

**The Integration of Information and Communication
Technology (ICT) into Education Management Information
Systems (EMIS) value chain activities.**

by

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Declaration

I confirm that, except where indicated through the proper use of citations and references, this is my own original work and that I have not submitted it for any other course or degree. I confirm that, subject to final approval by the Board of Examiners of the University of KwaZulu-Natal, a copy of this Dissertation may be placed upon the shelves of the library of the University of KwaZulu-Natal and may be circulated as required.

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Date: *10.02.2004*.....

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Abstract

The purpose of the research was to evaluate whether the Education Management Information System (EMIS) units within Provincial Education Departments can take advantage of the information management and communication tools to enhance the flow of information within the education system. The research investigates the clients' insight on the support provided by EMIS in the education department. Clients were only limited to Senior Managers and Unit Heads within the Head Office of a specific provincial education department.

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Acronyms and abbreviations

ABET	Adult basic education and training
ASS	Annual School Survey
CEO	Chief Executive Officer
CSS	Central Statistical Service
DET	Department of Education and Training
DoE	Department of Education
ECD	Early childhood development
ELRC	Education Labour Relations Council
ELSEN	Learners with Special Educational Needs
EMIS	Education Management Information Systems
FET	Further education and training
GDE	Gauteng Department of Education
GIS	Geographic Information System
GP	Gauteng Province
HE	Higher education
HOD	House of Delegates
HOR	House of Representatives
ICT	Information and Communication Technology
ISBN	International Standard Book Number
IT	Information Technology
HRIS	Human Resources Information Systems
NGO	Non-governmental Organisation
NSS	National Statistical System
OCR	Optical Character Recognition
OFSTED	Office of Standards in Education
PALC	Public Adult Literacy Centres
PED	Provincial Education Department
PERSAL	Personnel salary system
POS	Public Ordinary Schools

SASA	South African Schools Act
SIDA	Swedish International Development Agency
SPSS	Statistical Package for the Social Sciences
TED	Transvaal Education Department
UNESCO	United National Educational, Scientific and Cultural Organisation

CHAPTER 1

Scope and Background of the Research

1.1 Introduction

The onus is on managers within education departments to manage information and to ensure that all personnel and interested parties have access to reliable, accurate and timely information for proper decision-making. Information can be used to improve educational quality by providing data that are used directly to ensure the allocation of resources, by constraining bad decisions, detecting inefficient resource use, and supporting mechanisms that offset the impact of resource loss. The lack of timely and accurate information on the number and distribution of students, teachers, schools, and instructional materials is be a major impediment to effective allocation to instructional resources.

Education Management Information Systems (EMIS) units/directorates are given the responsibility of gathering, disseminating and analysing information in the education system. This research considers the current use of Information and Communication Technology (ICT) within an EMIS value chain and attempts to identify how EMIS addresses the information needs of its clients, and whether the Provincial Education Departments, and especially EMIS, can take advantage of the information management and communication tools to enhance the flow of information within the education system.

1.2 Background to the Research

South Africa has a population of approximately 43.1 million people (Statistics South Africa, 2003). African blacks constitute the majority of the population (76.7%), with the balance being Whites (10.9%), Coloureds (8.9%) and Indians (2.6%) (Statistics South Africa, 2003). While South Africa has a young population, the rate of growth of the population (1.9%) has decreased significantly in the last decade.

Since 1994 the education systems has been restructured to address the geographical, political and economic needs of the country more effectively. The Constitution specifies that the national and provincial spheres of government share the responsibility for

framing the laws of the administrative and systems of education, with the exception of the higher education sector where the national sphere has sole responsibility. The Constitution makes provision for nine provinces, each with its own education department tasked with delivering education in accordance with national education policy.

The Department of Education co-ordinates education at the national level and is responsible for the policy formulation and monitoring of implementation. Implementation of policies takes place at provincial, district and local levels. The South African Schools Act devolves responsibility to the school level by delegating the governance of public schools to democratically elected school governing bodies consisting of parents, educators, non-educators staff and (in secondary school) learners.

A recent publication by the National Department of Education (2003b) revealed that in 2001, there were 33 894 established public institutions and registered independent institutions in South Africa, namely, 27 458 ordinary schools and 6 436 other education institutions, including Adult Basic Education and Training (ABET), Learners with Special Educational Needs (LSEN), and pre-primary/Early Childhood Development schools or centres, public Further Education and Training (FET) institutions and public Higher Education (HE) institution (universities and technikons). A total of 13 426 914 students were enrolled in the education system in South Africa in 2001, served by 415 376 educators (including lecturers at public HE institutions) and 33 894 educational institutions in the sectors listed above (DoE, 2003b). The inclusion of statistics on the mentioned institutions is to provide a glimpse into the challenges facing EMIS annually with reference to data collection and dissemination of information. The development of EMIS began when the new policies for LSEN, ECD, ABET, FET and HE were being developed. A much more detailed discussion on the policy and legislative context and background of EMIS will follow in the next chapter.

The responsibility of the Departments of Education, both nationally and provincially, is to report and account to parliament and the public on the education system. The trends toward self-management schools, the pressure to measure the performance of the

education system, and the rapid development of information and communication technology (ICT) are providing the necessary conditions for technology based management information systems to become a normal part of school functioning. Clearly, this is a massive operation in business terms. The management of such systems requires significant information systems, information management and knowledge management. Central to this at the provincial level is EMIS. EMIS at national level is currently in the process of piloting a School Information Management Systems (SIMS) in previously disadvantaged schools. The SIMS provides software modules that cover the main areas of school administration including human (student and staff) and financial resources, and, of increasing importance, analysis of student performance and comparison with data available from other schools. The school system is becoming more devolved, and so is the source of information. One principle of a good information system is the processing and analysis of data at source. Schools thus need to be assisted in developing school based information systems that also provide strategic information for policy making, resourcing, planning and delivery. Schools would thus require three types of information systems: School management information systems; School governance information systems; and Parent information systems. In order for these information systems to work effectively one has to combine them with knowledge systems, i.e. information systems that aid knowledge workers in the creation and integration of new knowledge in the organisation. Despite the problems that might occur with implementation, the main elements are in place for an integrated system that can have information flow between the classroom, the school and the system.

1.3 Motivation for the research

This section demonstrates the importance of data and information for the education system. It also shows that it is essential to understand the background to the entire process of the data/information lifecycle from collection to analysis to archiving.

Before one can present and interpret information there has to be a process of gathering and sorting data. Data are observations or facts which when collected, organised and evaluated become information or knowledge. Information is data that has been organised

to serve a useful purpose. Indeed, it is hard to imagine reasons for collecting data other than to provide information. This information leads to knowledge about issues, and helps individuals and groups to make informed decisions.

The importance of education information

Valid and reliable information is essential for policy, administrative and operational leaders to manage education systems properly. These persons need to monitor various educational processes and outcomes and, with the assistance of appropriate information, make decisions which will influence the education of those in their charge. However, the type of decisions they have to make and, therefore the type of information they require is often quite different.

EMIS systems tend to have the greatest impact on planning and policy support – at that stage policymakers have the greatest latitude to act in response to new information. This information is critical for managers to be able to make the appropriate investment allocation decisions in terms of efficiency and effectiveness. High quality information is essential for managers of the education system to monitor and assess system change in terms of particular objectives. For example, one of the key aspects in this regard in South Africa is to track transformation of the system towards greater equity in access to educational opportunities, and access to educational resources.

There are short term and long-term data needs for educational planning and monitoring. This means that appropriate data resources must be made available for education analysts to create indicators that reveal trends in the changing education system over time. In order to create credible indicators, data must be valid for comparison over extended time periods, since some aspects of education change are relatively slow moving.

Furthermore, the needs for information for decision-making do not only reside at the highest levels of the education system. At all levels from the national to the provincial to the district and local levels, information is important to inform the various stakeholders in their planning and analysis. In the context of South Africa's democratic constitutional

framework, access to information is a right of our citizens. High quality information about the education system should be made available to stakeholders.

The importance of understanding how the data is obtained

As has been indicated above, valid and reliable information is a critical foundation for sound educational management. This refers to data and information that can capture the main features of the education system and its subsystems as comprehensively as possible within the time and budget allowed for data collection and data management purposes. It is equally important to be aware of the complexity that lies behind educational data. Put differently, in order to interpret data correctly, we need to understand the process according to which that data was collected, the conditions under which the data was collected, and the background of the respondents who supplied the data at the point of collection. This is because these conditions can influence the eventual data sets produced, leading in some cases to data that may be interpreted as representing an over-estimate or an under-reporting of the phenomenon in question. This means that the technical processes of data cleaning, normalisation and validation must be appropriately informed by an understanding of the social and educational contexts in which data is collected.

Having demonstrated the importance of bringing an understanding of the institutional, social and educational context within which data is sourced, a brief examination of key areas of possible weaknesses in educational data will be discussed.

Data Weaknesses

In this brief discussion of the potential weaknesses of educational data, reference is made to challenges for developing countries. This is because within South Africa, at the provincial level, there are a range of problems and difficulties that are currently experienced in regard to data collection, management and distribution. All of these aspects must be taken into account in the strategy to develop a credible set of national data over an extended time period.

According to Moses (2000) the education information system structure in developing countries is inadequate for the rapidly growing information demands. He further argues that obtaining quality education data is often elusive, costly and frustrating, and implies that in many cases, available data may be:

- Of poor quality (either incomplete, poorly defined, or not comparable year to year);
- Too late to influence the current school year or policy discussion;
- Occasionally part of a 2-3 year backlog of information;
- Sometimes duplicated so that there are different totals for students enrolment in the same month or year;
- Difficult to access; or
- Often directed or formatted for the wrong set of questions-occasionally leading to huge amounts of data when a simple summary would suffice.

Even if the quality and reliability of these data are far from perfect, their relevance and utility for decision-making are evident.

In many countries, the flow of information is only one way up towards the centre. In South Africa, it is critically important to consider the ways in which data can be accessible at all levels and be diffused to the stakeholders and agents who need it and will use it to benefit learners primarily and the system in general.

Furthermore, decentralised education systems such as South Africa's, have placed major burdens on Information Systems and the information they produce.

During the early years of the present educational administration, old data systems were transformed. As provinces geared up for their new data systems, the ability to gather, analyse and report even the limited repetition data that had previously been gathered, as well as other key data, was temporarily reduced (Crouch and Mabogoane, 1997).

Since 1997 the National Department of Education has been housing data from all schools in South Africa (DoE, 2002). This process has not been without problems as provinces struggled to build EMIS units from scratch. There were serious capacity challenges that are still facing the department to data. These challenges have largely contributed to the poor data quality, untimely reporting of data and incompatible data sets across provinces. However, progress has been made, as the DoE is now able to produce basic education indicators and publications from the annual statistical collections (DoE, 2002).

1.4 Value of the project

The Internet is opening new opportunities, creating a fundamentally different business environment, and prompting organizations to incorporate the capabilities of online technology to transform the way they do business. In recent years, major advances in education/information dissemination have been made possible in developed countries like Western European countries and the United States because of the revolution in global communication and the availability of computers and internet connectivity practically to all major education stakeholders, all teachers and most of the parents. In 2001 a few governments around the world have started to embrace their citizens by intelligent use of the Internet. It is the beginning of a revolution that will profoundly change the relationship between citizen and state: a more efficient, more humane, more responsive system of government is slowly starting to emerge (The Economist, December 2000).

The research will seek to identify the strategic ICT issues facing the EMIS units within Provincial Education Departments (PED), key factors for successful Information and Communication Technology (ICT) implementation and any impediments to taking full advantage of ICT.

1.5 Problem statement

What is the current information value chain of an Education Management Information System unit/directorate within a Provincial Education Department? To what extent does an EMIS integrate information and communication technology into its value chain

activities to improve its performance? To what extent does EMIS address the information use of its clients?

1.6 Objectives of the study

The objective of the study will be to investigate the current use of ICT within an EMIS value chain. The study will also attempt to identify how EMIS addresses the information needs of its clients. Further investigation will assess the extent to which departmental EMIS users are satisfied with the EMIS information.

In doing so it is hoped to discover whether the current flow of data between schools, districts and provincial head offices is regarded as adequate by EMIS and if not what improvements will or can be made. Human and physical resources are important to the functioning of any organisation and especially how these resources contribute to effective and efficient service delivery.

1.7 Research methodology

This study will use a cross-sectional method because the data will be gathered from a limited number of people, approximately 10, and will be comparable within the province where research will be done. The research technique is both quantitative and qualitative. The quantitative aspect of the research will involve the collection of quantitative data using structured questionnaires, and the qualitative aspect will entail conducting in-depth interviews.

1.8 Limitations of the study

Provision and contingency must be planned beforehand for anything unforeseen that may happen before or during the project. The following possibilities were considered:

- The departmental officials not being present on the day of the interview.
- The possibility of respondents being uncooperative.
- Self-administered questionnaires allow for too much interpretation of questions by the subjects.
- The research is limiting its focus on one province.

1.9 Structure of the study

Chapter 2

This chapter covers the theoretical section of the project. A detailed account of an Education Management Information Systems unit/directorate is given. The discussion will include the legislative mandate informing EMIS, the problems and challenges facing EMIS internationally and nationally, identifying the EMIS value chain through the Survey Process, and the current use of Information and Communication Technology in these units. The chapter also looks at another important issue facing EMIS units, that is the question regarding the role of EMIS concerning the disjuncture between data collection and research.

Chapter 3

Chapter 3 contains a discussion on the methodology followed in this project: Selecting the sample, development of the questionnaire, dissemination procedures, and the statistical procedures to manipulate the data acquired from the questionnaires.

Chapter 4

Reporting and discussion of results, that is, findings expressed according to descriptive and inferential statistical procedures.

Chapter 5

Recommendations and conclusions. This chapter will indicate what the findings mean and how the findings can be utilised by provincial EMIS units.

Chapter 2

Literature Review

With the enactment of the South African Schools Act (1996) there are large numbers of areas, especially school developed policy and schools funding norms and standards that need to be implemented and monitored. The National Education Policy Act (1997) also requires government to ensure the health of the education system hence the need to calculate/measure the flow-through rates, retention rates, and access/redress. These responsibilities fall on the EMIS units in the National and Provincial Education Departments.

2.1 Legislation

This section provides an overview of the legislative mandate of public institutions to provide information to National and Provincial Education Departments. This is necessary to enable the functioning of the system.

The new constitution proclaims the rights of individuals to education as follows: “Everyone has the right to a basic education which the state through reasonable measures must make progressively available”(Constitution of the Republic of South Africa Act No 108 of 1996). It is the duty of Education institutions to provide information to the education departments and public in terms of section 59 of the South African Schools Act (Act 84 of 1999 with amendments of Act 100 of 1997), section 41 of the Higher Education Act (Act 98 of 1998), and section 35 of the Adult Basic Education and Training Act (Act 52 of 2000). This provision of information needs to occur in a manner that is efficient and allows for the proper archiving of institution data in the education departments. This policy statement creates a framework that improves the processes by which institutions provide information.

In terms of the National Education Policy Act, 1996 (Act No. 27 of 1996), the Minister of Education must monitor and evaluate the standards of education provision, delivery and performance, to a large extent through the use of national education statistics. The policy statement promotes the processes required to ensure that reliable national education

statistics are available. The National Norms and Standards for School Funding (Notice 2362 of 1998), state that it is the duty of education departments to plan and advance education redress and quality through the intensive and efficient use of education data.

The mandate for an EMIS is contained in The National Education Policy Act (1996): Section 4(a) states that the minister may determine policy for: education management information systems, including the provision of data in accordance with the international obligations of the government; and Section 8(3) states that ‘The Department shall undertake the monitoring and evaluation contemplated in subsection (1) by analysis of data gathered by means of education management information systems, or by other suitable means, in co-operation with provincial departments of education.’

2.2 Education Management Information System (EMIS)

An Education Management Information System (EMIS) is a comprehensive system that bring together people, process, and technology to provide timely, cost effective, and user appropriate information to support educational management at whatever level is needed (Moses, 2001).

The EMIS Directorate is charged with the advance and expansion of a national Education Management Information Systems which will cover schools, colleges, Higher Education, ABET, ECD, ELSEN centres and Further Education and Training institutions (Department of Education). The National Department of Education espouses the following responsibilities for a national EMIS:

- It should be a well-coordinated system of education management information systems that facilitate planning and management at institutional, circuit, district, provincial and national level.
- EMIS should facilitate capacity building, support and training on collection, processing, analysis, dissemination and use of information at all levels of the education system.
- It should be an integrated system, providing data and/or information for use at all levels of the education system.

An EMIS must be capable of providing data and information for policymaking, planning, management, and development monitoring of the education system. It must facilitate accurate, timely, relevant access to information. It should be coordinated and lead towards integration of data and information for use from institutional to national level. It is imperative that EMIS should operate within the legal framework of the Promotion of Access to Information Act (Act 2 of 2000).

An article by the Literary Resource Centre (1998) denotes the purpose of EMIS as follows:

- To integrate all information related to the planning and management of educational activities;
- To present them in a comprehensive and succinct manner to users;
- To strengthen the capability to manage, plan and control the flow of information among related agencies and various sectors;
- To streamline the flow of information for decision-making by reducing and eliminating duplication as well as filling information gaps;
- To link up various quantitative and qualitative information resources under one system; and
- To further improve the collection, dissemination and use of education management information, in response to constantly changing information needs.

The objective of an information system has to aim to enable the line sections/managers to be owners of their information, which they share with other users in a format that will satisfy the needs of the organisation. The difficulty with information comes when users expect it to do more than it was planned to do. Some of the problems began that emerge are that data was being collected to fulfil the core business goals of sections, units and functions but that these systems did not take advantage of modern technologies to be able to integrate and provide information to users. Education Departments can only consider EMIS effective once all the various disparate collections and accumulations of data have been integrated and used for decision-making and planning (Patel, 2000).

Management information can be conceived in different ways (Davies and Ellison, 1990; Donovan and Jackson, 1991; Laudon and Laudon, 1996; Warwick, 1997). Yet, the core purpose is illustrated simply by Davies and Ellison (1990: 22-23):

"If managerial functions are to be carried out both efficiently and effectively, then it is a prerequisite that high quality information is available to inform decision making at the various managerial levels...An information system...should be reliable and provide:

1. The right information
2. To the right people
3. At the right time
4. In the right way
5. To achieve clear objectives."

The information systems developed are generally conceived as rational, and with the ability to supply different types of information to different parts of an organisation. The emphasis is on the construction of appropriate information from the data collected.

Davies and Ellison suggest that information identification and collection has to be targeted.

"It is a fallacy to think that the more information an organisation has the better will be the decisions. Information must be focussed so as to serve precise management tasks."

They adopt a rational and sequential approach involving:

1. Identification of information management tasks and decisions that require information.
 2. Identification and definition of the nature and type of information required.
 3. Deciding how and when data will be collected.
 4. Analysis and evaluation of data to turn it into useful information.
 5. Communication of information to relevant parties.
-

An EMIS is inorganic, an artifact, manifested in what policy-makers, managers, planners have decided to pay attention to, communicate to others, and measure against the education system's policies, strategies, tactics and operations. The collection of indicators contained in the EMIS is directed at accounting for the performance of the education system rather than for achieving the goals defined by policy. The EMIS is a thin, formalised slice through the Information Structure which seeks to inform the information structure (Welsh, 1993). The EMIS is directed to satisfying the need to learn in the interest of performance rather than pursuing continuity.

Information can be used to improve educational quality in four principal ways by: (i) providing data that are used directly to secure or allocate resources; (ii) constraining 'bad' decisions; (iii) detecting inefficient resource use; and (iv) supporting mechanisms that offset the impact or resource loss (Chapman, 1990).

Most EMIS were not developed to serve as monitoring and feedback devices, that is, they were not designed to provide the on-going information needed for the systems correction. Presumably, they were conceived to provide summary information on the condition of schooling system, that is, to indicate whether the system 'worked' but not how to fix the parts that did not (Kemmerer, 1993). In many developing countries EMIS emerged in response to donor requests for information. Thus in the past decade there has been an explosion of statistical yearbooks, detailing the quantity of schools, teachers, and students with some countries having rather more information and others rather less. Cases of the collection of the same data by multiple agencies, the collection of too much data or inappropriate data, too little analysis of the data, and significant gaps in the data available for decision-making are well documented [see Ross; Mählck (eds.), 1990; Chapman, 1990].

EMIS are often conceived as information gathering devices, that is, as devices by which planners elicit specific pieces of information from the field. In the case of the EMIS, however, the questions are the message. The types of information requested are translated

by system managers into statements of the goals, standards to be met, and criteria by which they will be judged. As in most EMIS, the information requested is limited to counts – counts of teachers, students, buildings, the message is that it is the numbers that are important – that the goal of the education system is to employ (teachers, janitors, etc.) and to expand (Kemmerer, 1993). EMIS limited to simple descriptive statistics and functioning as a public relations device obviously represents a missed opportunity to ‘inform and negotiate’ integrated (and therefore, more or less self-explanatory) system goals, standards, and criteria.

2.3 Problems and Challenges

The overarching problem for education systems in most countries is that on the one hand they have too little information, in an accessible form, for the issues they are now facing, and on the other hand, they have too much information about issues that were important at one time (Moses 2001). Current EMIS practice are typically limited to centralised databases containing basic, school level data: pupil data (enrolment, age, repetition), teacher data (experience, placement), school inventory data (location, number of classrooms, equipment, etc) (Crouch, Enache & Supanc, 2001). Crouch (2001) argues that in spite of the recent development of regular EMIS data, such as good pupil and teacher counts, the systems have not improved nearly as fast as would have been technically and organisationally feasible in the last few years. Although South Africa has relatively good personnel and exam records these have not been integrated with the financial records and EMIS records.

The reasons for this lack of integration are not clear, but perhaps have to do with a lack of awareness at high administrative levels within the system of precisely the level of effort it takes to organise large-scale information systems support, and how to do so on a systematic rather than once-off effort basis (Crouch and Spratt, 2001). Crouch hypothesised that the level of skills required simply has not been available to the education sector, even though it is available to society.

Education systems are faced with both internal and external information problems, linked to the kinds of stakeholders they have. An effective EMIS can begin to change both the tools and the processes used to exchange information and to support decisions. By addressing, not only what information is necessary for decisions, but also who will use it, in what manner, and how that process is to be supported (Moses 2001). According to Moses, the three major issues facing ministries are: 1) old organisational structures that do not meet current challenges; 2) hierarchies that may not be responsive; and 3) the speed of transfer of information.

A major concern for Provincial Education Departments (PEDs) is the challenge of deconcentration and decentralisation of functions. The quality of data collections tends to be better at the local level (Crouch et al 2001). The higher the level of local use of data, the higher the quality generated for general systems purposes. Other issues that are sometimes confused are the speed and completeness of data with accuracy. Celerity may be motivated by ties to resources (Crouch et al 2001).

In many developing countries, the entire education information system structure is inadequate for the rapidly growing information demands. Obtaining quality data is often elusive, costly and frustrating. In many cases problems such as data weaknesses are excessive, see above. Those who generate data, the teachers and staff of schools, themselves may have little idea whether their information, reporting has been of use, has been retained, or in fact has reached those who need to know. In many countries, the flow of information is only one way – upwards to the centre (Moses, 2000).

2.4 Problems and Challenges (South Africa)

The access to accurate, reliable and relevant information for decision-making and planning has been difficult in the past. Education management systems are fragmented and data cannot be easily collated due to lack of standardisation (EMIS Steering Committee 1996). One of the most serious challenges that have been facing the department of education was the lack of human resources as most officials who were in the previous education departments left the public service (DoE, 2003c). The National

and Provincial Education Departments suffered a serious loss of skilled people and there has been no concerted effort to replace the loss. The process of recruiting and developing internal capacity has been very slow and non-existent in some cases (DoE, 2003c).

Another challenge has been the adequate funding for EMIS activities. The levels of funding for EMIS activities have been very low although EMIS development involves a lot of development work as well as ICT infrastructure. There are cases where EMIS units use outdated technology, making it impossible for the units to perform certain basic functions (DoE, 2003c). Even donor funding could not be used for the acquisition of hardware infrastructure, as most donors do not support such needs. These are taken as normal recurrent/capital requirements that departments should budget for. Extreme cases of under-funding have been observed in cases where there would be no paper to print the survey forms and annual surveys would be conducted late that the scheduled period.

One of the major challenges facing the Department of Education is the lack of common standards, definitions and classification systems for the development of Education Management Information Systems. This has partly been addressed by the department of Education in developing a national education information policy that will set up standards, guidelines and classification systems for the entire education system.

The fragmented landscape of education information systems in South Africa, and the significant provincial and regional discrepancies in the availability, quality, reporting and use of education information require urgent steps to unify the national education information system. The unity and consistency of the system can only be assured by developing and enforcing clear policy mandates, responsibilities, as well as norms and standards for handling and using information to provide guidance and monitoring to the education system.

The immensity of the task is daunting. Provinces are ill prepared and certainly unevenly prepared to address this development effort. There is simply no capacity in many

provinces to even maintain the existing education management systems, in terms of basic data collection, capturing, processing and reporting (Business Plan, 2003a).

The national EMIS has responsibility not only for developing and enforcing standards for the national education information systems, but also for assisting and supporting provincial governments and EMIS units in complying with those standards and developing, integrating and maintaining their own information systems.

The above problems have affected the effectiveness of most provincial EMIS units to an extent of these units not seen as playing a role in supporting, planning and decision-making processes. These challenges have also contributed to poor data quality, ultimately reporting of data and incompatible data sets across provinces (2002 SIDA proposal). In addition to lack of capacity, absence of minimum standards and guidelines also contributed to problems of data quality. In spite of considerable demand-side pressure for good data, EMIS and other informational-analytical units have been understaffed, under budgeted, and their organisational and institutional features have not been cogently and effectively analysed and then delineated (Crouch and Spratt, 2001).

In a sense, management within the system has perhaps not really known or understood the technicalities of how to respond to the accountability pressure by organising good information system. What is clear, however, is that when, and as, such systems do begin to get organised and start providing good data, the data are immediately used and taken up by the management and policy debate, because the accountability, or demand-side, pressure is present and quite intense.

2.5 EMIS Value Chain

Accurate information is an essential guide to action. Every organisation needs systems for gathering and storing data, tracking key performance indicators, identifying and diagnosing problems, and reporting strategy-critical information. Companies that rely on empowered employees need measurement and feedback systems to monitor the

performance of empowered workers and guide them to act within specific limits so that unwelcome surprises are avoided (Thompson and Strickland 2001).

Information systems need to cover five broad areas: 1) customer data, 2) operations data, 3) employee data, 4) supplier/partner/collaborative ally data, and 5) financial performance data. All key strategic performance indicators have to be measured as often as possible. An effective way to search for potential IT opportunities is through a systemic analysis of a company's value chain – the series of interdependent activities that bring a product or service to the customer (Applegate, McFarlane & McKinney 1999). In different settings IT can profoundly affect one or more of these value activities, sometimes simply by improving effectiveness, sometimes by fundamentally changing the activity, and sometimes by altering the relationship between activities (Applegate et al 1999:71). The actions of one component, e.g. the district office or school, can significantly affect the value chain of key customers and suppliers.

The value chain links the value of the activities of an organisation with its main functional parts. The analysis will examine how each part might be considered to contribute towards the generation of value in the EMIS. Significant weaknesses in the practical application of value added include a lack of precision in identifying areas of resource advantage and company leadership (Lynch 2000). Value-added analysis tends to focus on assets that can be clearly measured. This is a weakness, because some of the organisations most valuable assets may be difficult to quantify, such as specialist knowledge and company leadership.

Survey Management Process

This section deals with the methods and processes by which provinces currently collect school data, and share ideas and experiences. I shall draw extensively from the article by Gugu Nyanda and Wendy Heard, entitled *Management Process of Conducting and Processing School-Based Surveys*. The article illustrate how provincial EMIS units presently conduct and process the two major surveys of the school year, namely the SNAP (tenth-day count of educators and learners) and the Annual Survey (conducted in

April as a detailed census of schools, covering information relating to the curriculum, educators and learners, including age, gender, distribution, etc.). It also reviews issues of survey instrument distribution and collection, data capture, processing and dissemination. The phases of management process are shown in the flow chart, Figure 1.

The phases in the survey management process is an excellent way of identifying the EMIS role-players and as such the value chain. The section first explores the survey management process, which forms the greater part of the EMIS value chain, and then continues an exploration of the users (decision-makers) of education information.

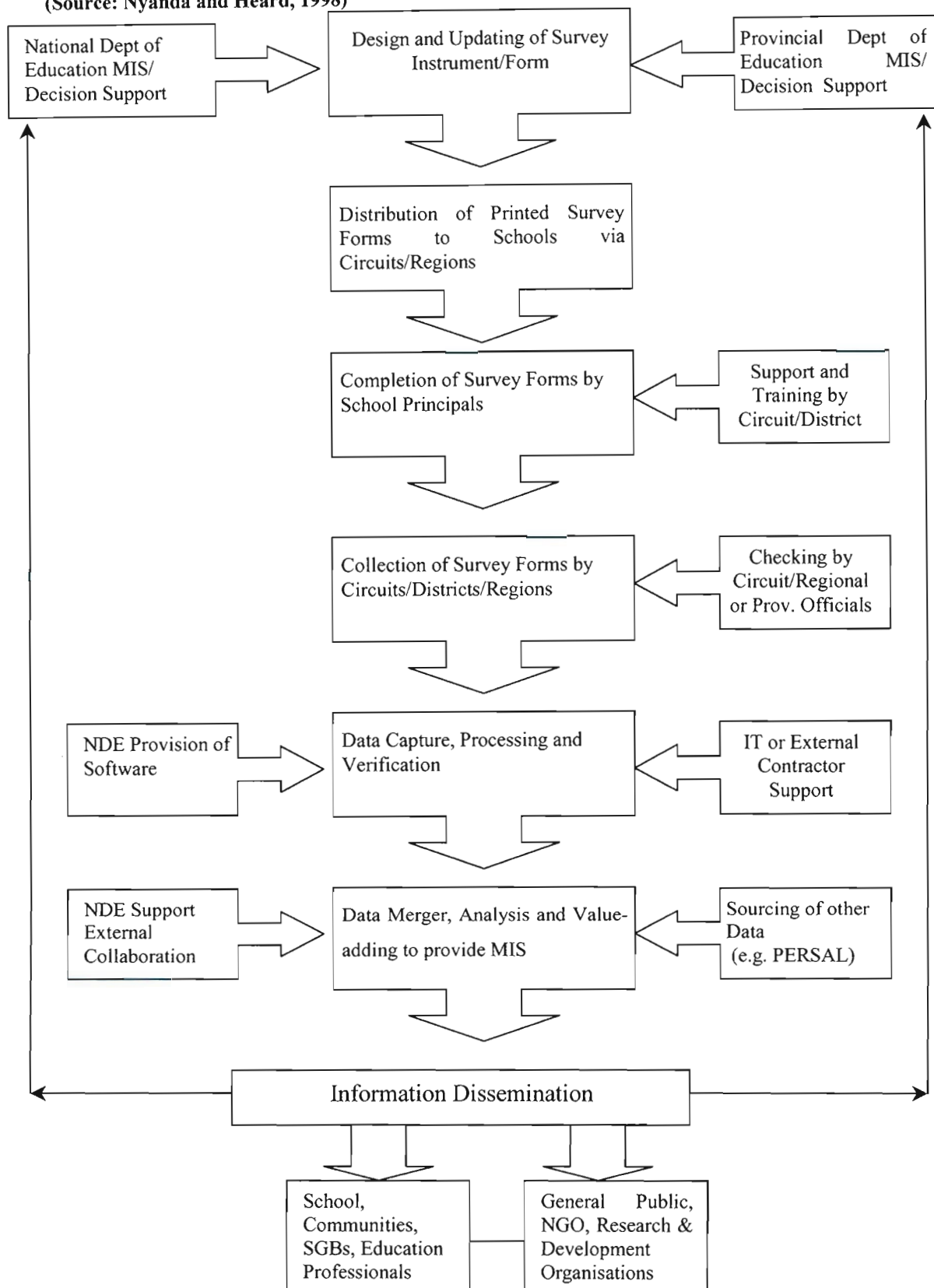
The National Department of Education has facilitated the process of determining a core data set, containing critical fields of information which all department are required to collect at school level on an annual basis and then process and submit to the national department. To assist this process at the provincial level, an annual survey form and data capture programme were designed and provided to all provinces. As indicated above, some of the provinces adopted these instruments while others adapted the form to suit provincial needs and some other chose to develop their own systems entirely.

Distribution

The process of survey distribution is quite similar in all the provinces (Nyanda and Heard, 1998). The survey forms are either hand-delivered from the provincial office through education regional offices to schools; or they were collected from the provincial office by regional managers who would then distribute these via circuit or district managers until they have reached the schools. The main difference in this process is the number of levels of management through which the forms pass. The survey forms of the Northern Cape, for example, are distributed from the provincial to the circuit offices and then to schools, whereas in provinces with many more schools, like KwaZulu-Natal and Eastern Cape, the forms go from provincial to the regional office, then to the district office and circuit office before they reach schools (Nyanda and Heard, 1998).

Figure 1: Survey Management Process Phases

(Source: Nyanda and Heard, 1998)



Most offices provide training to their education managers on how to complete the survey form, especially in the case of the Annual Survey. The training sessions are an attempt to decrease the errors in the completion of the form and to ensure the supply of correct and complete information by the principals. The Northern Cape for example has a single management level between the provincial EMIS office and the schools, which mean fewer problems, are encountered with the distribution and collection of forms in spite of the fact that they offer no training whatsoever (Nyanda and Heard, 1998).

Completion of survey forms

While EMIS forms are being completed, EMIS staff in all the provinces offers support should managers and principals have problems. This service tends to be offered only at Head Office, since there are a lack of EMIS personnel in the regional and area offices.

The forms are completed by principals and checked by managers at either circuit or district level for errors and completeness. It is not clear though how provinces ensure that the information supplied by the school principal is correct and that the learner numbers are not inflated, since the provincial EMIS units do not always verify information systematically.

Collection of survey forms

The forms are collected from schools in a reversed distribution chain. The Circuit or Area Managers, Regional Offices and Head Offices check them for accuracy and completeness.

The whole process of distribution, collection and analysis of forms takes such a long time for the largely under-resourced EMIS units. By the time, information is ready for dissemination, at times a year later; it is often inadequate to meet the needs of information users. As a result, a number of provinces are looking at the possibility of either outsourcing the data capture process or hiring additional data typists who would work round the clock.

Data Capture and Processing

The National Department of Education had developed a data capture programme and a survey form that was made available to the provinces to use either as is, or to be adapted to meet their specific requirements. Most provincial departments do not have their own data capturers and either have to employ personnel to on a contract basis to complete the task, or to make use of data typists appointed to the Information Technology section to support all data capture tasks for the department. The provincial units with smaller school numbers to contend with, particularly in respect of the Snap Survey, actually complete the task themselves.

To verify the information the survey is captured twice where time and resources permit, and generally verification is carried out after the data capture process has been completed by EMIS personnel or area office personnel. In some cases the data is compared with other data sources for verification, available from other directorates within the department.

Dissemination of Information

Educational information has a wide variety of users who have different information needs (see discussion below). Provincial EMIS units are faced with the task of meeting the needs of information users whose requirements range from simple lists of schools in a given area to more complex applications such as teacher relocation, school clustering and prioritised resource allocation.

Educational planners must go beyond simply transmitting evidence and findings. Instead, there must be a continuing dialogue and interplay between (a) the decision-maker who demands information and assigns priorities to competing problems, and (b) the educational planner or educational researcher who produces data and infers certain meanings from evidence (Fuller, Gilford, Lapointe, Al-Nouri and Brunswic, 1990). Educational planners have often been inflexible in the manner in which they have produced and disseminated information in the form of documents and publications. Their information reporting approaches are rarely addressed to the end-user. They often have

difficulty in presenting a concise statement of the conclusions reached and the associated administrative changes that are required in order to improve the quality of education. In most national education systems planners continue to apply traditional methods for disseminating information.

The simple task of releasing a list of schools can become a burden to some provinces. For example, the Eastern Cape EMIS unit sometimes run out of paper to print hard copies of information and for which no budget is available. As a result, it is often easier to supply information on disks or through electronic mail. However not all information users have access to computers and the need for hard copy information and reports will always exist. The provinces agreed on the need for improved dissemination and for information tailored to the needs and levels of sophistication, but noted the lack of resources and personnel to achieve this.

The next section will first look at the users and producers of information at a national level, then from an EMIS perspective, as well as identifying the decision-makers in the education system.

Main sources, users and uses of EMIS data and information.

Statistical information is a strategic resource. How well this resource is harnessed and used for development in each provincial EMIS depend upon how well the EMIS is engineered and operationalised.

Main sources of data and information.

In many countries including South Africa, there are many institutions/agencies involved in data production. However, the main producers include:

- National Statistics Agency
- Line Ministers
- Central bank
- Research Institutions
- Public sector institutions

- Civil Society

Main users and uses of statistical data and information

Table 1 shows the main users and uses of statistical data and information. The main users of statistical data and information are: Government (central and local), public and private sectors, research and training institutions, NGOs, donors and international organizations, the press and the wider public.

Table 1: Main users and uses of statistical data and information

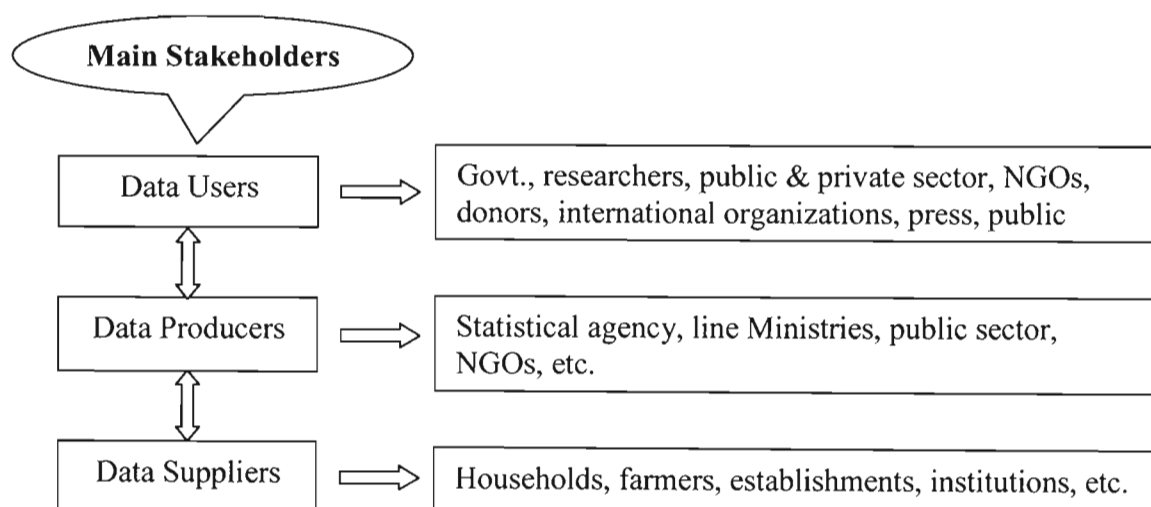
Users	Use
Government (Central and Local) <ul style="list-style-type: none"> ▪ Policy makers ▪ Decision makers ▪ Analysts (e.g. poverty analysts) ▪ Administrators ▪ Politicians 	<ul style="list-style-type: none"> ▪ Main uses: policy design, planning, administration, decision-making, plan implementation, monitoring and evaluation, reporting, transparency and accountability.
Public and Private sectors <ul style="list-style-type: none"> ▪ Investors ▪ Traders 	<ul style="list-style-type: none"> ▪ Assess opportunities, risks and prospects ▪ Planning, decision-making, monitoring, evaluation ▪ Reporting
Research and training organizations	<ul style="list-style-type: none"> ▪ Teaching aids ▪ Planning and decision-making ▪ Research ▪ Analysis
Donors and international organizations	<ul style="list-style-type: none"> ▪ Assess requirements for assistance and/or ▪ Participation in the development initiatives ▪ Planning and decision-making ▪ Monitoring ▪ Evaluation ▪ Reporting
The Press	<ul style="list-style-type: none"> ▪ Analysis and reporting
The Wider public	<ul style="list-style-type: none"> ▪ Variety of reasons including public debate

Source: Kiregyera (2001)

The main uses include analysis, planning, decision-making, administration, monitoring, evaluation, reporting, transparency and accountability. A National Statistical System (NSS) is defined by the legal framework, infrastructure and institutional arrangements for the collection, management and dissemination of official statistics in a country.

The main stakeholders in a NSS are data users, data producers and data suppliers (Figure 2). Data users include Government (policy, decision-makers and administrators); researchers; public and private sector operators; NGOs; donors, international organizations; the press and the public. The main data producers include the national statistical agency, line Ministries, public sector, NGOs, etc. while the data suppliers included households, farmers, establishments, institutions, etc. (Kiregyera, 2001).

Figure 2: Actors and stakeholders in the national statistical system:



The next section looks specifically at the data users, produces and suppliers in the education system.

Education decision-makers

Who is the education decision-maker? The following persons or groups of persons are likely to make decisions affecting education in a given country (Psacharopoulos, 1980):

“The Minister of Education, the MECs for Education or other high profile government officials in their roles as instigators of educational change and innovation and/or administration of an adopted educational policy.

The technocratic government officials who, in elaborating an educational plan and absorbing the international and domestic educational conditions, influence the administrators, above, on, what a ‘problem’ to take action upon and/or generate ‘information’ demands in order to carry out their task.

The general public, especially pupils, students and their families who determine what level and kind of education they will seek from the State or private institutions and/or how this education will be financed, e.g. State, family, or forgone earnings.

The employers of labour in the economy as a whole who make specific demands for specific kinds of skills to be hired and/or offer on-the-job training opportunities to their employees.”

All these groups of people are likely to be helped by having ‘information’ relevant to their action in the educational sphere.

Ross and Postlethwaite (1988) proposes four broad levels of decision-making in education: (a) parent and teacher decision-making concerning a particular student; (b) school-principal decision-making concerning a particular school; (c) official state or provincial decision-making concerning a particular group of schools; and (d) official national decision-making concerning all a nation’s schools.

Teachers and parents need to gather and share information concerning the nature of the educational behaviours (knowledge skills and values) that have been taught, the extent to which this have been learned by the child, and the contexts in which the child has demonstrated these behaviours with either competency or difficulty.

School principals seldom need to have information about the education behaviours of individual children. When this kind of behaviour is required, the principal can consult

with the appropriate teacher. Principals often need to be informed about the progress of learning for each class in the school. Information required at the classroom level is more suitable for assisting with decisions concerning the deployment of school resources to ensure that all classes achieve the school's educational goals which have been set by the principal, teachers and parents.

In addition the principal needs to have information on how well the school is performing in comparison with other similar schools. This is especially important in respect of 'core' educational goals which are also valued by these similar schools. Principals can use this information to review the school's goals, set priorities among these goals, and focus a whole-school effort on improving the school's learning environment in ways which are relevant to the students' aptitudes, interests, and home circumstances.

State and provincial officials do not require information as detailed as that required by school principals because they are far removed from the daily operations of schools and the daily responsibilities of parents, teachers and principals. The broader role required of these officials, be they administrators, co-ordinators or supervisors, demands that they should make decisions only after having examined information which is sufficient to establish the existence of problems serious enough, or opportunities great enough, to warrant a considerable commitment of their time and state or provincial resources.

National officials require less information than do state or provincial officials. Their role is to make broad policy decisions concerning the linkages between the legislated directives of past and present governments, and the plans and resources required to attend to these resources. These decisions are expected to have impact across whole or large parts of school systems and therefore, because of the conservative inertia of educational institutions and the high costs of initiating system-wide change, a great deal of accurate information about students and schools needs to be collated at the system level.

2.6 Information and Communication Technology in EMIS

In the early stage of EMIS most Ministries think of EMIS as an undifferentiated set of solutions to all their problems involving computers, reporting, data, and costs (Moses,

2001). When large educational systems start moving responsibility for certain key functions, they must also plan on software and hardware support for these functions. What many governments do when they decentralise is to force Districts or lower levels to use manual procedures even though at central level most things are automated.

The role of Computerisation in EMIS is seen as:

- The ability to handle massive data volume
- Faster processing capacity such as: searching, sorting, and retrieving information
- Greater accuracy and uniformity
- Systematic information flow
- Greater security and easier maintainability

(Literacy Resource Centre, 1998)

Moses (2001) argues that EMIS have a technical element, but they are primarily about the use of information. Using information is a highly specific, often personal activity that affects work habits, work style, and work flows. Since information use tends to be specific, training and reengineering are a big part of making EMIS effective. Many old style information systems have ceased to work not because they became obsolete, but because the people supporting them failed to maintain them properly. Technology should be appropriate to the functions and scale of the system, and be sustainable (Moses 2000). Moses argues that the very latest technology if unsupportable for more than one year soon becomes useless and can actually set a system back. Technology requires redundancy (more than one year of training), regular maintenance, supplies to keep it working, alternative approaches when it fails, and people trained to diagnose and support its operations.

Since the early 1990s, the advent of relatively inexpensive and very high-powered modern micro-computers now means that, except for some large data collections such as student-level censuses using many variables, it is possible for the researcher to do most of the data processing on micro-computers. The use of personal computers has many

advantages, but users have to take cognisance and responsibility for making security backups of important data files.

The use of some types of technology can reduce errors associated with data preparation (Ross, Postlethwaite, Lockheed, Grisay, and Breis, 1990). For example, optical scanning sheets when used in appropriate situations can be read by an optical scanner much more quickly than printed instruments can be hand coded. The authors argue that the use of this type of technology can reduce the length of time between data collection and analysis.

Information and communication technology is probably the key to the increased reliance and use of management information systems.

“Through implementing IT, organisations not only increase process efficiency, they also change the locus of knowledge. In the eyes of many managers, this equates to changing the locus of power. If implemented in its most productive fashion, IT provides line employees with the data to perform their jobs more efficiently and makes decisions on job changes. In addition, IT changes the time dimension of many communication networks that cross multiple time zones and by increasing the turnaround time of production and feedback data. This in turn, provides employees with considerably more information on a more frequent basis. Coping and intellectual skills to handle these changes in information flow are critical.” (Thach and Woodman, 1994: 30).

If this description of the impact of technology on non-educational organisations is extended to schools, the amount, type and quality of information available to teachers, school administrators and school systems can be expected to rapidly increase.

Information and communication technology is increasingly allowing schools and school systems greater access to timely, relevant and detailed information on many of the functions of schools. Information that is more complex can now be collected, analysed and used at both the school and system level. The rapid development of information and communication technology, increased pressures to measure organisational performance

and the adoption of school self-management are leading to the development of powerful management information systems (Gurr, 1997). Information and communication technology is probably the key to the increased reliance and use of management information systems. In non-educational settings, the impact of technology is pervasive and if it is applied to educational settings we can expect that the amount, type and quality of information available to teachers, school administrators and school systems will rapidly increase (Gurr, 1997).

2.7 Policy factors to consider when introducing ICT in education

The following has been adapted from an article by Charles Kenny (2001) *Information and Communication Technologies and Poverty*.

In some developing countries, the importance of ICT policies is understood at the highest level.

- ICT infrastructure is weak. The lack of computer and telecommunications infrastructure is a key problem in many developing countries. National ICT policies therefore need to be very strong in this regard.
- ICT-related goods and services are made available on suppliers' terms and low per capita purchasing power does not allow markets to mature. The fact that low-cost computers – although technologically feasible – are not available is largely due to the rapid development of and trade in ICT components that are almost entirely supply-driven, taking into account the needs of only a minority of potential users. Government ICT policies can help the development of ICT markets by reducing red tape, reducing import taxes, and creating a favourable entrepreneurial environment.
- Telecommunications monopolies still exist. Telecommunications sectors in developing countries in the Asian and Pacific region are typically characterized by government monopolies. However, a fair degree of liberalization has been achieved in several domestic telecommunications markets, and private ISPs have become commonplace. National ICT policies cannot afford to ignore the fact that the need for low-cost telecommunications services in developing countries is higher than ever.
- The public sector is a significant employer. The computerization of routine functions allows governments to reduce staff and to improve the quality of their services at the

same time. The effectiveness of such moves is often moderated by inflexibilities in employment contracts that limit the scope for staff retrenchments.

- Management structures and styles are not conducive. Most failures in ICT application development are caused by poor planning and management and not by the lack of resources or wrong technology choices. Management of ICT projects is often made more difficult by overly hierarchical organisation structures that are not conducive to innovative ideas. This can create a problem if the management remains unaware of the benefits that could be achieved through the application of ICT. National policies should emphasise the importance of involving senior executives in ICT development and making them accountable for their organization's ICT-related performance.
- Governments are struggling to find money for basic public services. Government budgets tend to be tight, especially in developing countries; this can create problems for rational ICT development and hamper the ability to react quickly to new requirements or to buy the latest technology.
- The penetration and influence of the Internet are still minimal. The Internet is changing the way in which data and information are collected and disseminated and how services are provided to clients. Thus, new systems should be developed with either immediate or future Internet connectivity in mind.
- Governments find it difficult to recruit and retain qualified ICT staff. A key constraint for the effective application of ICTs in developing countries is the shortage of human resources. Apart from a lack of qualified ICT-system personnel, there is often high turnover of such personnel which can seriously hamper systems development and daily operations.

2.8 EMIS as Research

There is always the burning question regarding the role of EMIS concerning the disjuncture between data collection, first level information dissemination and research (namely high level analysis to produce academic papers and policy briefs). There is consensus that EMIS ought to concentrate more on the analysis of quantitative data for the monitoring of the education system and not to dedicate itself to operational work. It is

a fact that most EMIS offices nationally deal with operational data collection work and first level information dissemination, very little high level research is conducted.

However, as Chisholm (1994, p. 4) has noted, policy research must privilege neither quantitative nor qualitative methodologies, but employ either when necessary. Given the dominance of quantitative methodologies, Chisholm highlights the importance of qualitative research in providing quality control, a validity check on the interpretation of statistical data, and the opportunity to examine the unanticipated and contradictory outcomes of policy.

The practical skills and knowledge required dealing effectively with the logistics associated with the sampling, collection, preparation, and analysis of data are essentially those required in order to conduct educational research. Some data on the entire school population need to be collected regularly in order to inform managerial decisions, such as the allocation of resources. These types of data include the total number of students, teachers, and schools.

In some countries, such as South Africa, data on student populations are required in order to monitor compliance with compulsory education laws. For most purposes, sample surveys with units sampled from sampling frames developed for a well-defined target population are sufficient. Sample surveys when designed and executed appropriately, can provide as much information as complete censuses, at considerable less cost. Samples are perfectly adequate for describing most characteristics of an education system. In fact, most analytical work depends upon samples, even when census type data are available because the computational requirements for analysing complete population data are often very large (Ross, Postlethwaite, Lockheed, Grisay, and Breis, 1990).

An important reason why EMIS officials cannot be burdened with the responsibility to conduct research in their respective education departments is inadequate training and/or experience. The researcher, in this case the EMIS member has either never been trained in the techniques of data collection or has had some theoretical training but no practical

experience. The capacity of well-qualified and experienced people in developing countries to do research is often diminished. People with this high level of training are in short supply and therefore they are constantly being asked by their governments to take responsibility for a range of administrative tasks and a large number of research studies.

Decision-maker's interests have generally been linked to the present at the expense of a more serious consideration of the future prospects of education. They are more inclined to frame questions surrounding the visible aspects of school provision than about the comparative affects that various provisions have on educational outcomes (Fuller, Gilford, Lapointe, Al-Nouri and Brunswic, 1990). The authors are of the opinion that decision-makers often lack the skills required to properly interpret research outcomes or to discriminate between well and poorly designed research studies.

The case for differentiation within the EMIS

Some useful ideas have been put forward about areas where differentiation might be possible within the EMIS, which would contribute towards streamlining the system. Several parameters have been identified for possible differentiation: sampling for data-collection, frequency of data-collection, levels of detail (disaggregation) (Meyer and Motala, 1997: 15).

- **Sample surveys and assessments**

For example, longer-term tracer studies or longitudinal studies could be undertaken to monitor the progress of samples of learners in terms of the impact of their educational experiences on their later access to employment opportunities or further and higher education. Crouch (1996) has commented that such monitoring need not form part of an EMIS as such, but could be done by linking the EMIS to existing socio-economic information systems such as the Central Statistical Service (CSS) socio-economic database.

- **Frequency of data collection**

Not all data, which are relevant for inclusion in an EMIS, need to be collected annually. It may only be necessary to gather data in certain areas every few years. Some of the above observations point to the possibility of differentiation within the EMIS in terms of set time-frames, so that some data is collected annually, some every five years, and so on.

- **Degrees of data disaggregation**

Crouch (1996) has also pointed out that the degree of disaggregation in terms of the unit for which data is collected or reported (pupil, school, district, etc.) should be thought through carefully to eliminate unnecessary levels of details and to contain costs. This is another principle of differentiation which should be built into the EMIS, but taking into account key policy areas where disaggregated data up to the levels of individual schools and pupils would be needed. Crouch has argued, for example, that the Department of Education would need access to certain data on individual schools, not for management purposes, but to be able to do policy analysis and policy setting on an informed basis. In a similar vein, Riddell (1997) has made a strong case that data on multivariate analysis of factors influencing learning outcomes should be collected for individual learners to allow finer probing of key aspects of Curriculum 2005 and their relative effects on learning achievements (Meyer and Motala, 1997).

An effective EMIS can begin to change both the tools and the processes used to exchange information and to support decisions. An effective EMIS needs to address not only what information is necessary for decisions, but also who will use it, in what manner, and how that process is to be supported. Only when the entire cycle of people, process, and technology is addressed can governments expect to see real change in the speed with which information flows, and consequently an option for increasing the speed of decision-making.

CHAPTER 3

Research Methodology

3.1 Design and Analytical Technique

This study utilised a cross-sectional survey research design to assess how EMIS addresses the information needs of its clients and the extent to which departmental users are satisfied with the EMIS information. The research technique is both quantitative and qualitative. The quantitative aspect involves the collection of quantitative data using structured questionnaires. The qualitative aspect of the research involved in-depth interviews with unit heads in order to ascertain the level of ICT use in the EMIS units and the EMIS value chain.

The 'quantitative' questionnaire lends itself to simple descriptive analysis involving bar charts and frequency distributions. This study used a cross-sectional method because the data was gathered from a limited number of people, approximately 10, and will be comparable within the province where research was done.

3.2 Survey Method

The different methods of data collection such as personal interviews, telephone interviews and self-administered questionnaires were considered. The survey approach using self-administered questionnaires, personal interviews and telephone interviews were selected for the study. It was recognised that one drawback of the self-administered questionnaire approach was that returns would not be very high and therefore generalisation of the findings of the study may not be representative of the total population. Though it was noted that a low response rate would undermine the validity and reliability of the study it was nevertheless decided to go ahead with the use of the self-administered questionnaire.

Initially two provinces were selected for the research, Gauteng and the Northern Cape. The two provinces have distinct socio-economic features. Gauteng is the economic hub of South Africa, with a high concentration of people and highly urbanized, while the Northern Cape on the other hand has a more rural character. After much consideration the

researcher opted to rule the Northern Province out of the study, due to reasons given below, see “Limitations of the Study”.

3.3 Sampling Procedure

The sampling frame is the current population of Senior Managers (directors) and Chief Education Specialists (unit heads) within the Gauteng Provincial Education Departments. The sampling frame included officials beyond those whom the researcher was interested in, but a screening procedure was implemented to eliminate those who did not form part of the group the researcher was interested in studying.

The sample method is a non-probability sample. To be more precise a judgement sample. It was the intention of the researcher to only survey the Senior Managers and/or Unit Heads of those Directorates which deal frequently with the EMIS unit and which are located at the provincial Head Office. An initial interview/meeting was scheduled with the EMIS unit head, which served a dual purpose of presenting the outline of the research project and to ascertain the most demanding internal clients of EMIS. As suggested by Patton (1990) purposeful sampling was selected as it would allow for the selection of information-rich cases for study in-depth. Patton identifies information-rich cases as those which one can learn a great deal about issues of central importance to the purpose of the research.

The sample for Gauteng was drawn from two lists: (1) a list with the contact numbers and designations of all Senior Managers in the GDE and (2) the internal telephone directory, which includes all the names, ranks, contact details and short job descriptions of all GDE officials.

The questionnaires were only administered to selected Senior Managers and Chief Education Specialists in directorates or units which deal on a regular basis with EMIS, e.g. Physical Planning, Curriculum, Institutional Development and Support which include the Further Education and Training, and General Education and Training units, as well as the Organizational Development unit in the Human Resource directorate. The 10 officials

sampled represent the directorates that utilises EMIS information most often in the Gauteng Department of Education. At the time of the survey, Gauteng had 46 Senior Managers representing 46 directorates within the provincial education department. Of these, 16 are located in the districts and the rest at head office.

3.4 Measuring Instruments

For the collection of information from Senior Managers and Chief Education Specialists (Unit heads) the chosen survey method of data collection were structured questionnaires. Personal interviews were conducted with the EMIS Manager in Gauteng and the Deputy Director of the Decision Support Unit. Telephone follow-ups were used when the researcher needed clarity on some issue or if additional information was used.

Structured questionnaires were distributed to selected respondents within the respective Education Departments. The questionnaire was distributed to a sample of two EMIS specialists for pre-testing. Based on the feedback received the questionnaire was further modified.

The survey instrument comprised of 6 sections. Section 1 focused on background information, such as the respondent's line-directorate and designation within the education department. Section 2 was on the objectives, functions and information needs of their respective directorates. These were all open-ended questions. Section 3 contained questions based on the respondents' knowledge of EMIS procedures and policies. Section 4 was on the use of Information and the Service the directorates get from EMIS. Section 5 was on the directorates' own generation of data sources and research needs. Section 6 focussed on the directorates' computer skills, access to EMIS data sets and training needs.

Several scales were used in the construction of the questionnaire: simple category scales, Likert scales, and multiple rating lists.

In some cases simple category scales were utilised only in those instances where a dichotomous responses was adequate. The use of the Likert scale was to ascertain the users satisfaction with the performance of the unit under investigation. This was employed to judge whether the EMIS unit's efforts had the desired effect on the users of information. No pre-test post-test was done, due to the descriptive nature of the investigation and the short timeframe the research was conducted in. The multiple-response rating scale was employed specifically to check the respondents' evaluation of a certain issue. A few arbitrary scales were also designed for inclusion in the questionnaire. These scales have content validity. In one situation, the arbitrary scale was an extension of a dichotomous scale, giving three options and not two. In the second situation, the respondents were requested to evaluate a product of the EMIS unit. The weakness of this scale is that the researcher's insight and ability offer the only assurance that the item chosen are a representative sample of the universe of content. It is difficult to assess whether respondents have viewed all items with the same frame of reference.

The front page of the questionnaire consisted of a cover letter which described the objectives of the survey, assured the respondent of confidentiality of the information provided and requested returns to be forwarded by a deadline. A person in the respective education departments distributed and collected the questionnaires. Follow-up included telephone conversations with those respondents who missed the deadline. The survey was conducted between June and July 2003.

3.5 Procedure: Data Collection Plan

Permission was obtained from the two Provincial Education Departments to conduct the research. The purpose of the research was highlighted in detail.

Once permission was granted the questionnaires were distributed to the subjects and interviews were conducted with selected subjects. All participants were assured of complete confidentiality. The purpose of the research and the period within which to complete the questionnaire were indicated on the front page of each questionnaire. All the relevant information, such as the name and contact details (telephone and fax numbers) of

the researcher, the purpose of the research, the course and university through which the research is done, were indicated on the front page of the questionnaire.

The distribution was done via the Education Departments' internal delivery service. In the case of the Northern Cape, a Senior Manager's secretary distributed the questionnaires, assisted in following up and faxed/e-mailed the questionnaires back to the researcher. In Gauteng, the researcher recruited the assistance of a Senior Manager who distributed, followed up and delivered the questionnaires back to the researcher. The position and authority of the officials within the respective education departments had a major impact on the return of the questionnaires.

The questionnaires in both provinces were forwarded only to those units which deal on a regular basis with EMIS, e.g. Physical Planning, Curriculum, Institutional Development and Support which include the Further Education and Training, and General Education and Training units, as well as the Organizational Development unit in the Human Resource directorate. The intention was to distribute the questionnaires to a minimum of 10 respondents in each province.

3.6 Data Analysis Method

Quantitative data from the questionnaires were entered into a Microsoft Access database and exported into a format compatible for SPSS analysis. The researcher created a capture programme within Microsoft Access in which the data was captured. The database was imported and analysed, using SPSS. Frequency distributions and cross tabulations will be needed to confirm statistical assumptions. Once the data has been analysed, conclusions and recommendations will be made on the findings.

Only two in-depth interviews were conducted. The diverse nature of the interviews did not necessitate transcribing the interviews electronically and analysing the data using a sophisticated qualitative analysis software tool, such as Atlas ti or NVIVO. The interviews conducted were not comparable but complimentary.

3.7 Delimitations and Limitations of the Study

Delimitations imply limitations on the research design imposed by the researcher. These limitations usually restrict the populations to which the results of the study can be generalised. Limitations on the other hand refer to restrictions in the study over which the researcher have no control. This study was limited to a narrow segment of the total population the researcher wished to study.

Delimitations of the Study

It was the intention of the researcher to limit the distribution of the quantitative instrument to only those directorates in the respective provincial education departments that use and request information from the EMIS unit on a regular basis. This does not imply that the other education directorates do not use the EMIS information. The questionnaires were only distributed to the above-mentioned directorates at the provincial Head Office.

This researcher arranged an introductory interview with the EMIS unit head in the Gauteng Department of Education. The restriction in the population was to ensure a higher return rate.

Limitations of the Study

Provision and contingency were planned beforehand for anything unforeseen during the project. The following possibilities were considered:

- The departmental officials not being present on the day of the interview. This prompted the researcher to distribute questionnaires to the respondents.
- The possibility of respondents being uncooperative. In the case of the Northern Cape, officials did not respond even though extension was granted. In one instance, a Senior Manager indicated that he was not willing to participate in the study. Although the other respondents did not object to the study, they cited job pressure as the overwhelming reason for not completing the questionnaire.
- The research is limiting its focus on one province. Due to the uncooperative nature of the officials from one of the provincial education departments, the researcher continued the study in only one of the provinces.

Chapter 4

Analysis

This chapter contains the results for both the structured questionnaire and the in-depth interviews and is organised in the following manner. The chapter is divided into three basic sections: a description of the sample, the examination of research questions, and further exploratory investigation.

4.1 EMIS Clients

As mentioned above, 10 respondents returned questionnaires, of which five were Senior Managers and five were Chief Education Specialists. The respondents represented the following components in the Gauteng Department of Education (GDE): finance, planning and monitoring; policy and planning; educational planning; physical planning; human resources management and development; curriculum; further and general education and training (ABET); labour relations; provisioning.

The provincial EMIS units provide information to a wide range of users, including most of the directorates within the department. The most frequent users of EMIS are identified as: Provisioning; Physical Planning; Curriculum including Subject Advisory Services; Policy and Planning; Finance; Examinations; Human Resources Development; Auxiliary Services; PERSAL; and the School Funding Norms Committee.

EMIS units in some cases provided information back to the schools. Statistical reports are sent to regional/district offices, which in turn are intended to send the information down to schools. The reports are mostly raw data without extensive analysis.

4.2 Findings based on the structured questionnaire

Responsibilities and functions

Most of the EMIS information users at the provincial level are tasked with the implementation of national and provincial policies such as: the South African Schools Act (SASA), National Norms and Standards for School Funding, Admission Policy, the Public Service Financial Management Act, National Skills Development Act as well as

the Employment Equity Act. Their functions involve the monitoring and evaluation of the impact of the implementation of these policies.

The objectives tabulated by the respondents include:

- Provide basic literacy and training to previously disadvantaged adult community, and to enable them to participate meaningfully in social, economic and political activities
- Provide support in respect of Curriculum and Examinations
- To facilitate Medium Term Expenditure Framework plans and budgets for the department
- To monitor the roll out of plans and measure whether objectives have been met
- Provide curriculum support for FET school and colleges and the ABET level 1 to 4
- Facilitate policy development and alignment
- Provide Secretariat Supports Service to Senior Management
- Monitor implementation of policy (statutory compliance)
- Coordinate all research activities within the GDE
- To facilitate and monitor alignment and implementation between policies, plans, budgets and financial expenditure
- Human Resource planning to develop policy
- Provisioning to develop policy
- Vacancy lists to coordinate
- Analyse human resource requirements
- To develop human resource strategy
- Employment relations
- Employee discipline
- Collective bargaining
- Disputes
- To ensure the continuous improvement and alignment of staffing, organisation design and systems with departmental strategies
- To provide educational facilities/infrastructure
- Responsible for determining needs and planning processes

The functions tabulated by the respondents include:

- Provide ABET (academic) programmes to adult learners; providing skills to adult learners
- Training educators and assessment; advocacy and awareness raising and encourage participation in governance and policy formulation
- Routine support to schools; training of teachers; policy review; provide examination support services to schools
- Facilitate strategic planning; compile macro budgets and finance divisions; to monitor plans and budgets
- Improve learner attainment; assessment systems; interventions; teacher development support programmes; strategy development and implementation; performance management
- Record proceedings of Senior Management meetings and disseminate to all SMS meetings; maintain database of all researchers that request permission to conduct research; coordinate the research requests received by the GDE; visit schools twice in each financial year to monitor implementation of policy
- To facilitate policy alignment within the GDE; to facilitate development of policy and legislation; monitor and provide reports on development and implementation of educational policies; provide advice and policy support to Senior Managers
- Human Resources requirements analysis; post provisioning; develop and implement human resources strategy; develop and implement policies on human resources supply and utilisation
- To ensure labour peace (disputes)
- Organisational development; human resource policy and planning; human resources systems
- Analysis of demographics and determining needs for educational infrastructure development

Information Needs

The respondents were able to articulate their information needs with great clarity. It would appear that most information required is readily available from the EMIS Units or

from other operational systems such as Examinations or PERSAL. There is also an indication that other data sources are used, such as the Census, Demographic Bureau of Information, and Financial Management Systems used by the Finance and Physical Planning components.

Information needs identified, include the following:

- National policies guidelines and legislation; national and provincial demographics; database of ABET service providers
- Assessing out of school learners – who are they? Where are they? Can migration patterns be predicted/forecast to help with resourcing strategy? etc.
- Learner attainment in both internal examinations in Senior Certificate/ FET colleges and ABET; teacher database in terms of qualifications/subjects taught and development needs; financial management; curriculum related information; policies, legislative frameworks; subject specific information and research reports; teacher and learner support materials supplied and required; demographic information of all aspects of the system
- School data (learner and educator information); school management information; policy related information (monitoring and evaluation reports); media reports; policy reviews; national reports
- Status of policy & legislation in education and others impacting on education; status of policy and legislation compliance at school level; policy gaps; research gaps; statistics relating to above; budget expenditures/provincial patterns; statistics of learners, educators, etc.
- Statistical analysis of workforce-complete spectrum; monthly trends in human resources statistics; planning & forecasting information; impact studies e.g. attendance (HIV/Aids); research information on learners
- Data for collective bargaining that formulate policy changes
- Personnel related information; learner statistics; institutions statistics; equity information; performance related information
- Learner numbers (enrolment per school); number of residential units per residential area; number of classrooms at existing schools; population statistics

Addressing Research Questions

Policy or Practice:

Only two of the ten respondents knew that EMIS has or are in the process of developing a provincial EMIS policy or practice document. Although both of the two respondents have read the document, only one of them was approached to comment on the content of the document.

Information/Service

EMIS information usage among respondents is quite high. Seventy per cent of the respondents indicated that they require information quite often from the EMIS unit, while 30 per cent seldom require information from EMIS. Most of the information is requested in the form of tables, figures and reports.

Sixty nine per cent of the respondents indicated that EMIS provided the information in the format requested. Only one respondent was satisfied that the information was always provided as requested, while 30 per cent indicated that the information was not provided in the requested format. Reasons given for this are:

- The Geographic Information Systems (GIS) is not fully functional
- The information cannot be presented in the format required
- In many cases the information is not available or dated

The majority of respondents (60 per cent) indicated that EMIS informed them of the time it will take to process a request. Forty per cent did not receive any communication from EMIS regarding the time it will take to perform a request. However, 40 per cent is quite significant especially when considering that the respondents all hold senior positions in the Gauteng Department of Education. The question here is, whether there is a lack of communication between directorates, or whether senior officials do not get the message from their subordinates concerning processing of information requests..

On the question whether certain procedures have to be followed to acquire EMIS data, 50 per cent of the respondents answered in the affirmative and 50 per cent in the negative.

The reason this question was included, as well as section 3 dealing with EMIS policy and practice, was that the researcher worked in the EMIS unit from 1998 to 2000, and the unit was in the process of developing a draft EMIS policy and practice document that would outline the following issues:

- The definition, purpose, and fundamental components of EMIS
- Procedures for acquiring information (to name but a few).

As mentioned above only 20 per cent of the respondents have come across the document and have read it.

EMIS performance

The table below shows the respondents scores in terms of the quality of information provided by the EMIS units. Forty per cent of the respondents indicated satisfaction and thirty per cent was very satisfied with the quality of the information.

Table 2: Quality of Information

	Frequency	Percent
Dissatisfied	1	10.0
No Opinion	1	10.0
Satisfied	4	40.0
Very Dissatisfied	1	10.0
Very Satisfied	3	30.0
Total	10	100.0

Although the majority of the respondents were satisfied with the quality of the data there were some reservations. Those respondents who were either satisfied or very satisfied, gave the following reasons:

- Satisfied to the amount of time to react relative to the size of personnel and amount of work to be done
- Quality sometimes dubious depending on whom generated the query.
- EMIS still building analytical skills

- The information supplied is based on the requests made
- Errors do occur from time to time
- We get what we request
- Information usually available in the format required. Only raw data is requested to be analysed independently.

Respondents who were either very dissatisfied, dissatisfied or had no opinion on the quality of information made the following comments with reference to the quality of information:

- Information generally dated or not available and thus projections have to be made to use data for management decision-making.
- Turnaround times are too long
- Only comes in quarterly review format.
- Information outdated and never reconciled with the data

Timeliness of the data

As far as the perceived timeliness of the service provided were concerned, 40 per cent of the respondents were satisfied, 40 per cent were not satisfied and 20 per cent had no opinion.

Although sixty per cent of the respondents were satisfied with the overall service provided by EMIS, in terms of data collection, they were not satisfied by the support provided by EMIS in terms of in-house training, and EMIS learning about their directorates' information requirements.

Fifty per cent of the respondents had no opinion and 40 per cent were dissatisfied with EMIS in-house support. The support has to do with EMIS providing in-house training on data manipulation for those officials who need to manipulate the data themselves. It seems that no training whatsoever is provided by EMIS.

Seventy per cent of the respondents were dissatisfied with EMIS understanding of their directorates' information requirements.

Respondents believed that EMIS could support the information needs of its directorates in the following manner:

- It does by supplying demographics and some education indicators
- EMIS official responsible for ABET should work directly with one doing PALC
- Database for EMIS in ABET unit
- By providing updated SNAP (Tenth Day Headcount) statistics, ASS data (number of classrooms and all infrastructure information)
- By taking a more active role in identifying and analysing our needs to be able to support us
- Through closer working relationship and alignment of what directorates outcomes are which we need to state more directly
- By developing the policy/practice document alluded to in Question 3.1 and engaging directly with directorates around their information needs
- Increase personnel capacity, improve turnaround times, and provide more specific or detailed records or resources provided/available to schools and learners information including demographics and learner performance especially on internal results
- Liase with the Human Resources Information Systems (HRIS) sub-directorate; provide monthly reports to line managers on reportable issues

Directorate data

The following became clear in this section of the questionnaire:

Ninety per cent of the respondents received requests for information from within the department, other government departments or outside agencies or individuals. The information is supplied in Report form, electronically or hard copy or in the format requested. If the directorate does not have the information, they source it from EMIS, the Examination section or get it directly from schools.

Eighty per cent of the directorates surveyed request additional information. The sources are Statistics South Africa, the Department of Labour, the Gauteng Shared Service Centre, and PERSAL.

Ninety per cent of the respondents indicated that not enough research has been done from EMIS data.

The following comments were received in response to this:

- No funds from provincial budget; provinces rely on tools designed by the national department of education. National does analysis without being sure of verification.
- EMIS has historical data that has not been thoroughly explored, e.g. dropout/push out rates; at which level and after how many years educational investment was wasted; factors leading up to these indicators.
- Analysts in EMIS with specific interests
- Data is generally raw and provides demographic data. No reports on the analysis of the data are prepared unless requested. This is generally not adhered to due to limited capacity
- There is a wealth of information and this has not been properly interrogated to facilitate decision-making
- Attributed to lack of capacity in current unit. This is now beginning to happen. Need to integrate EMIS data into decision-making in the GDE
- HR requirement forecasts; need for substitute teachers; predictions on future learner numbers
- No longitudinal studies; data available only to a select few

The following comments were received in response to who should be responsible for conducting research. Consensus was that it should be the responsibility of the directorate and EMIS to conduct research if enough analytical capability exists within the directorates. However, the relevant directorate should outsource scientific research to capable service providers.

Database access and training

This section of the questionnaire was geared to elicit responses with regard to respondents or directorates' computer application knowledge and training needed to be able to interact with EMIS databases.

Sixty per cent of the respondents indicated that they have staff within their directorates with the ability to manipulate and analyses EMIS databases. All EMIS databases at national and provincial levels are in the Microsoft Access format. When asked staff knowledge in using software applications, the respondents gave the following results:

- Word Processing applications: 30 per cent advanced; 60 per cent working; and 10 per cent limited
- Spreadsheet applications: 10 per cent advanced; 60 per cent working; and 30 per cent limited
- Database applications: 10 per cent advanced; 60 per cent working; and 30 per cent limited

An advanced knowledge indicates a well-developed and thorough knowledge of the software application; a working knowledge indicates an ability to work with the software application but only in a basic format; and a limited knowledge indicates a beginner's knowledge of the uses of the software application.

As mentioned above, 60 per cent of the respondents indicated that their personnel have the ability to manipulate and analyse EMIS databases. Of this 60 per cent, 67 per cent have a working knowledge of the database application, 17 per cent have an advanced knowledge and 17 per cent have a limited knowledge.

The following statement was included in the questionnaire: "The personnel of this directorate/unit should be able to interact with EMIS data". All the respondents agreed with this statement. It seems that although some officials have the ability, although limited, to engage with EMIS data, it does not happen on a large scale.

Respondents were asked to rate the benefits if the following training themes:

- The role and function of EMIS in education management
- Keeping of complete, accurate and up to date records
- Calculation and use of education indicators
- Statistical analysis, interpretation and application of information
- Training in quantitative analysis

All the respondents regard this type of training extremely important for their personnel.

4.3 Findings based on the in-depth interviews

EMIS as research

There is the thought-provoking question regarding the role of EMIS relating to the disjuncture between data collection, first level information dissemination and research (namely high level analysis to produce academic papers and policy briefs).

There is consensus that EMIS ought to concentrate more on the analysis of quantitative data for the monitoring of the education system and not to dedicate itself to operational work. It is a fact that most EMIS offices nationally deal with operational data collection work and first level information dissemination, very little high level research is conducted. It is widely believed that EMIS should not just be restricted to data acquisition, but to the creation of knowledge. However, the personnel do not possess the academic background to perform enough in-depth analysis to create knowledge.

Currently the GDE has two Directorates incorporating research in their respective objectives. Policy Coordination conducts issues of research in schools, specifically addressing issues such as policy compliance, e.g. whether policies such as the Admissions Policy are implemented and adhered to at school level.

Recently a new unit, the Decision Support Unit, was created in the Education Planning division, directly accountable to the Divisional Manager. The unit will perform a strategic analytical role for the organization as a whole with a specific strategic support role to the Division: Education Policy and Planning.

The role of the unit is to integrate data from all sources, internally and externally, especially from EMIS data, PERSAL, OFSTED, and Financial data, as well as from outside agencies such as Statistics South Africa and other research agencies. The unit will carry out strategic analysis by integrating all the data, and make projections through modelling and scenario planning for the Department. This can be done through existing data or by conducting sample surveys. The unit will also assist in providing integrated data for reporting and budgeting, and will establish and maintain a catalogue of data with information on validity, reliability and sampling.

Regrettably, the Education Directorates and the EMIS unit are not jointly involved in research projects. EMIS also has the added difficulty of not having enough personnel.

Gathering of statistical information

This section focuses on the Survey process: (i) Determination of the survey questions (ii) Preparation of the survey instrument (iii) Processes of the survey including distribution and collection of the questionnaires (iv) Data capturing and cleaning (issues of ensuring of accuracy, reliability and validity of collected information) (v) Production of technical and statistical reports.

The Gauteng Department of Education has fairly been compliant to all requirements including timeframes for conducting of the survey and submission of data. There has been however a few instances where the surveys did not cover the entire sub-sector such as the ABET 2000 survey. A number of centres were not surveyed in 2000 and this impacted on the quality of the national dataset. The main reason for this is the lack of clarity on the roles of the EMIS unit and the line function, ABET directorate in this case. Traditionally EMIS see its role as that of managing surveys for the ordinary school sector and not for other sub-sectors. It is a challenge to secure support of other units in issues of data collection and EMIS units are not fully capacitated to manage data collection for the entire education system (Report on the State of EMIS in the Provinces).

EMIS conceptualises a framework to assist other directorates. Draft questionnaires are distributed to the divisions within the department. The idea behind this is that divisions should incorporate questions that will specifically suit their interests. The aim of this exercise is to customise questionnaires for the National Department of Education.

Provinces annually customise questionnaires. The National Department of Education is responsible for the final draft of the ASS questionnaire, which is then sent to provinces for distribution. This final draft contains the National core data that national expects from provinces. The process above assists provinces to add additional questions that relates to provinces specific interests.

As mentioned above the National EMIS Steering Committee meeting and national workshops are the forums where all parties, Provinces, National, and other stakeholders, contribute by giving inputs into formalising or customising questionnaires. The procedure of determining areas of inquiry is a democratic process.

The following describes the current Survey process of the Gauteng Province (illustrated in figure 3):

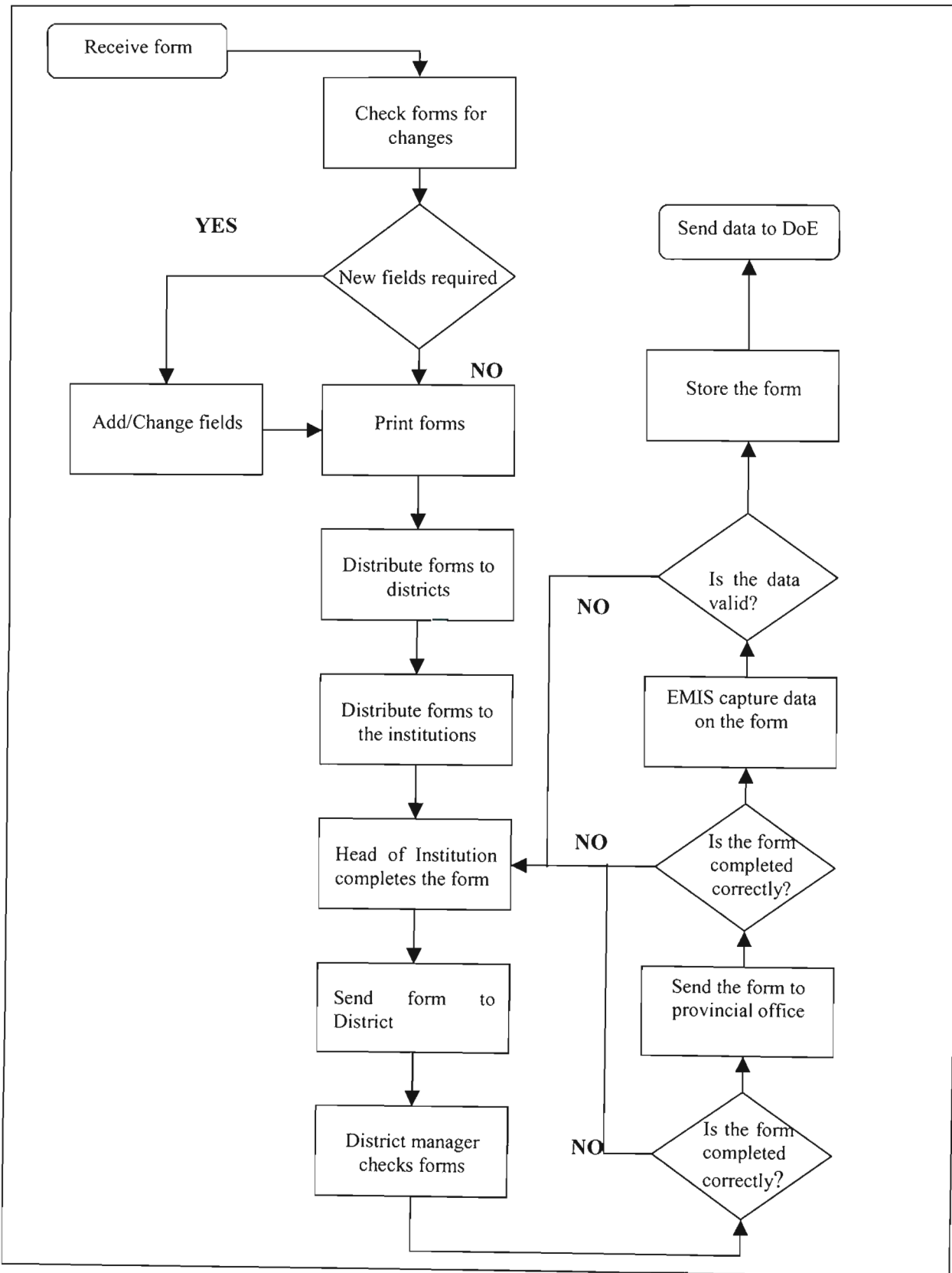
Printing of forms

- The provincial office receives a hard copy of a form and a CD containing an electronic version from the National office
- The EMIS personnel change/add the field for every survey issued due to the new policies introduces rules and regulations to meet the provinces needs and requirements.
- A private company prints the forms

Sending of forms

- The EMIS department distributes the forms to the districts.
 - The districts distribute the forms to each school
 - Each district decides the manner of distribution
 - The Head of institutions acknowledges receipt of forms
-

Figure 3: EMIS Survey Process in the Gauteng Department of Education



Completion of forms

- Heads of institutions completes and signs the form
- Heads of institutions makes a copy and sends the original forms to the relevant district co-ordinator.
- The District Manager and responsible official check and signs the form before they are sent to the Provincial office
- If any problems are encountered, the District Manager sends the form back to the school for correction
- The District Manager then sends the forms back to the Provincial Head Office.
- EMIS personnel acknowledge receipt of forms from the District Managers and check the correctness and completeness of the forms. If there are some discrepancies, with the completed forms the concerned Head of Institutions will be informed and the EMIS personnel will make the required changes.

Capturing of Forms

- Data capturers capture the information on a Microsoft Access capturing tool.
- Validation and verification are done
- Once the database is updated, the data is stored in a Microsoft Access database and a copy is sent to the National office.

Storage of Forms

- The completed and processed forms are stored at the EMIS section of the provincial office per year
- Forms are filed according to district and EMIS number.

The district officials responsible for EMIS activities are located in the Policy and Planning directorate. They form the second tier in the survey process, and are responsible for first stage validation of data. EMIS personnel at the Provincial Head office do the second stage validation, i.e. checking forms for inaccuracies. The real validation is done during the capturing process.

Once the capturing and cleaning are completed, a Statistical Output report is produced from the captured data. For the first time in 2003, the GDE EMIS designed a Statistical

Report with its own ISBN number for the annual Tenth Day Headcount survey. The output report is given the same status as a publication and contains a series of tables with text (elementary analysis). However, pressure is applied on EMIS to produce more text-based reports, and not only reports dominated by tables.

A Technical Report is also available for every database produced by the EMIS unit. A Technical Report can be regarded as a user manual for understanding a database e.g. which tables is in the database, number of records per table, how many no responses per field, etc.

Presentations were done to the district Policy and Planning officials, as well as to the Institutional Development and Support Officers. Usually EMIS is accused of not giving proper feedback to its district colleagues and schools, and this process was an attempt to remedy this situation. The Annual School Survey on the other hand is quite a huge survey, and takes approximately 9 months from the printing of forms to the creation of a statistical report. Consideration is also given to perhaps change the format of the report.

Verification procedure:

Occasionally in the past, the GDE has done verification visits to schools. The verification of survey data means that a sample of the survey data is physically verified at the source, which in this case is at a few selected schools. The purpose of the verification procedure is to establish whether the schools have effectively and honestly completed the survey instrument. Obtaining accurate learner numbers is regarded as strategic information for the Gauteng Department of Education (GDE), and any irregularities with regard to this are deemed fraudulent.

Methodology of Verification Visits

A stratified random sample of 2 or 3 per cent of the institutions is drawn. The purpose of this sampling methodology is to make the sample representative of the population in terms of the districts in which the schools are located and the types of schools in the province.

Officials representing the Head of Department will visit any school or centre of learning to verify information in connection with the affairs of the school or centre of learning. Head Office officials and District officials will conduct these verification visits. The relevant GDE officials will conduct their visits according to a clear outline:

- 1) The officials will, through discussions with the Principal and Educators, establish the correctness of learner numbers;
- 2) Any document (e.g. class registers and class lists), book or article relevant to the verification procedure will be examined and copies will be made if necessary;
- 3) Moreover, visual monitoring will be used to establish the accuracy of basic school information (e.g. number of classrooms). Verification visits will typically take one to two hours.

Mandating Acts:

- Gauteng Schools' Education Act, Act 6 of 1995, Sections 9 and 10.
- South African Schools' Act, No. 84 of 1996, Section 59.

(According to these Acts, the Department of Education may record or collect all relevant information from schools relating to education in the Province.)

A circular, accompanying the survey questionnaire, is distributed to schools, outlining the purpose of the survey, the submission date, and the verification procedure. Due to a lack of personnel and the accompanying pressure on EMIS to conduct surveys, this process of verification has been neglected. However, the EMIS unit intends to continue this verification process once the unit is at full capacity.

Once the survey process is completed, a submission is forwarded to the Chief Executive Officer (CEO) of the GDE sanctioning the sealing of the database. The CEO is the only official with the authority to seal databases. If survey forms are received at a later stage, it is captured in another database with the “additional” designation.

EMIS personnel

Table 3 shows the current number of professional staff in the GDE EMIS unit as well as the proposed staff complement according to the GDE organogram. The Education Labour Relations Council (ELRC) placed a moratorium on the filling of posts at the beginning of 2002. The intention of EMIS is to fill all vacant posts in the unit as soon as the moratorium is lifted.

Table 3: EMIS Personnel

Designation	Current	Proposed
Chief Research Specialist	1	1
Deputy Chief Research Specialist	1	6
First Education Specialist	3	4
Statistician	0	1

One of the strengths of the EMIS unit is transforming new recruits into fully-fledged data analysts and data miners within a period of 2 years. This period is regarded as a gruelling experience due to its influence on Human Relations within the unit. The whole EMIS experience is time consuming and intensive. New recruits are literally thrown into the deep end. One survey follows the other and personnel are responsible for surveys, creating statistical reports, as well as statistical analysis, depending on the requests of internal and external clients. Apart from this personnel also has to attend training courses organised by the provincial and/or national EMIS units. These courses include generic courses such as the Microsoft Office applications (Access, Excel, Word, PowerPoint) and EMIS courses that are of a more specialised nature. Experience gained on the job through the assistance of more experienced colleagues is invaluable.

Table 4 shows the number of staff who have entered and left the unit since 2001. The three Deputy Chief Education Specialists were in the unit as First Education Specialists and were subsequently promoted. One left the department and the other has taken up a more senior position within the GDE in the Decision Support Unit mentioned above.

A statistician was appointed in the EMIS unit but has left the department. The main reason was that the job description and specifications were vague, leading to confusion as to what the role of the statistician is in the EMIS unit.

Table 4: EMIS Personnel Retention

Designation	In	Out
Deputy Chief Research Specialist	3	2
First Education Specialist	3	0
Statistician	1	1

The biggest challenge that would face the Gauteng Department of Education is securing and retaining qualified personnel in the area of information management. There is intense competition for qualified personnel with the private sector and non-governmental organisation. The private sector salaries are highly attractive compared to what government would offer. Although this impact has not really hit the GDE, it is a serious challenge that government departments are faced with. In the past three years there has been a few staff losses but there is stability at management level. GDE does not use full-time data capturers as part-time capturers are employed and the procurement process has been smooth without negative impact on the operations. It has to be noted however, that the current staffing complement may not be sufficient for optimal and efficient management of EMIS and to meet future demands and it does need to be improved (Report on the State of EMIS in the Provinces).

Information and communication technology

Hardware and equipment

The hardware and software infrastructure is sufficient and there have been ongoing improvements. There were no difficulties reported by the EMIS unit head with regard to hardware. The department is ready for the implementation of the Electronic Data Capturing system and implementation will continue as planned (Report on the State of EMIS in the Provinces).

Software applications

- Microsoft applications: Access, Excel, Word, PowerPoint
- Statistical Package for the Social Sciences (SPSS)
- Geographic Information Systems (GIS) ArcView 3.1
- Sophisticated Optical Character Recognition (OCR) equipment and software (recently delivered)

The EMIS personnel are all extremely proficient users of the Microsoft Office applications. These are used in the daily activities of the EMIS personnel. MS Access is the relational database management system used to perform management tasks, such as storing, retrieving, and analysing. The EMIS unit uses the MS Access form function to create a capturing tool for the capturing of questionnaires. MS Excel is the spreadsheet of choice used for analysis of information prepared in MS Access. All reports are prepared in MS Word and presentations done using MS PowerPoint.

SPSS for Windows is a statistical analysis and data management computer system. It allows the user to summarise and analyse data using tabulated reports, charts, descriptive analysis, as well as complex statistical analysis. The data analysis conducted by EMIS members for internal and external clients does not require the analytical capability of SPSS. As mentioned above elementary analysis is done in MS Excel. EMIS does not have a qualified statistician.

Optical Character Recognition (OCR)

From July to September 2003, the OCR system was installed in all 9 provinces including the National Department of Education. A technician has been on the site full time for the first three months until the end of September and will thereafter be on call as needed by the province.

The aims of implementing the OCR system is to achieve the following:

- To ensure that the turnaround time from the distribution of forms to the collection of required data is improved

- To ensure that the data collected is correct and not corrupted during the capturing process
- To ensure that the EMIS units only concentrate on their supporting role activities
- To ensure timeous delivery of up-to-date information for decision-making purposes
- To ensure that efficiency, productivity and client service delivery is improved.

The key users of the OCR system will be data capturers, and not permanent EMIS personnel, who were trained to operate the system. In some provinces, such as Gauteng there are no permanent data capturers. This resulted in the province nominating personnel who will handle the scanning of documents until people are appointed to take over this responsibility. The appointment of permanent data capturers in Gauteng is under consideration.

The majority of schools in South Africa do not have computers, or a network infrastructure. The process of collecting data, which is manual, is very time consuming and the quality of data collected is affected during the capturing process. It was perceived by the National and Provincial Departments of Education that the use of electronic data capturing systems would improve efficiency, productivity and public service delivery as it would lead to fewer people conducting the survey process faster and quality assurance guaranteed throughout data processing.

However, according to the EMIS manager, the OCR system did not work as it was intended to. The system is technically functional as a solution but the province still has to revise its applications to use as a solution. The capturing of the ABET survey, pilot project, did not reduce the turnaround time of the survey process. The OCR system as a capturing tool is convenient for small surveys, such as the annual Tenth Day Headcount survey, approximately 3 pages.

The EMIS unit is not disappointed with the system. The OCR system will be used for research purposes, e.g. to establish how best the system can be applied in the unit.

Value Chain

The GDE sent its office-based officials on training courses such as Excel and Word in 2001/2002. However, the directorates, with the exception of Curriculum, do not yet have the personnel with the ability to access the EMIS databases and run their own queries. Much of the information required by internal users is requested from EMIS. Every person within the provincial head office and district offices has access to a computer, linked to the GDE Intranet via a Local Area Network or Wide Area Network.

This enables every departmental official to gain access to EMIS data sets on the EMIS server. An EMIS data set consists of a database in MS Access, a Statistical Report, Technical Reports and any other documents relating to that specific survey. These data sets contain databases and reports from 1996 to 2002, and now 2003.

The procedures to access the EMIS server and the data sets were workshopped within the GDE. EMIS also provides hardcopies and electronic copies of the document containing the procedures to access its datasets on the server.

EMIS does not currently have specific EMIS software but uses the standard Microsoft software in its daily operations. Although the majority of schools in Gauteng have computers, these are used mainly for administrative and to a lesser extent training purposes. The survey process in the province is still manual. The EMIS unit has looked at Education Solutions to be used at school level that will also have the ability to link the schools to the district and head office in one Management Information System. A submission to this effect was put forward to Senior Level.

4.4 The Availability of Computers at Schools

This section provides a glimpse at the number of schools that have computers and the purpose of these computers, i.e. the usage of these computers at the school. It would also mention whether the schools have computer rooms or laboratories. This study is drawn from the 2002 Annual School Survey for ordinary schools and has taken into

consideration public schools only. The inclusion of this section is to have an idea of the integration of ICT in schools, which form an important component in the EMIS value chain.

Availability of Computers

The number of public ordinary schools (POS) that completed the relevant section on computers in the survey is 1838, of which 1059 schools indicated that they have computers for administration purposes, 421 use computers in the media centre or library and 591 schools have indicated that the computers are used for teaching purposes, either for instruction or for computer studies (316 schools use their computers for computer studies) (Sujee, 2003). The distribution of schools with computers for teaching is skewed when disaggregated by former departments. Table 5 illustrates this inequality especially with regard to the use of computers for teaching and learning. More than 70 per cent Ex-TED schools use computers for teaching purposes and this indicates that a large number of learners enjoy the usage of computers in this former department whilst only 12 per cent (129 out of 1111) Ex-DET schools use computers for teaching and learning.

Table 5: Percentage of schools with computers according to usage (by ex-department)

Ex dept	Admin %	Media %	Computer teach %
DET	40	4	12
TED	89	62	74
HOR	71	10	27
HOD	82	46	51
GDE*	50	7	10
GP	58	23	32

* GDE – new schools established after 1994

Source: Sujee (2003)

Table 5 provides an indication that large numbers of schools have computers for learners to use. Specialist rooms have been created to provide computer-training classes for learners which may function as computer rooms or laboratories.

Computer Rooms/Laboratories

Table 6 shows the number of Public Ordinary schools with computer rooms in Gauteng. One third of schools (680) have indicated that they have permanent structures as computer rooms /laboratories and a further 15 schools indicated that their computer rooms are prefabs and construction of computer rooms is underway at five schools (Sujee, 2003).

Table 6: Number of schools with computer rooms (by Ex-Department)

Ex dept	Computer rooms permanent structure	Computer rooms prefabricated	Computer rooms under construction	Number of schools * *
DET	203	5	5	1118
TED	399	6	0	550
HOR	25	2	0	78
HOD	45	1	0	59
GDE*	8	1	0	42
GP	680	15	5	1847

* GDE – new schools established after 1994

** Number of schools that completed this section of the form

Source: Sujee (2003)

A substantial number of schools (695) have indicated that they have some form of computer room. This can be regarded as a true reflection of the situation especially when the number of schools that offer computer classes is also taken into consideration. Over 590 schools have indicated that they have computer classes. Of this 590 school, 319 are offering computer studies as a subject at their schools.

The 2002 Annual School Survey also reveals that only 493 (27 per cent) of POS have Internet access, and 305 (17 per cent) of POS have e-mail facilities.

GautengOnline

The GDE has committed a considerable amount of capital over three years and enlisted the support of six computer companies and Microsoft in an ambitious project to provide all school in the province with computer hardware, software and skills by 2006. The government will contribute connection to the Internet, secure buildings, electricity support and equipment upgrade for the project. Once completed the project will provide

about 2 500 schools with 25 computers each and will result in learners and educators having access to e-mail and Internet.

The programme aims to build on systems already in place in a number of schools, many of which are connected in a networking environment. Training is an important part of the agenda, embracing a strategy of training educators and entering into partnerships with higher educational institutions.

The important aim of the project is to create a networked schooling system capable of harnessing the full power of IT to address the many challenges facing education. Another goal is to ensure significant improvements to the administration systems and management information systems used by our department. The province's IT strategy will eventually bring every provincial department online. GautengOnline will be integrated with Gauteng's education system initiative, involving the development of a single, web-based administration and management system spanning schools and department offices. It will also be integrated with other government initiatives.

CHAPTER 5

Conclusion and Recommendations

The activities associated with the establishment and maintenance of an Education Management Information System (EMIS) are labour-intensive and costly. EMIS is making gains in improving the availability, relevance, and timeliness of data about the education system. Improving the information available to decision-makers has not always led to better decisions or better practice. Where information systems have been implemented, the flood of new information has often served to clog up the system, not streamline it. There is a growing concern that the promise of information systems will not be realised unless more thought is given to ways of improving information flows connected to better practice at the school-level, where the real activities of education occurs (Chapman and Mähle, 1993).

As the school system is becoming increasingly devolved so is the source of information. In centralised systems, the source of information is often at the centre. One principle of a good information system is the processing and analysing of data at the source. This would be able to remedy any dystrophy at the ground level where the problem occurs. The South African School Act (SASA) confers on the school community and in particular the school governing body to ensure that it is able to monitor the education and to improve the quality of education at the school level. SASA devolves policy-making functions to the school and thus schools need to have information available to manage and govern the school (GDE, 2000).

Schools need to be assisted in developing school based operational systems that also provide strategic information for policy making, for resourcing, for planning and for delivery. Schools would thus require three types of information systems: (1) School management information systems (2) School governance information systems and (3) Parent information systems. In order for these information systems to work effectively one has to combine them with knowledge systems. Thus, a parent will be able to make a judgement about a school comparing the position of the learner relative to other learners in the class, in the grade, in the school, in the province.

The use of information also calls for the capacitating of users in being information literate. They need to be trained in the use and interpretation of information. EMIS directorates also need to be trained in the preparation of relevant information for consumers. The same information should be packaged differently for different users and uses. Information systems should not be created for the sake of information, but should be inherent in the operations of the systems to be of value. Thus there is need to ensure that the system re-engineered or engineered for operational reasons and that in the engineering process one would build in “management information systems”.

Clients and Data use

A major impediment to the use of data is the concern of potential users about the quality of data available to them. The study has shown that the majority of the respondents were satisfied by the quality of the data, although some had misgivings. A priority in improving data use is to assure potential users that the data are reasonably accurate. A general design is to audit the consistency in the data that are recorded for the same school at each level of the education system, from school, through district education offices, to the provincial ministry. This can be expensive, since it generally involves site-visits to a sample of schools and district offices to review records. Chapter 3 gives a clear description of the verification procedures previously performed by the EMIS unit, but due to a lack of personnel this process has been dormant.

Studies of data quality need to be combined with a consideration of data flow, since problems in flow are often the sources of the quality problems. Too often, South Africa included, head office personnel attribute low data quality to recording and reporting problems in the schools. More careful study frequently suggests that problems in transmission across levels or units of the ministry account for many of the problems encountered. The survey process mentioned in Chapters 2 and 4 indicate that school data are manually summarised (captured) at the provincial head office. This in itself can lead to numerous problems. More intensive studies of data flows need to be undertaken to identify the types of problems related to collection and transmission of data from the

school to the ministry, and the flow eventual summaries and results from the ministry back to the school.

Strategies to shift the locus of educational authority and data use

If the local participants become more directly accountable for the effectiveness of local education, they will face strong incentive to become more active in the collection and analysis of educational data. While greater accountability increases the desire of local decision-makers to become involved in data use, the provision of training and technology will allow them to develop an effective capacity for such involvement. The training necessary need not be extensive. It is not required that the local decision-makers become statisticians or educator indicator specialists; what they must possess is an appreciation for the proper use of educational data and the administrative skills to ask for and interpret the educational data useful to them.

Capacity development should be a key criterion. Training and technology development should have the goal of long-term sustainability. The data use system should build on experiences. This implies providing training to those who will be involved in data use and retaining the personnel experienced in data use from year-to-year.

Affordability also must be a prime consideration for sustainability. An excellent but expensive data collection exercise that cannot be replicated is less valuable than the establishment of a recurrent data exercise tied directly to local decision-making applications. The decentralisation of data use must be fiscally realistic to be sustained and must be sustained to be educationally effective.

Encouraging data-based management

Senior Managers or political leaders can greatly advance the rate of local data use simply by demanding that, wherever possible, the local educational personnel present data support for their arguments. This does not imply that only quantitative data be used or that data alone can resolve the issues being debated. Data can help identify and characterise the issues and allow administrators to compare alternative solutions.

It is not enough for senior administrators to request data. They must themselves be able to ask the correct questions and make judgements about the propriety of data presentations and interpretations. They need to know the strengths and the weaknesses of the data being presented.

Requiring data use at the local levels can be achieved by establishing standards for local reports and for justifications for requests for personnel, facilities, equipment, and instructional materials, etc. This will require local administrators to obtain and preserve the most supportive data that can be developed.

Requiring detailed educational indicators

If each local unit is required to create and maintain a set of indicators of educational access, process, attainment, and outcomes, the local personnel will develop both sensitivity to the value of educational data and a capacity to monitor and apply the results of the data exercise.

EMIS personnel

It has become obvious from the research and literature review that EMIS is understaffed in many of the provinces, Gauteng included, and that these units are under immense pressure to perform the functions attributed to EMIS. It is also evident from research conducted (Chapter 4) that EMIS officials do not have the background or training to do qualitative research. More than ever before, planning is becoming a job for a full team capable of performing various tasks in research, planning, strategic analysis, negotiations, communications, and obviously technical operations. The Gauteng Department of Education is addressing this problem by establishing the Decision Support Unit, which will incorporate the functions of a research unit.

Planners need to assist decision-makers at all levels of an education system to articulate important policy related questions, and to design the format and scope of the data collection and analyses that must be conducted to deliver appropriate information. To

achieve this planner must be closer to the action, more pragmatic, and more operational (Hallak, 1990).

Information and ICT

In most cases, more information is collected than actually analysed and applied toward decision-making. EMIS reform should focus first on information that directly informs priority decisions.

For educational statistics at a District level or above, the minimum standard for information is this year's information, this year. Put information into the hands of people who can use it and quickly. The implementation of the Optical Character Reading (OCR) software in Gauteng and other provinces was exactly to remedy this situation, as discussed in Chapter 4. However the implementation of new forms of ICT might not be the solution to existing problems. It seems that there is still a lot of research to be done around the new OCR solution. Too many overly complex and difficult to sustain EMIS systems have been developed because of the goal of perfection, when what the Ministry needed was a good system (Moses, 2001).

Decentralised systems will need to establish standards, monitor their implementation and insist upon their use. Standards will also be needed to ensure that the national ministry or organisation can be effective, well-informed advocate for national educational needs and goals.

The World Wide Web will become the key tool, both internally and externally, for the generation, exchange, and even processing of administrative information. Virtually all-existing systems even in emerging countries will need to be converted to operate on the Web. Administrative use of the World Wide Web will also be aided by increasing use of the Internet for support of instructional material and aides to learning improvement. This offers remarkable synergies for learning and monitoring on a massive, efficient and affordable scale.

Software is just part of the process of building an EMIS. One of the measures of success will be when users start demanding more from the system because their original expectations are being met and they expect more. Accordingly, a potential successful EMIS should have a built-in mechanism for evolution and growth.

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