, and report, leaving specialists lacking the information they need. The problem is perhaps misunderstood by the decision makers, who think the lack of data signals a need to collect yet more, which, when collected, serves to achieve nothing. The solution is the wiser use of data which are already collected (Chapman, 1998, Christal et al., 1999). In addition, a carefully devised procedure should identify where and how data will be provided and validated, where and how long it will be stored, how and when it will be manipulated, and to whom and in what format it will be reported (Yuen and Duo, 1989).

Uses of data and information are varied and complex. Typically, the MOE includes many directorates, each of which needs customized information for planning and operational purposes. In itself, this task is enormous and requires detailed analysis of the function's organisation and goals. As a further complexity, the information must be comparable by directorates for corporate overview and planning purposes. The corporate function complicates the information requirements of each directorate function, because each requires information, but needs it to be structured differently. Moreover, difficulties would arise if each directorate in the MOE identified its information needs without considering other directorates, and the overall corporate information systems could be incompatible and of little value at a corporate level. Each directorate needs the same database configured differently in order to respond to its own educational needs.

In many ways, information is a vital educational resource, but many directorates refer generally to their information needs and not specifically to the use of information as a resource. Directorates must see corporate information and technology systems as necessary components of decision making, along with good educational judgement and sufficient resources (Beaumont and Beaumont, 1988, Christal et al., 1999).

Furthermore, not only is cooperation and collaboration necessary, but decision makers must have a significant understanding of systems and data structures to use such systems effectively. It is likely that most of the people who are concerned with educational strategy do not have such expertise, so the system may go unused, or be used only by educational specialists. This decreases much of the value which may be gained by the direct use of a system, particularly if the system is interactive and designed to be used on a question-and-answer basis (King and Rodriguez, 1980).

On the other hand, the MOE has developed many systems based on programmers' skills and abilities. These systems have been developed on different platforms with different standards. A decision has been made to transfer many of these applications into Oracle Developer to provide a more integrated approach. Most of these systems are under the control of the EIDC, but some of them have developed from the requirements and needs of the directorates. It is stated that multiple employee databases exist across the MOE without any integration; this results in duplication and data integrity issues. In addition, there are some directorates which use more than one application for the same information without any integration and that results in duplicated issues, waste of resource efforts and a lack of adherence to

any development standards and implementation practices that may exist (Figure 7 and Figure 8) (MOE, 2006).

- **Databases used in the Ministry of Education**:
  - Oracle 8i
  - Access XX
  - DB2 400
  - Clipper
  - SQL Server

- **Front-ends used in the Ministry of Education**
  - Oracle XXX
  - Clipper
  - COBOL
  - Access XX
  - Visual Basic
  - Various other tools
- **Platforms used in the Ministry of Education**
  - IBM OS 400
  - Unix
  - Linux
  - Windows 9x, 2000, XP
  - DOS
- **Network operating system**
  - Novell
  - Windows NT

Figure 7: Shows the application systems which are used in the MOE (MOE, 2006).

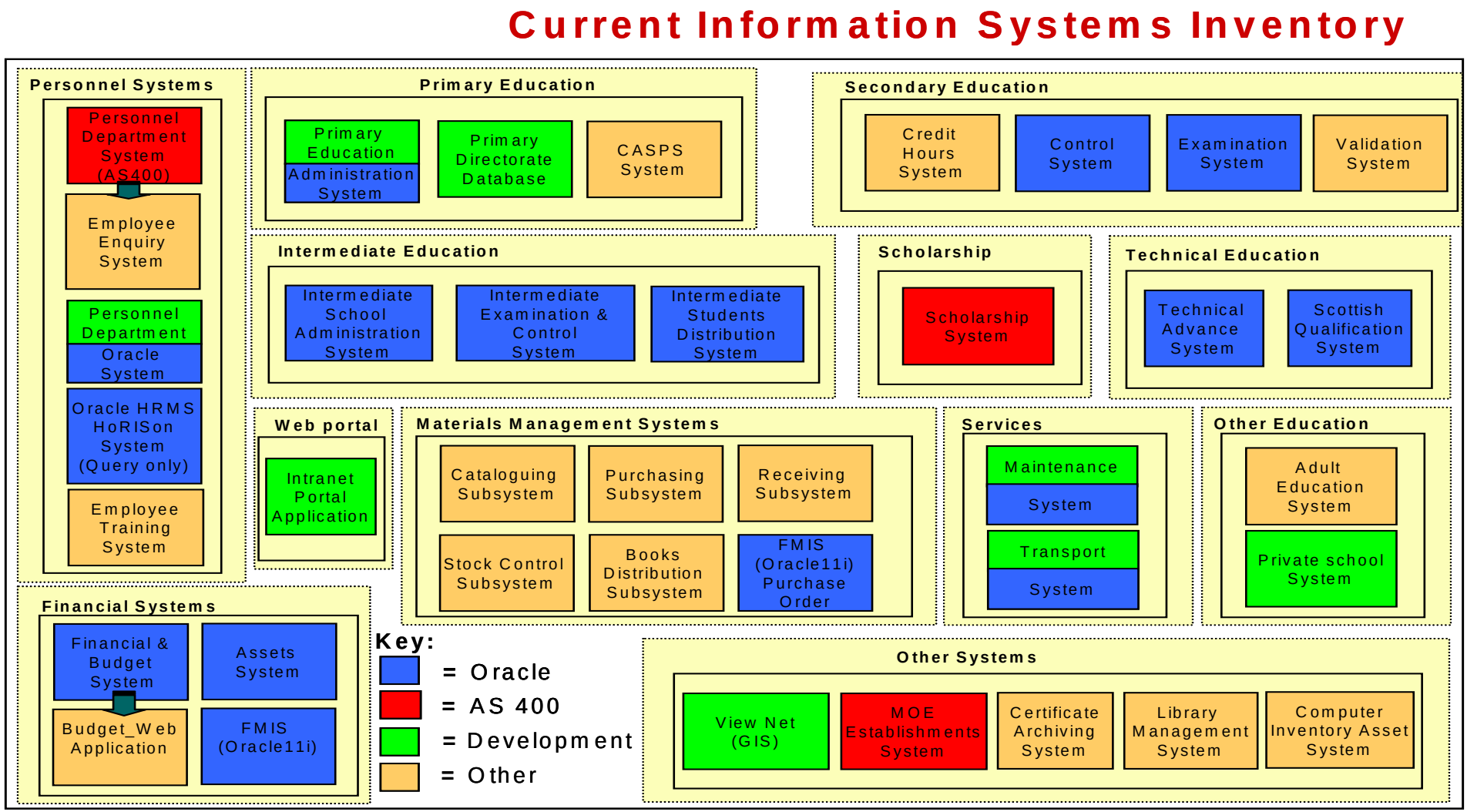


Figure 8: Shows the current information systems which are used in the MOE (MOE, 2006).

5.2 Guidelines for effective implementation of an EMIS in the Ministry of Education in the Kingdom of Bahrain.

The development of an effective EMIS is a complex and expensive task (UNESCO, 2006), especially when it produces results that do not support the political reviews. The results are sometimes ignored because educational reform is as much a political undertaking as it is an exercise in rational planning, (Chapman, 1998) especially after the September 11th, 2001 attacks. Therefore, a successful EMIS needs vision, people, and practices under the EIDC in the MOE. It is argued that the EMIS should be structured as a stand alone directorate in order to serve all the other directorates in the MOE (Wako, 2003b) and that is the case in the MOE. Moreover, the success of an EMIS depends on two factors. Firstly, not only are the internal and external users of information central to EMIS functions and management, they are also central to quality output. Therefore, it is important to focus on users' needs and expectations. An increased use of educational information leads to increased, informed decision making. In addition, quality products increase the number of users. This, in turn, leads to an increased use of information which, again, leads to an increased level of informed decision making (Wako, 2003a). Secondly, the success of an EMIS depends on reliable production of data and information, data definitions, database structures, data integration and data sharing among directorates (Chapman, 1991b, Cassidy, 2006).

However, data integration is one of the most important factors in EMIS development strategies (Education, 2006). It means that data from multiple sources, multiple years and multiple levels (school level, external level, or MOE level) can be linked, integrated or merged (Figure 9) (Chapman, 1991b, McDonald et al., 2007).

Data integrations add value to the collected data and must happen before policy analysis (Chapman, 1991b) because it cannot readily be integrated, or the integrated data used, unless a data integration strategy is implemented. Without coordinated management, there cannot be an effective EMIS. Without such a system, there would be no answers to decision makers' inquiries such as: What is the impact of a new curriculum on student learning achievement? Therefore, data from multiple sources must be integrated to conduct proper data analysis and to correctly answer the decision makers' questions. Multi-level data from multiple sources and years, once centrally integrated and organised, could have tremendous value for improvement in education management (Chapman, 1991b, Dr.Boediono, 1992).

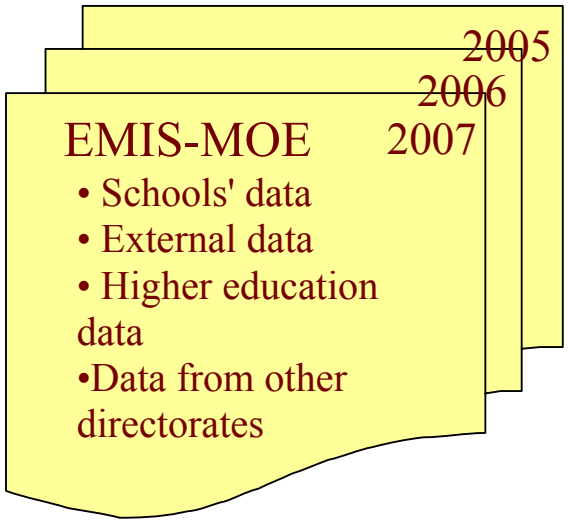


Figure 9: Multiple sources, multiple years and multiple levels of data integration

Nevertheless, it is common to see multiple directorates within the MOE collect and manage databases and not share them with each other. Data on student achievement are collected, managed, and available at EIDC; data on teacher

qualification and salary are at the Human Resources Directorate (HRD); data on enrolment and school inputs are at the ESS, and data on supplies of textbooks, classroom hardware, and other teaching resources are at the Materials and Supplies Directorate (MSD). Each directorate has separate databases for its own task planning and management and rarely shares them with other directorates. These multiple sets of data are often designed in varying database applications, organised in different platforms, and coded with self-developed identification code. Even the EIDC, whose role is to design and create integrated programmes for the MOE, has many programmes in different platforms (MOE, 2006). Collaboration is not a valued characteristic at the level of the directorates which, if used, is thought to reduce individual prestige, (Chapman and Dhungana, 1991) increase productivity and decrease redundant repetitive work. Not only do lots of individual programmes create problems inside the MOE, they also make the schools' work tedious because requesting the same data on several forms often results in annoyance, an increase in missing data, and always increases storage problems (Yuen and Duo, 1989).

To ensure that multiple surveys are not being sent out each year by different directorates with overlapping areas of inquiry, data collection processes conducted by the MOE should be well coordinated and integrated (McHugh, 2007, McDonald et al., 2007). This is important for eliminating duplicated effort at the MOE, and is a more efficient way of using resources allocated to information gathering and research. Coordinating survey efforts also assists information providers at schools. If headmasters/headmistresses are receiving several surveys a year from different directorates in the MOE, and if some are asking for the same data in different forms, they will probably be less inclined to complete the surveys carefully, as they begin to

feel that they provide an endless amount of information with seemingly little result (McHugh, 2007, McDonald et al., 2007).

The aforementioned is a solution to the issue of integrating and collecting data within the MOE. On the other hand, to be able to merge and integrate data from multiple sources, one must have access to data definitions and database structures used by external providers. Typically, access to data from other external providers requires maneuvering through a tangle of bureaucratic regulations and operational practices. External providers often want to know why the data is required and by whose authority they are required to provide it. Often access requires the development of cooperative agreements with data providers (Cassidy, 2006).

Data integration from multiple sources is not the only factor in developing education; developing the efficiency of an education system is also important. To improve efficiency, one must consider the quality and effectiveness of the activity. Efficiency cannot be improved only by raising quality, by reducing cost, or through a combination of these. The key points are that the efficiency of an activity can only be determined by considering the quality of the output, not just the cost of the input (Chapman, 1998). Consequently, the product of the EMIS must be clearly, concisely, and persuasively presented and regularly introduced in order to flow into education decision-making processes. Information produced by the EMIS becomes implicitly powerful when it is able to move policy debate from personal intuitions and beliefs towards more rational comparisons of both what is known and what is yet to be known, and that rational comparison feeds into such points of debate (Messec, 1990). In addition, to improve the efficiency of education systems, concentration on how

systems might be more efficiently designed, implemented and used is vital (Chapman, 1991b). Monitoring and evaluating the education system using the EMIS provides information, which is used to improve efficiency (Unknown, 2006).

However, the danger is when an EMIS is seen by the MOE only as a technical innovation. Its products, even though they may be of high quality and well presented, will be admired, but may have no effect on system efficiency (Messec, 1990). An EMIS therefore includes all of the people, computer applications and other communication technology, processes, policies and procedures involved in making sure that the right information flows to people who make decisions and take action within the education sector. On the one hand, this means creating communication channels between data managers and information users to ensure people know when and how to obtain the information they want. Moreover, it means keeping private and secure any sensitive or personal information that is not meant for public consumption. Putting in place clear procedures for giving out information will ensure that the right information gets to the right people when they need it and when it is appropriate for them to have it.

Thinking of an EMIS in this way reveals two vital features: firstly, it is about much more than simply technology. It can make the job of collating, analysing and reporting on education sector data much easier and function more effectively (McHugh, 2007). Secondly, a good information system is about effective communication and information flows; information needs to flow up to decision makers and down to action takers equally and smoothly (Figure 10) (McHugh, 2007, Dr.Boediono, 1992). An EMIS should support an entire network of education

directorates at all levels and should take raw data about the education system and, through analysis and interpretation, turn it into useful information that can be acted upon (McHugh, 2007). Thus, the purpose of an EMIS is to provide, as efficiently, effectively, accurately, and economically as possible, what management needs to know (Yuen and Duo, 1989).

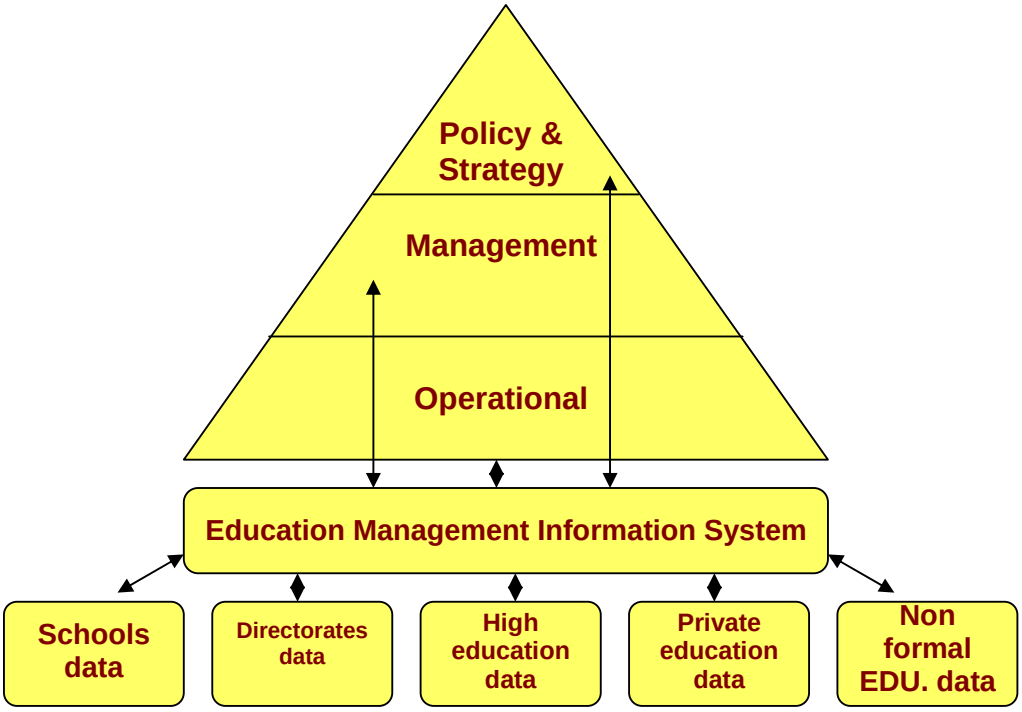


Figure 10: The two-way information flows

Attention to effective implementation of an EMIS has been emphasized by examining the importance of developing an analysis of the data and presenting the data to decision makers in relevant and interpretable formats. Without ensuring the quality of the data, the implementation of an EMIS may only provide a systematic procedure for making random decisions (Chapman and Boothroyd, 1988). An EMIS may identify problems through a detailed and critical analysis in order to be able to propose solutions for the MOE (Carrizo et al., 2003). Therefore, it is important to take a more systemic approach to EMIS development (Cassidy, 2006) because a solid

EMIS should cover all the needs and areas for information and not only aim to collect and store data and process information but should also help in the formulation of education policies, their management and their evaluation (Carrizo et al., 2003). Moreover, it should inform the decision makers about the pedagogical operation, performance, shortcomings and needs because it is the basis of the management, planning and evaluation of an education system (Carrizo et al., 2003, McHugh, 2007). Furthermore, effective planning and management of the education system is a complex and tiring exercise (Carrizo et al., 2003) and requires relevant, accurate and timely data on which to make decisions (Chapman, 1998, Nunamaker and Konsynski, 1982, Messec, 1990, Dr.Boediono, 1992).

An effective EMIS computer application also makes the task of data analysis easier and more efficient. An EMIS application should be capable of aggregating and disaggregating data, automatically performing calculations on the data set, and comparing and cross-analysing school data with other data within the MOE. Not all data managers and data users have a background in statistics, and so a good EMIS computer application should be able to perform accurate statistical analyses for them (McHugh, 2007, Dr.Boediono, 1992, Dougherty, 2003). There is uncertain and inconclusive evidence which suggests that, by building internal awareness of educational management issues, the MOE can attain very substantial improvements in educational performance (Gunningham, 2007). However, strong technology does not improve education with weak organizational skills. Therefore, the need is for a program which provides both technical and organizational knowledge (Nunamaker and Konsynski, 1982).

However, neither an effective EMIS computer application (Yuen and Duo, 1989) nor the increased ability to collect and analyse data has necessarily led to improved educational practice at the level where it matters most: in the schools, where the real process of education occurs (Chapman, 1998) and the output is evaluated (Yuen and Duo, 1989). Education output requires both internal and external evaluation at various points in order for the MOE to review and monitor whether and to what extent the planned program is being implemented (Yuen and Duo, 1989). The school is the major source of educational information, hence it needs greater attention (Wako, 2003a, Chapman and Adams, 1998). Ensuring that information produced by an EMIS feeds back to data providers and encourages ownership at the school level. When reports are produced, sending data in meaningful formats back to the people who provided the data in the first place will strengthen the EMIS in many different ways (Figure 11). Firstly, data providers will know that they receive returns from the system they contribute to. Data providers will also be able to see how the information they contribute to the system is used, and how it is ultimately beneficial to both the system and themselves to provide quality data. Furthermore, if schools receive reports back from the MOE, they will be better able to start using the information in their own strategic planning and development processes. A simple fact sheet summarizing a school's data, in comparison to another schools' average, for example, will give headmasters/headmistresses at this level something to work with and more incentive to contribute to the system. The information usage stage of an EMIS is about feedback cycles, including providing information back to data providers and mangers and reviewing and gathering feedback about the collection and treatment processes in preparation for the next EMIS cycle (McHugh, 2007, Christal et al., 1999); however,

currently headmasters/headmistresses in the MOE report data because they are told to do so, yet they receive virtually nothing of benefit in return (Chapman, 1991a).

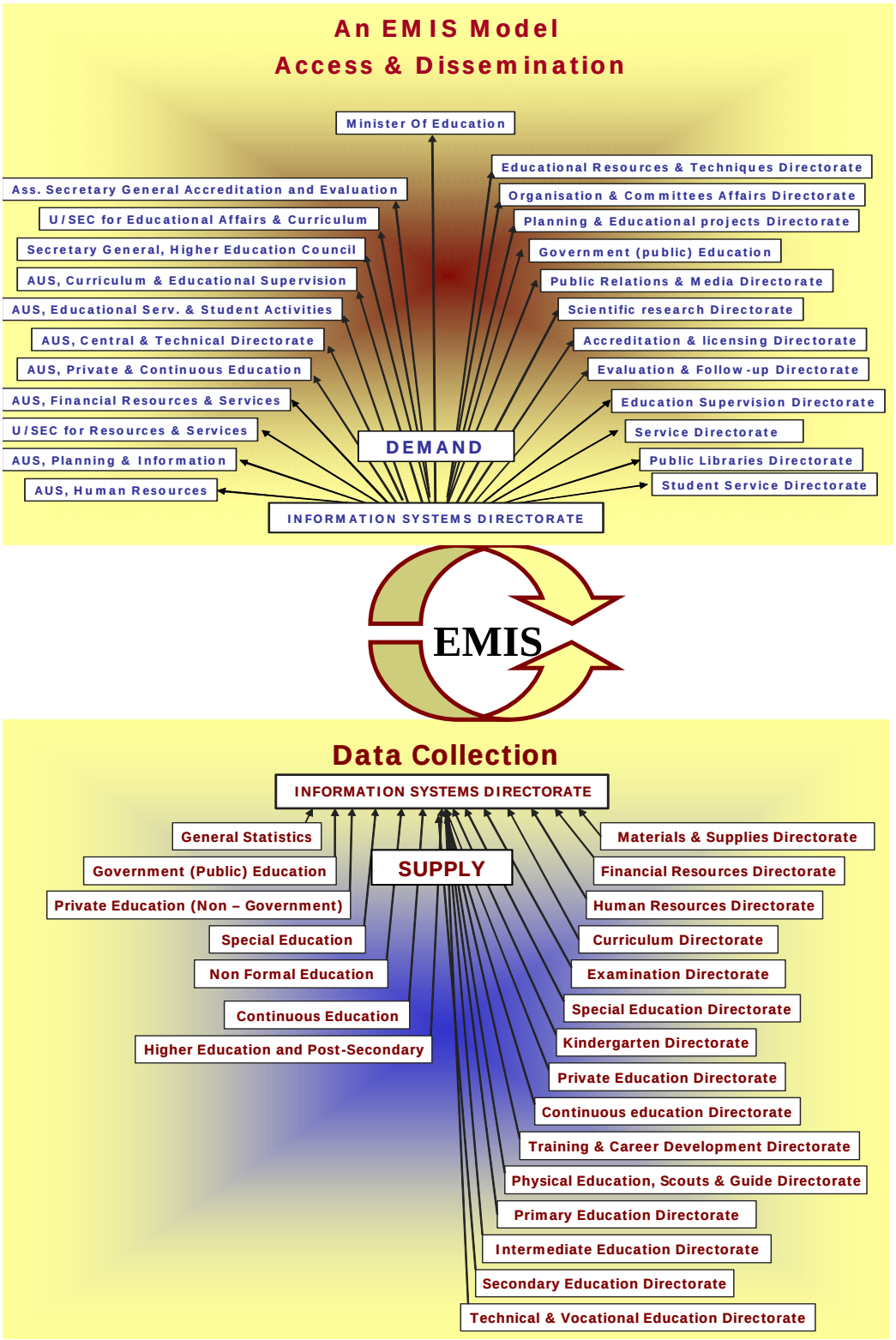


Figure 11: EMIS is about feedback cycles

Nevertheless, there are factors which hinder the introduction of information into the channels of users and decision-makers such as: those persons accustomed to decision-making without the provision of data-based information may see no advantage in using the information; decision-makers may believe that accurate and timely information may contradict their beliefs about the system; information produced with the MOE may be in conflict with external strategies or interests and the decision-making process may not be defined, and thus they may be unable to accept the information produced because the important decisions affecting the work of the MOE are actually made outside the ministry (Messec, 1990). In addition, the belief that the statistical yearbook is the only report that is needed for all users is another factor (Figure 12). The type of output may differ depending on the type of user who is to be served. Different users may need different information (Yuen and Duo, 1989). Some users are satisfied with the statistical yearbook, while others need detailed analysis which shows achievements and shortcomings (Figure 10). Consequently, the need to distinguish who the users are is a must, because it affects the way that the reports are presented. Furthermore, if the findings are not distributed internally and externally, we limit the use of information and waste our time and efforts. The last factor which affects the information introduction is the dissemination of the report. The MOE will not receive feedback to realize that others know and appreciate its actions; suggesting better ways of doing things and giving more ideas that could support the MOE's effort to produce accurate information is important for overall educational development (Wako, 2003a).

Table No. 21 00 01 جدول رقم

الإداريون والفنيون والموظفون الآخرون بديوان وزارة التربية والتعليم حسب نوع الوظيفة والجنسية والجنس: 2001 / 2002م

Administrators, Technicians and Other Employees at The Ministry of Education Headquarters by Position, Nationality and Sex: 2001 / 2002

Position	Sex	المجموع Total	أخرى Other	باكستاني Pakistani	هندي Indian	بريطاني British	سوري Syrian	أردني Jordanian	مصري Egyptian	سعودي Saudi	بحريني Bahraini	الجنس	الوظيفة
Executive Management	Male	36									36	ذكور	إدارة عليا
	Female	18									18	إناث	
	Total	54									54	المجموع	
Middle Management	Male	16	4					1			11	ذكور	إدارة متوسطة
	Female	6									6	إناث	
	Total	22	4					1			17	المجموع	
Secreterial Skills	Male	394	13		4			5	16	24	332	ذكور	أعمال إدارية
	Female	384	1		1			1	1	1	379	إناث	
	Total	778	14		5			6	17	25	711	المجموع	
Assistant Services	Male	255	3	1	3					1	247	ذكور	خدمات مساعدة
	Female	18	4								14	إناث	
	Total	273	7	1	3					1	261	المجموع	
Others	Male	13						1	2		10	ذكور	أخرى
	Female	13									13	إناث	
	Total	26						1	2		23	المجموع	
Grand Total	Male	714	20	1	7			7	18	25	636	ذكور	المجموع الكلي
	Female	439	5		1			1	1	1	430	إناث	
	Total	1153	25	1	8			8	19	26	1066	المجموع	

Figure 12: A data presentation table from the statistical yearbook 2001/2002

5.3 Guidelines for the quality of data collection in the MOE in the Kingdom of Bahrain

This section presents a brief description of an effective way of collecting data and discusses the obstacles to data quality in the MOE. Originally the EIDC and especially the ESS was created to be the data collection unit within the MOE. When the EIDC or any other directorates did not have the necessary data, the school administration was asked to collect it (Chapman and Dhungana, 1991). It is well known that the most important issue for educational development projects is improved collection, analysis and use of quantitative data in decision making. However, a major obstacle for more effective data use is the concern of potential users about the quality of the data available to them. This may bear evidence of the

extent to which the MOE and schools, often with limited training as administrators, are more than eager to grasp for any system that appears to offer credible solutions to the complex and often intractable problems they face (Chapman, 1991a, Farnsworth, 2002).

Firstly, it is not important to supply just any data because it is insufficient without a clearly-defined demand for the data (Christal et al., 1999, Yuen and Duo, 1989) and the capacities to analyse and interpret it. If there is no demand for data, there is no justification for investing in an EMIS or if there is a lack of capacity to use the data, that is the weakest link in the EMIS chain (Cassidy, 2006). It has been found that, in many countries, more data are collected than are analysed or used (Imboden 1980, IEES 1989). The MOE uses pre-designed forms to collect school data routinely and annually. Hence, there is a need to assess what is required; and there is a need to know what decision-makers, school administrators and other users require in order to attend to their needs (Wako, 2003a). Furthermore, the MOE collects data only via surveys and questionnaires (Figure 13); other data collections methods are ignored such as: observations, tests and assessments, interviews and focus groups, secondary sources and data reviews, self-report rating scales, and overall program-evaluation checklists (Lai and Young, 2000, Havard, 2004). There is no one data collection method that is perfect for every situation. For this reason, it is advisable to use multiple methods whenever possible to provide a richer spread of data, reduce the chance of bias and paint a more detailed picture (Havard, 2004).

مملكة البحرين
وزارة التربية والتعليم
إدارة نظم المعلومـــات
قسم الإحصاء التربوي

اسم المدرسة : _____
هاتف رقم : _____
استمارة رقم : (3 ب) ج -3-3

المستوى الثالث: الفني

المرحلة الثانوية - التعليم الصناعي

النظام المطور

عدد الطلبة في التعليم غير النظامي (المنازل) المسجلون والمتقدمون والناجحون والراسبون

حسب العمر والجنسية للعام الدراسي : 2007/2006م

سنة الميلاد	العمر	بحريني				غير بحريني			
		المسجلون	متقدمون	ناجحون	راسبون	المسجلون	متقدمون	ناجحون	راسبون
1992	14								
1991	15								
1990	16								
1989	17								
1988	18								
1987	19								
1986	20								
1985	21 فأكثر								
المجموع									

ختم المدرسة
يعتمد ، مدير المدرسة
في : / /

مملكة البحرين
وزارة التربية والتعليم

اسم المدرسة : _____
هاتف رقم : _____

Figure 13: A data collection form from the MOE

The issue of data accuracy problems is more likely to be at the school level, where the data are initially collected and recorded. If the schools records are not maintained, there is no point in working hard on the processing of the collected data nor in spending more time on the analysing process (Chapman, 1991a, Wako, 2003a). The quality of data collected by MOE survey tools is entirely dependent on the quality of data kept at schools. A good starting point for improving the data collection process, and hence the quality of the data gathered for the purposes of planning, is therefore to improve record keeping processes at schools themselves (Chapman, 1991a, McHugh, 2007). If school records are well organized, the accuracy of survey completion is improved (Yuen and Duo, 1989), surveys are more likely to be filled in completely and without guesswork, and the MOE data specialists will be able to verify the accuracy of school survey returns quickly by viewing school records. Well managed school records also assist with the timely completion and return of surveys,

because they make it an easy task each year to complete the surveys. There are several ways to improve record keeping at the school level, to ensure that data collected from schools through annual survey forms and other means are of good quality. Schools can be provided with a standard tool for collecting and aggregating school-level data to ensure that enrolment data and teacher information are captured accurately from year to year (Education, 2006). The tool should match the content and structure of the MOE annual school survey form, so that completing the survey form each year is a simple task of transferring details from school records to the survey form. Providing such a tool also ensures that schools can maintain their own record of growth and changes at their institution over time (McHugh, 2007).

The second condition for improving the efficiency of the data system is that data must become information (Yuen and Duo, 1989). Data becomes information when it has meaning for the decision makers. Numbers on enrolments, repetitions, dropouts, etc. (Figure 14), must be analysed and interpreted to become useful information for guided, rational policymaking (Messec, 1990). Data should be analysed in order to give useful information to decision makers so that they can check whether or not what they are doing is correct and whether they need to adjust the actions they may intend to take in the future (Wako, 2003a). However, machines do not produce information from data, because the process is necessarily subjective in nature. Consequently, the goal of the EMIS is simply to improve this process (Messec, 1990). Moreover, analysing data involves grouping and summarizing data, as well as performing calculations on the data to produce statistics. Data analysis therefore has a huge impact on the accuracy of reports that are produced based on the gathered data (Dougherty, 2003). If analysis is rushed, or skipped, data may be

available in time for planning purposes, but it will be less useful to planners if it has not been structured and organised properly (McHugh, 2007). Conduct data analysis to produce indicators to guide policy makers and provide recommendations for practitioners, in order to improve the quality of educational provision, is therefore required (UNESCO, 2006).

Table No. 24 30 07 جدول رقم

عدد الطلبة والمعلمين في المدارس الحكومية ونصيب المعلم من الطلبة حسب نوع المدرسة والجنس للعام الدراسي 2001 / 2002م

No. of Students, Teachers and Student-Teacher Ratio by Type of School and Sex: 2001 / 2002

Type of School	نصيب المعلم من الطلبة Student-Teacher Ratio			عدد المعلمين No. of Teachers			عدد الطلبة No. of Students			نوع المدرسة
	المجموع Total	إناث Female	ذكور Male	المجموع Total	إناث Female	ذكور Male	المجموع Total	إناث Female	ذكور Male	
Primary	18	17	18	3214	1650	* 1564	56325	28676	27649	ابتدائية
Primary / Intermediate	15	14	15	875	314	561	12968	4482	8486	ابتدائية / إعدادية
Intemediate	14	14	14	1555	871	684	22173	12257	9916	إعدادية
Intermediate / Secondary	13	13		235	235		3011	3011		إعدادية / ثانوية
Gen. Secondary + Other Branches	12	12	12	1048	600	448	12837	7259	5578	ثانوية عامة + مسارات أخرى
Commercial Secondary	14	14	17	368	318	50	5144	4316	828	ثانوية تجارية
Technical Secondary + Technical Commercial Secondary	9		9	598		598	5180		5180	ثانوية صناعية + صناعية تجارية
Religious Institute	9		9	53		53	491		491	المعهد ديني
Total	15	15	15	7946	3988	3958	118129	60001	58128	المجموع

* Includes (756) female teachers in primary boys schools.

* يشمل العدد (756) معلمة في مدارس البنين الابتدائية.

Figure 14: A data presentation table from the statistical yearbook 2001/2002

In addition, the strengthening of auditing and analysis processes that take place at the treatment stage will therefore have a great impact on the usefulness of the information produced by the EMIS for strategic planning and policy making. Auditing data is important to ensure that people can have confidence in the information they are using to make decisions. The processes of checking the accuracy of available data can be time consuming, so sufficient time needs to be allowed for it in order for good quality data to be available for policy making (McHugh, 2007, Christal et al., 1999).

Finally, quality data can be thought of as having three key attributes: it is accurate, relevant and timely (Cassidy, 2006, Christal et al., 1999, Yuen and Duo, 1989). In data accuracy, education decision makers need to have confidence in the data on which they will base their decisions. In order to be accurate, data need to be audited thoroughly as well as analysed correctly (Christal et al., 1999, Yuen and Duo, 1989). Regarding data relevance, data collection, analysis and reporting processes need to reflect the structure of the education system in question. Priority should be given to making sure that information is gathered and presented in ways that are relevant to the local context and the priorities of strategic education plans. Data relevance is also about being able to provide different types of information to different users according to their needs and interests. The last attribute is data timeliness; timely data are both current and available when needed. Timely data are available when they are needed most – in time for planning and budgeting processes (McHugh, 2007). Accurate, relevant and timely data and information provided through an EMIS can increase the effectiveness of decision making, enhance the planning process, ensure the quality of, and provide efficient and timely access to data for a range of planning and decision-making purposes (Yuen and Duo, 1989, McDonald et al., 2007, Dr.Boediono, 1992).

5.4 What interesting lines of inquiry should researchers consider in future?

The main aim of this study is to investigate how an EMIS can be effectively implemented in the MOE. In order to achieve that aim, there are certain factors which should be taken into consideration.

For effective implementation of an EMIS, a focus on users' needs and expectations is required, because the outcome of the EMIS depends on the users' needs. Therefore, users should be satisfied with what they receive, otherwise investing in an EMIS is a waste of time and energy. On the one hand, the efficiency of an activity can only be determined by considering the quality and the usefulness of the output. On the other hand, data should be supplied with a clearly defined demand for the data and the capacities to analyse and interpret should be present. If there is no demand for data, there is no justification for investing in an EMIS.

Moreover, the most important factor which affects the effective implementation of an EMIS in the MOE is the integration of the data. Data from multiple sources, multiple years and multiple levels must be integrated in order for decision makers to see the whole picture and to make the right decision. In addition, the directorates in the MOE should work collaboratively and cooperatively to reduce the redundancy of data collection and to reduce the school administrative work.

Furthermore, a good information system is about effective communication and information flow. Information needs to flow up to decision makers and down to action takers equally and smoothly. The school is the major source of educational information; therefore it needs greater attention and should be supplied with EMIS feedback. Moreover, school records should be maintained because the quality of data collected by the MOE survey tools is entirely dependent on the quality of data kept at schools.

However, producing statistical yearbooks without any analysis and thinking that they are suitable for all users may devalue the effectiveness of the EMIS, because decision makers may not have the time or the ability to analyse these statistics in order to extract some information from them. Data should be analysed in order to give useful information to decision makers so that they can check the plans and policy of the MOE, and so that they may know what to do in the future.

Finally, when a research program is newly established, the researcher cannot predict what future directions this program of inquiry will take. Only after the current research project is completed can the researcher be confident of the most appropriate next step in this line of inquiry, whether the next step in the series of research projects will be qualitative or quantitative and what specific type of qualitative or quantitative design should be used. These issues are based on the findings of the previous stage and the current state of knowledge known about the substantive area of study (Dreachslin et al., 1993). Therefore, I would suppose that future research should concentrate on: What types of analyses are required to address priority issues and concerns? What data and information are needed to complete these analyses?

Appendix

Questionnaire about data collection and analysis

This questionnaire is part of my critical study to obtain a master degree in Information Communications Technology and Education from the Leeds University, UK. This questionnaire focuses on how data are collected from schools and transferred to the Ministry of Education (MOE).

Felling this questionnaire will not take much of your time and I will be very thankful if you could help me in my project by answering the questionnaire. If you have any further questions about the purpose of this questionnaire or would be interested in the results, please feel free to contact me.

Ahmed Al Koofi, ahmedkko@hotmail.com

Name: (optional) _____

Occupation: _____

Name of school: (optional) _____

1- Is there a department or a unit in the Ministry of Education (MOE) responsible for collecting and analysing data? Yes, No.

2- (If your answer is No): Do you think establishing a department or a unit in the MOE is necessary? Why?

_____
_____
_____
_____
_____

3- (If your answer is Yes): Has establishing a department or a unit in the MOE helped to increase the performance of the country's educational development?

_____
_____
_____
_____
_____

4- How does the MOE collect the data from schools? Do you think it is the best way of collecting data? If not, what is the best way of collecting data?

_____
_____
_____
_____
_____

5- If the MOE collects data from schools about a specific topic, does it tell you why it collects the data, or does it inform you about the findings?

_____
_____
_____
_____
_____

6- Do you think creating a database system connecting schools to the MOE is necessary in collecting data? Why?

_____
_____
_____
_____
_____

7- Is exchanging data among schools from one side, and between schools and the MOE from another side appropriate?

_____
_____
_____
_____
_____

Ahmed Al Koofi ST ID:200292262

Questionnaire about data collection and analysis

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Ahmed Al Koofi, ahmedkko@hotmail.com

Name: (optional) _____

Occupation: _____

---

1. How important are the following types of data in ministerial decision making? (1 = unimportant, 2 = slightly important, 3 = important, 4 = very important) choose one answer only.

Students enrolment	**1**	**2**	**3**	**4**
Students' information (number, sex, nationality, etc)	**1**	**2**	**3**	**4**
Education costs	**1**	**2**	**3**	**4**
Teachers' information (number, sex, nationality, qualifications, etc)	**1**	**2**	**3**	**4**
Schools' information (stage, number of classes, etc)	**1**	**2**	**3**	**4**

2. How much of a problem are the following issues for decision makers? (1 = unimportant, 2 = slightly important, 3 = important, 4 = very important) choose one answer only.

Receiving data on time	**1**	**2**	**3**	**4**
Accuracy of the data	**1**	**2**	**3**	**4**
Mistakes in data analysis	**1**	**2**	**3**	**4**
Results not clear	**1**	**2**	**3**	**4**
Not sure how data were analyzed	**1**	**2**	**3**	**4**
Not sure how to interpret data	**1**	**2**	**3**	**4**

3. In your judgement, how accurate are the education data that currently are available to the MOE decision makers? And can they take decisions on them without going back to ask schools?

_____
_____
_____
_____
_____
_____

4. In your opinion, what percent of error presently occurs in collecting and analyzing data in the MOE? And what are the reasons for these errors?

_____
_____
_____
_____
_____
_____

5. In your opinion, what percentage of error is acceptable?

_____
_____
_____
_____
_____
_____

6. Rate how serious you believe data quality problems related to data collection to be?
(1 = the most ……. 5 = the least)

Schools don't keep accurate records	
Schools don't report the data they do have accurately	
Errors occur in transferring the data from the schools to the MOE	
Errors occur in the analysis stage	
Errors occur in the interpreting stage	

7. How important is it to improve the quality of education data in the MOE? Why?

_____
_____
_____
_____
_____
_____

8. In your opinion, do you think that the statistical yearbook has enough information to base decisions on? Or do you think it needs to analyse the data and give interpretations? Why?

_____
_____
_____
_____
_____
_____

9. In your opinion, do you think that the statistical yearbook should not only contain data, but also analyse and give the right interpretations?

_____
_____
_____
_____
_____
_____

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