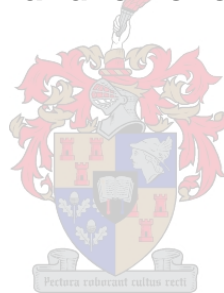# The Education Management Information System of the Free State Department of Education
- *a systems analysis*

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Thesis presented in fulfilment of the requirements for the degree of
Master of Philosophy (Information and Knowledge Management)
in the Faculty of Arts and Social Sciences
at Stellenbosch University

DECLARATION:

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

DATE: 15 February 2011

Opsomming

Organisasies is afhanklik van die beskikbaarheid van betroubare en geloofwaardige inligting ten einde ingeligte besluite te neem en effektief te beplan. Die Onderwysbestuursinligting-stelsel (EMIS) word deur al die provinsiale onderwysdepartemente gebruik, insluitend die Vrystaatse Onderwysdepartement, vir die versameling, verifiëring, analise, berging en disseminasie van betroubare en geloofwaardige data vir die doeleindes van besluitneming en beplanning. Deur sy pogings om inligtingbestuur te verbeter, het die Departement van Basiese Onderwys die Suid-Afrikaanse Skoolbestuurstelsel (SA-SAMS) ingestel om die bestuur van data op skoolvlak te verbeter en om voorsiening te maak vir die oordrag van hierdie data na provinsiale databasisse. Hierdie studie fokus op 'n analise van die Onderwysbestuurs-inligtingstelsel om vas te stel of hierdie stelsel, wat deur die Vrystaatse Onderwysdepartement gebruik word, betroubaar en geloofwaardig is, al dan nie. Ten einde die navorsingsvraag van hierdie studie te beantwoord, is die dimensies/konstrukte van die sukses van inligtingstelsels, soos inligtingskwaliteit, stelselkwaliteit, individuele en organisatoriese impak, gebruik om die betrokke inligtingstelsels te evalueer. Hoofstuk 1 lei die onderwerp in en verstrek die agtergrond en aanspreeklikheidsketting van die Vrystaatse Onderwysdepartement. Hoofstuk 2 behandel die teoretiese begronding. Die onderwerp Inligtingstelsels word bespreek, veral die kriteria wat gebruik word om die doeltreffendheid en betroubaarheid van 'n onderwysbestuurstelsel in die Vrystaatse Provinsie te bepaal. Met die teoretiese basis wat in Hoofstuk 2 uiteengesit is as vertrekpunt, fokus Hoofstuk 3 op die Vrystaatse Provinsie om die EMIS te modelleer en om die deurslaggewende elemente waar empiriese waarnemings nodig is, te identifiseer. In Hoofstuk 3 is die fokus op die versameling van empiriese data, gebaseer op die model wat in Hoofstuk 4 beskryf word. In hierdie hoofstuk word die metodologiese vraagstukke met betrekking tot die versameling van data in besonderhede behandel, en die bevindings word aangebied. In Hoofstuk 4 word die implikasies van die bevindings gestel teenoor die kriteria wat in Hoofstuk 2 geïdentifiseer is, en gevolgtrekkings word gemaak. Laastens word in Hoofstuk 5, gebaseer op vroeëre bevindings, die lesse wat uit hierdie navorsing geleer is, aangebied, gevolgtrekkings word gemaak, en aanbevelings word voorgehou as die pad vorentoe om leemtes wat in die Vrystaatse EMIS geïdentifiseer is, te verbeter. Dit is die navorser se ingeligte gevolgtrekking dat EMIS, deur die gebruik van SA-SAMS, die vaslegging van data op skoolvlak verbeter het, en dat dit bygedra het tot 'n verbetering van die kwaliteit van data in die provinsiale databasis.

Summary

Organizations depend on the availability of reliable and credible information to make informed decisions and to plan effectively. The Education Management Information System (EMIS) is used by all provincial education departments including the Free State Department of Education for collecting, verifying, analysing, storing and disseminating reliable and credible data for decision making and planning purposes. Through its efforts to improve information management, the Department of Basic Education introduced the South African School Administration Management System (SA-SAMS) to improve the management of data at school level and allow for the uploading of this data onto provincial databases. This study focuses on an analysis of the Education Management Information System to determine whether this information system, utilised by the Free State Department of Education, is reliable and credible or not. In order to answer the research question under study, the dimensions/constructs of information systems success, such as information quality, system quality, individual and organizational impacts have been used to evaluate the information systems under investigation. Chapter 1 introduces the topic and outlines the background and the accountability chain of the Free State Department of Education. Chapter 2 deals with the theoretical grounding. It discusses the topic of Information Systems, in particular what the criteria used to determine the efficiency and reliability of an education management system in the Free State Province are. Chapter 3 draws on the theoretical base outlined in Chapter 2, focussing on the Free State Province to model the EMIS system and identifying the crucial elements where empirical observations are necessary. In Chapter 3 the focus is on the empirical data collection based on the model as set out in Chapter 4. In this chapter the methodological concerns in respect of the collection of data are dealt with in detail, and the findings are reported. In Chapter 4 the implications of the findings are weighed up against the criteria as identified in Chapter 2 and conclusions are drawn on that basis. Lastly Chapter 5, which draws on earlier findings, presents the lessons learnt in doing this research, conclusions drawn therefrom, as well as the recommendations presented as a way forward to improve the gaps identified in Free State EMIS. The researcher's informed conclusion is that EMIS, through the use of SA-SAMS, has improved the capturing of data at school level and that this has contributed to an improvement in the quality of data contained in the provincial database.

Acknowledgements.

FIGURES

TABLES

ACRONYMS

ABET :   Adult Basic Education and Training
BAS   :   Basic Accounting System
ELSEN: Education Learners with Special Education Needs
EMIS :   Education Management Information System
FSDE :   Free State Department of Education
GET: General Education and Training Band
GIS   :   Geographic Information System
HEDCOM: Heads of Education Committee
HTML: Hyper Text Markup Language
ICT   :   Information and Communication Technology
IS   :   Information Systems
IT: Information Technology
LOGIS: Logistical Information Systems
LTSM :   Learning and Teaching Support Material
LURITS: Learner Unit Record Tracking System
NEMIS: National Infrastructure Management Information System
ROI: Return on Investment
SA-SAMS: South African School Administration System
SISP: Strategic Information Systems Planning
SMGD :   School Management and Governance Developer
WAN: Wide Area Network

TABLE OF CONTENTS

Chapter 1   EMIS and the Free State Department of Education

Chapter 2   Criteria for an appropriate Education Management Information System

Chapter 3   A systems analysis of the Free State EMIS

Chapter 4   A systems evaluation of the Free State EMIS

Chapter 5   Conclusion and recommendations

APPENDICES

Chapter 1

EMIS and the Free State Department of Education

1.1   Research question

The focus of this thesis is the question of how effective and reliable the EMIS system is in the Free State Department of Education.

In order to answer the above question it is necessary to investigate the following:

- the alignment of information systems with departmental goals.

- the departmental means to measure the effectiveness and reliability of its information systems.

- the different kinds of information systems available to the Free State Department of Education.

- levels of integration of information systems.

- systems control and integrity.

- dissemination of systems information.

In order to understand the magnitude of the research question, it is necessary to provide an overview of the department and the challenges which the implementation of such a system faces.

1.2   The Free State Department of Education

The Free State Provincial Government, of which the Free State Department of Education (FSDE) is a part, is divided into five districts which are geographically dispersed. These districts form the Education districts of the Free State Department of Education. The Free State Department of Education: EMIS Statistical Report[1] revealed that the Free State Department of Education serves 622 785 learners and 22 345 teachers from 1494 schools.

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[1] Free State Province. Department of Education. EMIS Statistical Report. 2010

The number of learners, educators and schools per district as reflected in the Department of Education, EMIS Statistical Report[2] is indicated below:

- *Xhariep* – The south-western district which consists of small rural towns. It contains 83 schools, 30644 learners and 1156 educators

- *Motheo* – The central district that includes Bloemfontein, Botshabelo and Thaba Nchu and which consists of 334 schools including farm schools, 188620 learners and 6780 educators

- *Lejweleputswa* - An important agricultural and goldfield area, consisting of 297 schools including farm schools, 139597 learners and 5125 educators.

- *Thabo Mofutsanyana* – The eastern district considered to be the poorest part of the province, consisting of 506 schools including farm schools, 185367 learners and 6705 educators.

- *Fezile Dabi* – The northern district which consists of 274 schools including farm schools, 111882 learners and 4103 educators.

Onderwysbestuursinligtingstelsel The aforementioned statistics include public and independent schools but exclude ABET Centres, Early Childhood and Development Centres and Further Education and Training Colleges. Amongst the challenges facing the Free State Department of Education is the huge infrastructural challenge that most schools are experiencing. For instance, according to School Realities[3] statistics, 41 % of schools in the Free State do not have electricity and 41 % do not have access to telecommunication facilities. The upshot of these deficits is that the efforts to roll out the Education Management Information System in all schools to ensure an integrated information system in the country may be at stake.

The FSDE's strategic priorities are derived from the government commitments relevant to education and these are mandated nationally and provincially. As a public service organization, the FSDE is mandated by National and Provincial government to contribute to the overall strategy of the Free State on the priority to invest in the development of people[4]. Like any government department it is mandated by legislation and policy frameworks to

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[2] Free State Province. Department of Education. EMIS Statistical Report. 2010.p.3

[3] School Realities. 2008.

[4] Free State Province. Department of Education. Annual performance plan, 2007/08-2009/10

deliver its mandate. For instance, the National Department mandates the department through policies and has to ensure that such policies are implemented. In response to this mandate, the Free State Department of Education, developed its own vision and mission statements which are presented below:

- Vision: To be a Department that strives to ensure progressive realization of universal schooling, improving quality of education and elimination of disparities amongst Free State citizens.

- Mission: To provide an education system that is free, compulsory, universal and equal for all children of the Free State.

The Free State Department of Education is expected to report and account to parliament and to the public on how the resources allocated to the department have been utilised in a cost effective manner through constitutional and legislative frameworks. Having an effective Education Management Information System will assist managers to gain access to appropriate information in order to make informed decisions and respond to new policy demands. An effective information management system is also driven by the value of producing complex information about educational processes and outputs, resource utilisation, the effectiveness of new learning techniques and the responsiveness of existing provision.[5]

In order to achieve its mandate, the Free State Department of Education is accountable to the National and Provincial priorities relevant to education[6]. The department reports its achievements to the Provincial Executive Council of the Legislature, the Portfolio Committee on Arts, Culture and Education, the National department and other government structures that are interested in the delivery of quality learning and teaching in schools. The department makes provision in its strategic plan to include strategic objectives as well as performance measures and targets thus realizing the objectives of the Provincial and National priorities. This strategic plan is aligned with the annual performance plan of the department. The annual performance plan is revised annually whilst the strategic plan is revised after five years to respond to the new priorities of the government. An analysis of the annual performance plan of the department, which is linked with the strategic plan, shows a gap in the capturing of strategic objectives because the goals of the National Education Information Policy of 2005 are not captured in the strategic plan or the annual performance plan of the department. For

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[5]Trucano, M. 2006a.

[6] Fox, W, Schwella, E and Wissink, H. 1991.

instance, the 2006/07 -2008/9 annual performance plan indicates the implementation of information systems in schools through a performance measure which states that "*the percentage of schools implementing School Administration and Management System*" appears in the Appendix of the Annual Performance Plan 2006/7 -2008/09. The annual performance plan with revised targets is updated annually. The annual performance plan for 2007/08 - 2009/10 has not captured this performance measure. Also, amongst the information systems mentioned to monitor programmes, Education Information Systems (EMIS) is listed with other information systems in the department e.g. Basic Accounting Systems, Logistical Information Systems and Personnel Salaries Systems. Though EMIS is listed in the strategic plan of the department, there is no indication of performance targets. This is surprising, given that BAS and LOGIS have been included in the annual performance plan with targets. Like any public service organization, the Free State Department of Education operates within very tight budgets and must ensure that it achieves its unique role of ensuring the satisfaction of public interests irrespective of challenges faced. The chain of accountability that the department is accountable to, illustrates a system operating within a wider system. The huge sums of money that are consumed in providing education to South Africans compel the accounting officer of the Free State Department of Education to account to the public on how the allocated resources have been utilised. This calls for an effective information management system namely, EMIS, that will monitor and evaluate the education system and provide information for improving planning and optimising use of allocated resources. An effective information system will enhance the flow of information from the department through to its stakeholders.

1.3   EMIS: Education Management Information System

According to Wako[7], the Education Information System is a concept imported from the business world that is used to process information to ensure effective management of education. Khan[8] believes that the Education Management and Information System is an organized method of providing educational management with information for decision making when it is needed in a form that stimulates action. Khan[9] is also of the view that EMIS data comprises not only statistics but includes all sorts of data which must be credible,

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[7] Wako, TN. 2003.

[8] Khan, Q. 1996.

[9] Khan, Q. 1996

verifiable and professionally certified by an independent authority whose integrity is accepted by all. Along with this opinion, Trucano[10], also observes that

"EMIS in the past has been responsible for providing information on education inputs such as the number of schools, enrolment levels and number of teachers. However, as a result of a recent drive towards increased transparency, combined with the need to demonstrate value for money, information systems are increasingly required to produce more complex information about educational processes, outputs, resource allocation, the effectiveness of new learning techniques and the responsiveness of the existing provision."

The White Paper on Transformation of the Public Service[11] views information systems as strategic and costly resources that were not fully deployed by the previous dispensation to promote information sharing and efficient monitoring and revision of public sector programmes. Supporting this statement, Gupta[12] contends that information systems are used as a tool for building successful organizations by helping firms to improve customer relations and provide better decision making. This means that the public service administration requires all government departments to deploy effective management information systems in order to provide reliable statistics and promote accountability to the public. In order to do this effectively, reliable and current data must be accessible to all stakeholders at the click of a button. The creation, capturing, storage, retrieval and transfer of this knowledge is critical for the department to be a learning and innovative organization. Heard and Badcock-Walters[13] acknowledge that data is used to improve planning and reporting, to measure , monitor and evaluate, to identify trends, to show the extent of the impact, to predict or project trends and scope and support advocacy. Explaining the background to EMIS development, Patel[14] stated that the Education Management Information System (EMIS) is the information system which materialized in South African Education to bring about improvement in information disparities which existed prior to 1994. EMIS objectives include, amongst others, promoting the development and operation of education and training management information systems for accountability (how many learners there are, are all there that should be there in terms of the population), planning (learner numbers are used for allocation to provinces, these must be

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[10] Trucano, M. 2006a. p.7-8.

[11] Draft White Paper: Transformation of Public Service. 1995.

[12] Gupta, U.G. 2000.p.4

[13] Heard , W. and Badcock-Walters, P. p.5.

[14] Patel, F. 2007.

correct, so as to prevent overfunding and underfunding) and monitoring to achieve quality and ensure effective service delivery within the national education system. The output from EMIS assists provincial and national departments to plan effectively and make informed decisions. EMIS therefore needs to take the needs of the customers into account. Linking EMIS objectives with strategic goals of the department is crucial as it is a sub-system that will assist the department in planning. For instance, other than looking at the collection of data related to learners, teachers and curriculum, EMIS must consider looking at the critical areas that will assist the department in planning. It must gather information related to the following: the distribution of textbooks, identification of areas where shortages may exist, the analysis of results per subject or Learning Area, establish the number of learners participating in feeding schemes, learners participating in the transport initiative of the department as well as the National School Nutrition programme. This information is vital for the management of the department to make informed decisions and planning. Such information is valuable when the department is developing its strategic plan or the annual performance plan where targets and performance measures are clearly stated. EMIS information is also valuable for the reporting and monitoring of the performance of the department, thus it is crucial that the department acknowledges the important functions performed by EMIS. Failing this, the system will direct the allocation of resources incorrectly.

Information systems are the lifeblood of any organization - and the Free State Department of Education is no exception – and function toward the management of critical data, planning and decision making. According to Bulling[15] , there has been an absence of detailed centralised information in the past. The introduction of the newly developed SA-SAMS (South African Administration Management System) is able to provide standards for all school data and school administration systems at ground level. Bulling further added that a system known as NEIMIS (National Education Infrastructure Management Information System) exists, whose function is to store data on the infrastructure of all schools. With these information management systems in place, the Department of Basic Education, as well as Provincial Education departments including the Free State Department of Education, are able to make available credible and reliable information for planning purposes. To assist in learner tracking, the Department is also in the process of rolling out Learner Unit Record Information and Tracking System (LURITS). Bulling stated in his address that LURITS will be fully populated by 2011. The Free State Department of Education has already started with the roll

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[15] Bulling, P. 2009, p. 18.

out of SA-SAMS, a project which was kick-started in 2007 with advocacy to all stakeholders. Bulling 16 noted further that public schools in the province are now implementing SA-SAMS whose prime function is to assist schools with a fully integrated computer solution containing all aspects of school administration. In support of Bulling's data, Kok[16] maintained that the Free State Department of Education has increased its efforts in implementing SA-SAMS in schools since 2007 and has successfully achieved the roll out of SA-SAMS in all public schools.

Officials from different directorates, districts and schools find it difficult to access the knowledge base of captured, analysed and stored information for planning and decision-making purposes because of the geographically dispersed location of districts and schools coupled with poor technological infrastructure. This problem is compounded by a failure to understand the interdependency between information technology, human resources, organizational structure, culture and information systems strategy, which is linked to the department's strategy. The researcher is concerned that the department may be lacking effective information systems to transfer and share quantitative, qualitative and statistical knowledge needed by stakeholders to make informed decisions. It is against this background that she decided to evaluate the effectiveness of information systems in the Free State Department of Education and to determine whether EMIS assists the department in achieving its objectives. Findings of this research will serve as a platform to advise the department on numerous strategies that can be adopted to make EMIS more effective in assisting managers to plan and make informed decisions.

Public service administration requires all government departments to deploy effective management information systems in order to provide reliable statistics and promote accountability to the public. In order to do this effectively, reliable and current data must be accessible to all stakeholders at the click of a button. The creation, capturing, storage, retrieval and transfer of this knowledge is critical for the department to be a learning and innovative organization. The processes mentioned will enable the department to respond to the varied needs of its customers. Information systems are the lifeblood of any organization including the Free State Department of Education, to manage critical data, and to create and implement strategy. According to Bulling[17], there has been an absence of detailed centralised information in the past. However, the introduction of the newly developed SAMS is able to

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[16] Kok, F. 2009b, p.26.

[17] Bulling, P. 2009, p. 18.

provide standards for all school data and school administration systems at ground level. Bulling added that the NEIMIS system (National Education Infrastructure Management Information System) is in place, and its function is to store data on the infrastructure of all schools. With these information management systems in place, the Department of Basic Education as well as Provincial Education departments are in possession of credible and reliable information for planning purposes. To assist in learner tracking, the Department is also in the process of rolling out Learner Unit Record Information and Tracking System (LURITS). Bulling 18 is of the view that this will be fully populated by 2011. The Free State Department of Education pioneered the roll-out of SA-SAMS and the project kick-started in 2007 with the advocacy to all stakeholders, and acknowledges that public schools in the province are now implementing SA-SAMS whose prime function is to assist schools with fully integrated computer solutions containing all aspects of school administration.

1.4 The layout of the study

This study consists of theoretical and empirical components and is organised in five chapters.

Chapter 1 provides an introduction to the topic. Chapter 2 analyses the theoretical component of this particular study. It deals with the topic of Information Systems, in particular the question of what the criteria to determine the efficiency and reliability of an education management system in the Free State Province are.

In Chapter 3, drawing on the theoretical base established in Chapter 2, we focus on the Free State Province to model the EMIS system and identify the crucial elements where empirical observations are necessary.

In Chapter 4 the focus is on the empirical data collection, based on the model as set out in Chapter 3. In this chapter the specifics of the methodological concerns in respect of the collection of data are dealt with in detail and the findings reported.

In Chapter 5 the implications of the findings are weighed up against the criteria as identified in Chapter 2 and conclusions are drawn on that basis.

Chapter 2

CRITERIA FOR AN APPROPRIATE EDUCATION INFORMATION SYSTEM

2.1 Information systems

Laudon and Laudon[18] define information systems (IS) as a set of interrelated components that collect or retrieve, process, store, and distribute information to support decision making and control in an organization. Laudon and Laudon[19] also make the point that information systems assist managers and workers to analyse and visualise complex problems and subjects and create new products. In this research, this term will be used synonymously with the term knowledge management systems which Alavi and Leidner, in Thomas[20] termed information systems, as a class of information systems applied to manage organizational knowledge by supporting and enhancing the organizational processes of knowledge creation, storage or retrieval, transfer and application. They further emphasise that for a system to be classified as a knowledge management system it has to satisfy the chief purposes of organizational processes such as knowledge creation, storage retrieval, transfer and application. In addition, the term Business Information System (BIS) will be used interchangeably with information systems due to relatedness in their definitions. To indicate this relationship, BIS – according to Bocij et al[21] refers to a group of interrelated components that work collectively to carry out input, process, output, storage and control actions in order to convert data into information

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[18] Laudon K.C. and Laudon, J.P. 2005.

[19] Laudon K.C. and Laudon, J.P. 2005.

[20] Thomas, R.D. 2006.

[21] Bocij, et al…2006

products that can be used to support the forecasting, planning, control, coordination, decision making and operational activities of an organization.

By contrast, Davis in Bjørn –Anderson and Davis[22] observes that information systems in an organization are viewed differently, depending on individual perception. For instance, the individual's judgement depends on the purpose for which she or he uses such information systems. Davis highlights the fact that defining information systems with a user in mind creates difficulties in assessing the quality of a particular system. Davis's concluding view of an information system is two-fold. He sees it firstly as a design tool with the primary purpose of serving people actively with information in an organization and secondly as an organized construction comprising subsystems that collect, process, store, retrieve and distribute information, with people at the centre influencing these processes. The conclusion drawn about information systems is that they are applications or systems which are there to support business processes through technology. They are, collectively speaking, a means by which individuals in an organization use IT to gather, process, store, use and distribute information. From the above definitions an educated conclusion is made in line with Gupta, that information systems should not be perceived in isolation but as systems with interrelated components such as people, IT, the organization, business processes and the society, all working together to achieve business goals. Different kinds of information systems prevail to deliver information to individuals and organisations. They may be manual systems such as handwritten bookkeeping systems, or computerised systems, the latter being the focus of this study. Gupta compares these information systems to a puzzle because they are made up of pieces that ultimately come together in a meaningful and effective way.

Most frequently the term, information systems is erroneously confused with information technology which only includes the technological component of information systems. Information technology, which is sometimes termed as Information Communication Technology, refers to hardware, software and networks, servers, routers, switches and cables that must be present to facilitate business processes. Claver et al... [23] aver that information systems are frequently used synonymously with information technology though these concepts mean two different things. Bocij et al... [24] argue that information technology and information systems are used interchangeably, which they view as erroneous, because their

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[22] Bjørn-Anderson, N and Davis GB. 1986.

[23] Claver, S, et al... 2001.

[24] Bocij, P. et al...2006. p.48

scope is different. The above authors strongly argue that information technology stresses the technology part whilst information systems incorporate how IT is applied and managed to contribute to business objectives. Heeks[25], attempting to show the difference, argues that information technology is defined as computing and telecommunication technologies that provide automatic means of handling information. IT, therefore, represents hardware and software, for example, a computer linked to another computer on a local area network. Heeks also argues that information systems are defined as systems of human and technical components that accept, store, process, output and transmit information. Heeks emphasises that information systems are more than IT because they include people and their actions. The performance of information technology effectively depends entirely on the availability of information systems. As a result of the relationship between IT and IS, relevant research on IS or IT will be analysed to understand the hypothesis further. Whilst the opinion of the authors mentioned above is valued, this research considers information systems as going beyond information technology but possessing a set of interrelated components such as information, data, people and supporting elements. For the purposes of this study, information systems whose components include hardware, software, database, network, procedures and people as presented by Turban et al...[26] will be considered to represent the information systems of the Free State Department. The confusing and erroneous use of IT and IS interchangeably in most literature compels the researcher to critically analyse related literature about these terms in order to understand the hypothesis further.

2.2 Systems theory

Different perceptions about the word 'system' prevail amongst individuals. For instance, when the term is used people always relate it to a computer system. According to systems theory, as presented by Jackson[27] as well as Gupta[28] a system is viewed as a unit that functions in an environment with many parts working together to achieve a common goal. Schulthesis and Sumner[29] further articulate that an information system has the same

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[25] Heeks, R. 1999.

[26] Turban, E. et al...2005.

[27] Jackson, M.C. 2005.

[28] Gupta, U.M. 2000.p.12

[29] Schulthesis, R and Summer, M. 1995.

characteristics as a system. A system is viewed as a collection of parts or functions that interact with each other to contribute to its wholeness and such interaction maintains its existence. This means the term system relates to a set of interrelated concepts that constitute the whole. Examples of systems include financial systems, air conditioning systems, school systems, investment systems as well as information systems. Schulthesis and Sumner[30] , on the other hand, refer to a system as a collection of people, machines, and methods organised to accomplish specific tasks. On the same view, Jacobs[31] maintains that a system's parts or functions regularly interact and demonstrate interdependence which in turn contributes to the whole. A system receives inputs from the external sources outside its boundary. These inputs are processed within the system and the output is distributed back to the environment.

All systems are characterised by the following:

- Boundaries that distinguish them from the environment

- The environment within which they operate

- Have inputs which are received from the environment and are transformed into outputs. Transforming the inputs to outputs contributes to the system's existence.

- Feedback and regulation.

- Structure operating within the hierarchy

- Purpose – processes within the system or sub-system are are driven to achieve an intended purpose.

Turare and Kavanamur[32] further explain the concept of "systems" as an approach to a problem which takes a broad view by taking all aspects into account and looking at interactions or interconnections between the different parts of the problem. Systems approach, from the perspective of Turare and Kavanamur[33] , emphasises the view that systems approach is an approach to a problem which takes a broad view, tries all aspects and concentrates on interactions or interconnections between the different parts of the problem. Furthermore, Turare and Kavanamur[34] argue that a systems approach devotes attention to the whole, to the transactional process among the units of the system, to the ongoing process of information

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[30] Schulthesis, R and Sumner, M. 1995.

[31] Jacobs, M. 2008.

[32] Turare, R and Kavanamur, D. 1999.

[33] Turare, R and Kavanamur, D. 1999.

[34] Turare, R and Kavanamur, D. 1999

and feedback loops and to repeated interaction and patterns inherent in the system. Of the same view on interaction and interconnection of system parts, Cabrera et al.[35], point out that systems refers to a complex whole of related parts whether it be biological (e.g ecosystem), structural (e.g a railway system) or organised ideas (e.g. the democratic system). In a system, the parts and how they interact or communicate to produce the overall objective is crucial. Without this interaction a system or its sub-systems are unable to achieve the intended objective. Rountree[36], in support of the statement, argues that the whole is of higher organizational status than the parts and has its own identity. Viewing systems holistically, Rodgers[37] argues that a system is characterised by the following:

- A system is an integrated whole, comprising interconnected and interdependent parts or sub-systems.

- A system is bounded i.e has a clearly defined inside and outside.

- A system is a spatial concept as opposed to a process which expresses the notion of movement and time.

- A system which has a permeable boundary between itself and its external environment is defined as an open system.

- A system survives and strives by adapting to change in its external environment.

- A system has an overall unified purpose to which the parts are aligned.

The systems approach links very closely with systems thinking, an approach to thinking about systems in relation to the parts that make up the whole. System thinking embraces characteristics such as relationships and thinking about how parts relate and the outcome which results in specific changes. It is also argued that by observing the relationships and changes in a system, people start developing a comprehensive picture of how the system works[38]. The concept of systems as well as systems thinking fuels the argument that the management and transfer of information in an information system is about the interaction of clients with the environment within which it operates, in this case EMIS in particular. Without the interaction of EMIS with its stakeholders for feedback, EMIS could rarely survive. Using

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[35] Cabrera, R. et al...2008.p.301

[36] Rountree, J.H. 1977. p. 247.

[37] Rodgers, C. 2006.

[38] Brown, S. E. and Lerch , D. E. Systems thinking: a tool for municipalities.

EMIS as an example of systems thinking, the components of the system (EMIS) start with survey administration, data processing, data analysis and data use. According to Wako,[39]

"It is possible to have a good survey administration with bad data processing, or a good data processing system but poor analysis. Even worse, the system may have good survey administration, good data processing and good analysis in place but poor use and feedback information. It is not the functioning of one part that leads to the desired result but the interdependency of all the parts." This statement acknowledges that the holistic approach to EMIS management will produce the desired results.

2.3   Types of systems

Systems are either classified as complex or simple systems. Krishna and Sharma[40] point out that systems vary from a simple system consisting of one component to complex systems consisting of two or more components. This study will concentrate on complex systems as it is believed that the Free State Department of Education is a complex system that receives inputs from the environment, processes them and then distributes them back to the environment.

2.3.1   Complex systems

Complex systems, as explained above, constitute a number of elements or components with well defined roles and governed by defined rules. Experiencing a problem in one of the system components results in the non-functioning of the whole system. Complex systems are then defined as systems whose units are able to self organise, and through the interaction of the units something new emerges. Complex systems are, therefore, characterised by self organization and emergence. Complex systems are also classified as open systems which depend on constant interaction with the environment for their survival. Burkhart and Schindler[41] argue that an open system is equated to a "cut" which separates the inner world from the outer world and which defines the discrete interaction points at which the inner world and the outer world may interact with each other. Katz[42] articulates that complex

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[39] Wako, T.N. 2003. p.18.

[40] Krishna, H. and Sharma, R. 2008. p. 772.

[41] Burkhardt, H.J and Schindler, S. 1981, p.157.

[42] Katz, J.S. 2006. Research Policy, p. 894

systems are difficult to define but maintains that they may be delineated by their characteristics, which are the following:

- A dynamic structure with interdependent constituents that interact in complex and non-linear ways.

- Open in the sense that the information flows across boundaries which are not clearly identified.

- Possess structures which span many scales

- Exhibit emergent behaviours and patterns that are not caused by a single entity in the system but that arise from simple rules.

- Can self organise i.e the system's emergent properties may change its structures or create new structures.

- Is composed of sub-systems.

Open systems, as Jackson[43] articulates, take inputs from their environments, transform them and return them as some sort of product back to the environment. Information systems are sub-systems of an organization, therefore they are open systems that interact with the environment at all times. During the interaction with the environment, a feedback loop is critical to detect an unacceptable behaviour and put control measures in place to ensure that the system is performing towards the fulfilment of its intended objectives. Brown and Lerch[44] support this argument in their postulation that, in complex systems, the chain of cause and effect does not have a stopping point and this causes a feedback loop. Complex systems are also referred to as complex adaptive systems since they are able to adapt to the environment for survival. Complexity in information systems is determined by the nodes that represent the units and edges representing the interactions between them[45]. Brown and Lerch[46] further point out that the feedback loop is a circular connection between two or more systemic elements in which a change in one element or input causes other elements to generate a response or output that eventually feeds back to the original element. In view of the above, a system does not operate in isolation. There must be interaction with the other components of the system for change to take place. As far as EMIS Free State is concerned the feedback

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[43] Jackson, M.C. 2005.

[44] Brown, S. E. and Lerch, D.C. Systems thinking: a tool for municipalities.

[45] Katz, J.S. 2006. Research Policy, p. 894

[46] Brown, S. E and Lerch, D. C. Systems thinking: a tool for municipalities.

occurs when districts for instance detect mistakes in data collected from the schools and immediately send the detected errors back to schools for correction. An information system like EMIS is an open system that needs to share the same characteristics mentioned above. It is therefore critical to evaluate EMIS in the FSDE to check if it is in line with the requirements of an open system. As an open system it is critical that it is evaluated to identify whether it responds to the environmental changes as expected. As a sub-system, EMIS Free State demonstrates the characteristics of an open system. In other words, the information systems of the department must possess the following elements:

- Input: This is called data. In the department this refers to collected information regarding the profiles of schools.

- Processes: These refer to policies, procedures and operations that convert data into information.

- Output: This refers to the information in the correct format that is transferred at the right time and place to the right person.

- Feedback: The information must allow individuals to report errors in the system's output immediately for corrective measures to be taken by relevant officials.

- Control: The system must allow for the processing of feedback and taking the necessary action to modify the processes, input or output.
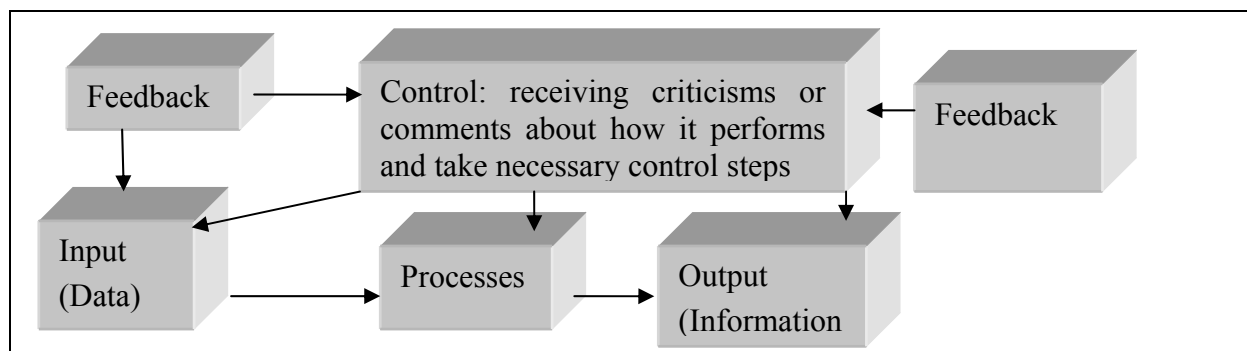
Figure 2. 1 : A generic model of a system *Source: Bocij et al...2006* [47]

Data processing in information systems management involves the collection of data from the environment, and transforming this data into output i.e information. Figure 1 above illustrates how the components of an open system should interact in order to survive. Without interaction it is impossible or risky for a system to survive. The survival of the information system of the department depends on its interaction with the environment. During the control and communication steps which are characteristics of an open system, there must be feedback from the environment about an acceptable or unacceptable behaviour so that corrective

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[47] Bocij, P. et al...2006.

measures can be taken. Özkan's[48] opinion is that assessment is an essential requirement of a feedback loop for continuous improvement of the information system and such improvement relates directly to the overall performance of the organization. Jackson[49] also believes that communication is significant because it helps in controlling the actions of a machine or a human being. Information systems as sub-systems of an organization, serve as control measures because of the role they play in giving feedback to the organization about the correct information on which to base decision making. As illustrated in Figure 2.1 above, information systems as open systems must demonstrate interaction with the environment. This could be achieved when constant evaluation of the system is conducted. Through constant evaluation of the system the users of an information system must be consulted to check their perceptions about the output received from the databases. By doing so, adjustments in line with the recommendations of clients are made to achieve the objectives of the National Education Information Policy. When an information system transforms data into information, (i.e input to output) it is affected by the environment and has to respond to the demands of the environment. Like any open system, information systems of the Free State Department of Education need to be monitored to check whether they are assisting the department to achieve its intended objectives. Such evaluation will assist in identifying the challenges faced which need minor or major adjustments during implementation. Systems theories would suggest that information systems undergo a life cycle which includes the phases of development, use, evaluation and maintenance. The evaluation of an information system is therefore crucial in order to detect problems during implementation. In this case an independent evaluator, who does not have an interest in the information system and is not affected by the processes of the information system, is needed. This will lead to establishing an accurate view of how the information system is assisting the department in achieving its objectives. In systems approach, open systems have to obtain constant feedback from the environment and this feedback results in the survival of the system under discussion. It is also critical for the department to have post reviews to check whether its information systems are performing according to the expectations of the stakeholders to avoid wastage of huge sums of money.

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[48] Özkan, S. 2006.

[49] Jackson, M.C. 2005.

2.3.2   Simple systems

A simple or a closed system operates independently from its environment. There is little or no interaction with the environment. In a closed system, problems are solved by taking into consideration the internal factors without consideration of the environmental influences. In other words, this system considers management, technology, and personnel with very limited or no consideration of the external factors which also lead to its survival and development. This means a closed system does not consider its competitors, government regulations or politics, economic climate as well as other stakeholders that have an impact on its survival or growth.
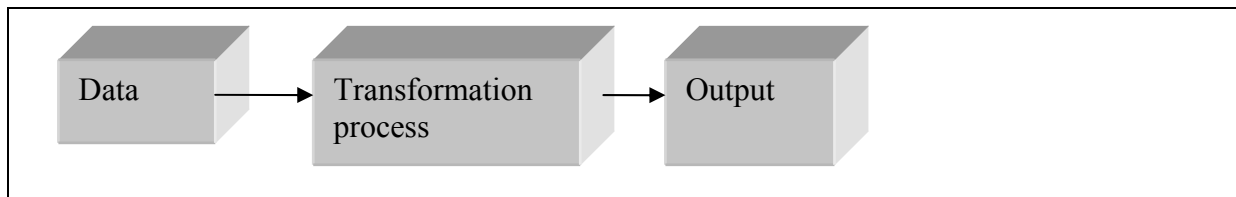
Figure 2.2: A basic model of a transformation process *Source: Bocij et al...2006[50]*

A system that follows this transformation process represents a static system that does not receive inputs from its environment. There are no checks and balances to measure whether the system is performing according to its intended objectives.

2.4   Effective and reliable information systems

Information is critical for the successful functioning of any organization. Therefore it must be of good quality, thus ensuring the success of good decision making by organizations. Wang et al in Xu,[51] argue that more and more organizations believe that the quality of information is critical for their success. Though quality data is noted as a critical factor for the success of organizations, Xu argues that many organizations do not turn this belief into effective action. Consequently, decisions made are based on information of inferior quality. Xu further articulates that as a result, stakeholders are dissatisfied with the quality of data delivered within the organization.

Munshi[52] argues that the effectiveness of a system should be measured by the degree to which the business goals are achieved. In order to determine the effectiveness of information

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[50] Bocij, P. et al...2006.

[51] Xu, H. 2003.

[52] Munshi, J. (1999)

systems, the users' perceptions of the outcome of information systems must be taken into consideration. Hamilton and Chervany in Bjórn – Anderson and Davis[53] came up with a different view regarding the definition of effectiveness in the course of presenting two predominant views regarding effectiveness, namely, the goal-centred view and systems-resource view. The goal-centred view approach relates to the identification of task objectives of the information system, task attainment, and determination of how well the task's objectives are satisfied. It is critical when evaluating the effectiveness of the information systems of the Free State Department of Education to check for the existence of objectives in the organisation. In this case a consideration of the vision and the objectives of the Education Information Policy Act is critical. This Act guides provinces on how to manage and develop information systems effectively for decision making and problem solving. Effectiveness is thus the outcome of comparing task objectives and the actual performance. On the other hand, systems resource view defines a system as effective when it acquires the resources needed to function well and satisfy the members of the organization. Dickson, Wells and Wilkers in Bjórn – Anderson and Davis[54] believe that the resource-view approach refers to a system that is able to attract competent personnel and receive more funding. Further analysis of this term involves a demonstration of whether it is meeting the objectives of the organisation. The analysis of the above definitions of effectiveness leads to the conclusion that the term effectiveness is a measurement of the extent to which the desired initiative has been achieved or not. This goes along with setting indicators and targets to measure whether a project is achieving its intended objectives. For the purposes of this study, the data quality standards and the National Education Information Policy released by the National Department of Education will be used as points of departure in developing the indicators for effective performance of the Education Management and Information System (EMIS) of the department. Other research conducted on the subject will also be used to align the study objectives with what has been achieved by past researchers on the topic of this research. Bless and Higson-Smith[55] suggest that a probability statement be used as it is sometimes rare in social sciences to be in possession of all information leading to the occurrence and explanation of certain phenomena. In the absence of any existing research on this related topic, the hypothesis is used to evaluate the effectiveness of its information systems. Although

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[53] Bjórn – Anderson and Davis (ed.) 1986.p.132

[54] Bjórn – Anderson and Davis (eds). 1986.

[55] Bless C and Higson-Smith, C. 2000.

it is understood that information systems of the Free State Department of Education will be considered effective when the characteristics mentioned above are met, the public sector is faced with the challenges of limited budgets or, alternatively, political decisions that divert financial resources to areas that are subject to public demands. The researcher has worked in the public sector for many years and can confirm that IT/IS departments within the public sector operate within tight budget constraints and that decisions must be justified at every step. For instance, the budget allocated for EMIS improvement in the Free State province is R1, 8 million. This is far less than what the other provinces are allocated.

Grover (1999) in Gounaris et al...[56] argues that the notion of information system effectiveness is a construct measuring efficiency, productivity, internal communication, flexibility, control and information management. The debates on the difficulty of measuring information systems' effectiveness resulted in academics such as Pitt (1995), as discussed in Gounaris et al...[57] to consider the element of service quality of the system.

Meyers (2003) in Özkan,[58] for instance, confirms that measuring information systems' effectiveness has been a subject of debate amongst members of the Society for Information System Management. However, though measuring information systems' effectiveness has been high on the agenda of information systems, research confirms that it has been difficult to measure, quantify or define the effectiveness of information systems due to a number of challenges that were on the agenda of information practitioners resulting in very little research being conducted on its effectiveness. According to Özkan one of the reasons associated with the difficulty in evaluating the success of an information system is that information systems cannot be evaluated in isolation from the other factors that are linked to organizational performance.

Past research reveals that studies targeting information systems measurement concentrated on economic value. Hatting[59], argues that the traditionally monetary-based evaluation measures that were used to evaluate the success of information systems were inadequate in terms of measuring the complexity of information systems successfully. The huge sums of money invested in information systems to ensure the smooth running and management of knowledge

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[56] Gounaris, S. P. et al... 2007.

[57] Gounaris, S. P. et al... 2007.

[58] Özkan, S. 2006.

[59] Hatting, M.J. 2005.

in organizations calls for an evaluation of these systems even in service-oriented organizations like the Free State Department of Education. While constructs such as Return on Investment (ROI) have been successfully used to measure the tangible value of information systems in organizations, this study does not undermine such importance. The focus of this study, however, will measure the intangible value of the information systems of the Free State Department of Education. It is also understood that the costs of information systems are easier to determine than the benefits arising from information systems investment. The measurement of the benefits of information systems will be the focus of this study. Bocij et al…[60] claim that benefits of information systems investment result in an organization doing things that it could not do or did not do well before. Arguing about the effectiveness of information systems, Jennex and Olfman[61] state that the success of information systems, or to use their term, 'knowledge management systems' depends on a number of factors as indicated below:

- Quantity of knowledge to be captured and in what form.

- Who are the users?

- Who filters what is captured?

- What reliance or limitations are placed on the individual memories?

- Technical issues i.e knowledge storage / repository considerations

- How information and knowledge are organised to facilitate easy searching and linkage to appropriate events and use

Even though measuring information systems' effectiveness is associated with difficulties, it is imperative that organizations evaluate IS because research indicates that poor performance of information systems can be an inhibitor to good organizational performance. This could be achieved by adopting an integrated approach whereby other organizational factors are considered when evaluating the effectiveness of information systems. Information systems are sub-systems of organizations therefore they have to demonstrate the characteristics of a system i.e interaction of parts to achieve completeness. The exclusion of other organizational factors when measuring IS effectiveness will achieve results that do not reflect an authentic

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[60] Bocij, et al...2006.

[61] Jennex, M.E. and Olfman, L. 2004. p.2

state of affairs. Özkan[62] is of the opinion that an integrated approach to the measuring of information systems must be followed. Özkan[63] also points out that information systems, as open systems, are affected by the environment and the people who use them. Hence an integrated approach to their evaluation is necessary. The information system under study exhibits the characteristics of an open system whereby it receives inputs from the environment and transforms the input into information. As a result, EMIS in the Free State Department of Education needs constant evaluation to check whether it satisfies its intended objectives. The department is a public service organization whose main objective is to improve services not sales; the measurement of information systems will concentrate on how the stakeholders perceive it in meeting its intended objectives.

2.5   Effective information systems in the Free State Department of Education

Performance in the context of an organization especially in the public service is the outcome, achievement and accomplishment of objectives that the organization is assigned to achieve. For instance, the objectives of the Free State Department of Education are captured in its vision and mission as indicated in point 1.2 above.

Having analysed the values of the department, it has been discovered that there is no evidence of the department's commitment to improve its information and knowledge management systems. In the opinion of the researcher, if knowledge is the heartbeat of an organization, it has to be one of the core values of the department to ensure that all stakeholders adhere to improving its information and knowledge management systems. According to Drury and Farhoomand, 1998 and Garson, 1999 in Elpez and Fink,[64] for information systems to be judged as successful, they have to become key components in achieving the organization's mission. It is understood that the Free State Department of Education's core business is learning and teaching, hence it is argued that the values of the department have to also capture the effective management of information and knowledge for decision making purposes.

As a public service organization the Free State Department of Education has to deliver quality service, use resources in a cost effective manner and ensure a fair and equitable distribution of resources to its clients. Information systems in this context as subsystems of the organization

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[62] Özkan, S. 2006

[63] Özkan, S. 2006

[64] Elpez , I. and Fink, D. 2006.

must assist the department to bring about changes in such a way that there is improvement in attempts to achieve its mandate. With regard to performance in relation to application of information systems as an organization, the department will be considered performing when it develops an integrated information system that will ensure the flow of information throughout the organization. The department will also be considered performing if during strategic planning sessions the statistics of the profiles of schools are considered thus aligning its budgets according to the priorities as listed in the strategic plan. If information systems are effective they will provide reliable, accurate and current data reflecting the actual profiles of the schools. For instance, the system must assist the department to indicate the actual number of learners for each school against the number of teachers so that schools are allocated resources (both human, financial and physical) according to statistics. This statement is also endorsed in the National Education Information Policy's[65] goals which state that:

- The information system has to enhance the day-to-day running of institutions and education departments

- Information systems must provide information to the public as a whole thereby promoting accountability.

- The information system must yield data and statistics needed for planning and monitoring purposes which occur at all levels from individual institutions, provincial education departments and the National Department of Education.

- The ultimate aim of information systems is to improve efficiency in the management of the education system, to introduce more transparency in the activities of the education system and ensure greater accountability on the use of scarce public resources.

- Any EMIS must facilitate public access to accurate, timely and relevant information within the legal framework to all role players. Information on the education inputs processes and outcomes must be accessible to the public with the exception of personal information where confidentiality should be ensured.

- The system should be simple, accessible, accurate and standardised.

According to these stipulations, the information system (EMIS) of the Free State Department of Education must contain information that is of good quality, reliable and up-to-date to

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[65] South Africa. Department of Basic Education. 2004.p.7.

facilitate informed decision making. Also such an information system must be easily accessible at all levels of the system thus promoting accountability and transparency to all stakeholders. Quality information will enable the department to allocate resources according to the needs of schools and different Directorates of the department.

The Department of Basic Education Information Policy: draft data quality standards[66], provides criteria to assess the effectiveness of the Education Information Management System (EMIS). The data quality standards indicate that relevance and timeliness are the most important characteristics of effective statistical information.

Quality of data according to the data quality standards has many facets which include the following elements:

- Relevance: the information must reflect the extent to which it meets the real needs of its clients. This available information sheds light on issues which are important to clients. The challenge is that the public service organisation has clients with varied needs and it is not possible to understand what the future needs of clients will be. This means the department has to concentrate on the needs that are captured in its mandate rather than looking at what future clients will need.

- Accuracy : The information must measure what it is intended to measure

- Timeliness: This refers to the time lag between the reference point to which the information pertains and the date on which it becomes available.

- Accessibility: This refers to how information becomes available in a suitable form or medium to users.

The data quality standards serve as a framework to ensure that the department adheres to the elements used to judge the effectiveness of information systems. These elements and other dimensions that were suggested by past studies will be used in judging whether information systems of the department are effective or not. These data quality standards are regarded as indicators for the success of information systems in determining how effectively the output of the EMIS processes meet the requirements of the customers. Although these data quality standards serve as the framework to evaluate information system effectiveness, it is critical to note that users of the system, especially in the public service, have varied needs and conflicting objectives that may not somehow be satisfied by the system under study. Pitt et

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[66] South Africa. Department of Basic Education. 2004.

al...[67] note that there is rarely a single common objective for all stakeholders, therefore the measuring of the success of organisational endeavours is problematic. This statement does not necessarily mean these varied needs must prevent or stop organizations from evaluating information systems. Pitt et al...[68] further postulate that information system effectiveness is multi-dimensional in nature therefore various constructs in its evaluation must be taken into consideration.

Although there are other interdependent factors that contribute to organizational performance, this study confines itself to how effectively information systems of the department enhance organizational performance.

Based on the above discussion on point 2.1 and a critical analysis of the guiding principles of the National Education Information Policy of 2005, the conclusion drawn is that an information system of any education department,   like the Free State Department of Education, will be considered effective when it meets the objectives of the policy mentioned above as well as the data quality standards when:

- it is able to organise and analyse information in the department's database.

- the information contained in the databases demonstrates accuracy and timeliness

- the output information corresponds with the input

- it demonstrates consistency in its output

- data collected from different schools becomes available throughout the organisation through an integrated information system shared by all members of the organisation and other relevant stakeholders rather than being kept in the Directorate where it was created resulting in inaccessibility to others unless requested from the Directorate concerned.

- free flow of information throughout the organization via an integrated information system is possible.

As far as EMIS is concerned, data must demonstrate quality in relation to correctness, completeness and currency. Lewis[69] claims that quality of data is shown by the following features:

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[67] Pitt, L.F. et al... 1995.

[68] Pitt, L.F. et al...1995.

[69] Lewis P.J. 1994.

- correctness – which refers to a measure of closeness with which the symbolic message contained within the data reflects the truth about the real world situation

- completeness – which refers to a reflection of the extent to which the data tells the whole truth about the real world situation.

- currency – which refers to a measure of the extent to which data reflects the most recent available knowledge about the situation.

De Lone and McLean in Sabherwal et al...[70] base their argument for measuring information systems success on three broad dimensions, namely:

- IS success is examined in terms of four aspects – system quality, perceived usefulness, user satisfaction and system usage.

  - User-related factors which include user IS experience, user attitude and user participation.

  - Contextual factors which include top management support, IS facilitating conditions and quality of IS development.

The above authors' arguments create a clear understanding that the success or effectiveness of information systems depends on interrelated factors which must be taken into consideration when evaluating the effectiveness of the information systems of the Free State Department of Education. For the purposes of this research, the effectiveness of the information systems of the Free State department will be measured in terms of the six dimensions proposed by the DeLone and McLean IS success model namely; system quality, information quality, use, user satisfaction, individual impact and organizational impact.

Bocij et al…[71] further confirm that the information captured in the information system must be of good quality. Information systems that are of good quality according to Bocij et al… relate to:

- Information relevance - the information presented is relevant to decisions to be made by the organizational members.

- Accuracy- The information on which decisions of the organization are based is accurate.

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[70] Sabherwal, RF. et al.... 2004.

[71] Bocij, et al…2006.

- Speed of information delivery - whether information reaches decision makers with speed when they need it.

- Functionality of information to support decision making - will the system do what officials want it to do?

- Reliability of information systems – this concerns whether users of information can rely on an information system to give them the information they want.

Although the measuring of the success or effectiveness of information systems in an organization has been cited amongst IS practitioners as critical, research indicates that there is no validated model to evaluate IS effectiveness. This has resulted in a lack of consistency in the use of correct IS constructs, incompatibility in research outcomes and an absence of a theoretical grounding on which to base the IS measurement for effectiveness. Alavi et al… 1989, Ives and Olson, 1984 and Keen, 1980 in Thong and Yap[72], articulate that IS research has been criticised for its lack of theoretical grounding. Rai et al...[73] argue that though IS success has been widely accepted through IS research as the criterion for the evaluation of information systems, researchers are still grappling with the correct constructs that best represent information systems success. The ambiguity of the concept and the multiplicity of IS constructs are the outcomes of this confusion. The absence of a theoretical grounding and the multiplicity of constructs for IS success contradict the high ranking of information systems and a need to measure their effectiveness that prevail amongst information systems practitioners. This does not mean that organizations like the Free State Department of Education need to relax and not measure the impact that the deployed information systems have in assisting the department in achieving its objectives. From the literature studied it is evident that most researchers who evaluate the success of information systems base their models on DeLone and McLeans' model. The contribution of these authors to the body of research on the optimal model to utilise in evaluating the success of information systems confidently allows the researcher to adopt their model for the purpose of evaluating the effectiveness of the information systems of the Free State Department of Education.

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[72] Thong, J.Y.L. and Yap, C. 1996.

[73] Rai, A., et al... 2002.

2.6 Dimensions or constructs for information systems effectiveness or success

Over the past three decades, evaluation of the value and success of information technology systems for organizations have been a matter of debate amongst IS practitioners. Different assessment approaches with varied results were used. As a result, researchers like Keen in Ifinedo[74] argued that the concept of an independent variable needed to be clarified. DeLone and McLean[75] then developed an integrated, interrelated and multi-dimensional IS success model which was used predominantly as a framework to measure IS success. The literature reviewed demonstrates that numerous studies conducted in searching for information systems success measurement produced varied results. Weaver and Shanon, the pioneers in information theory as noted by DeLone and McLean,[76] articulate that the varied results are caused by the fact that information as the output for an information system can be measured at different levels, namely, technical, semantic and effective levels as explained below:

- Technical level: accuracy and efficiency of the system which produces the information

- Semantic level: the success of the information in conveying the intended meaning

- Effectiveness level: the effect of the information on the receiver.

Mason (1978) in DeLone and McLean substitutes "*effectiveness with influence*" denoting a series of events from receipt of information to change in behaviour and a change in system performance. After an analysis of these levels, DeLone and McLean[77] concluded that different researchers focused on various aspects when evaluating the success of information systems, namely*:*

- desired characteristics of the information system itself which produces information which they labelled as *system quality.*

- studying the information product for desired characteristics like accuracy, meaningfulness and timeliness which they referred to as *information quality.*

- some researchers analysed the interaction of information product with its recipients, the users and decision makers and measured *use and user satisfaction.*

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[74] Ifinedo, P. 2007.

[75] DeLone, W.H and McLean, E.R. 1992

[76] DeLone, W.H and McLean, E.R. 1992

[77] DeLone, W.H and McLean, E.R. 1992

- other researchers concentrated on the effect of the information product on management decisions thus focusing on *individual impact.*

- whilst the last group were interested in the impact of the information product with regard to *organizational impact.*
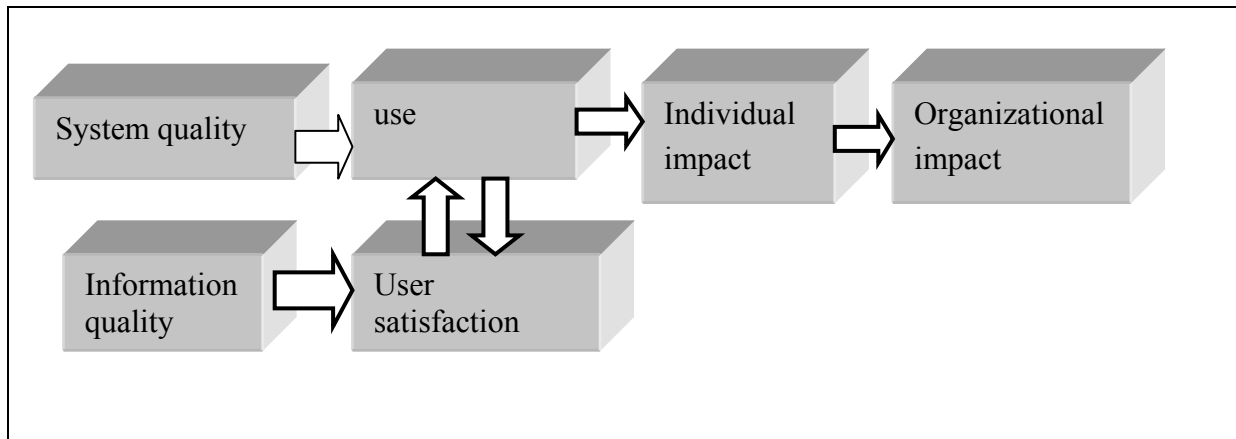
Figure 2.3: DeLone and McLean IS success model.

Source: DeLone and McLean, 1992

DeLone and McLean[78] argue that system quality measures technical level, information quality, semantic success and use whereas user satisfaction, individual and organizational impact measure effectiveness success. The proposed model presented by DeLone and McLean show interrelatedness rather than independence. In actual fact, the six dimensions have to be measured each in consideration of the other, otherwise results will be distorted. It is evident in figure 2.3 above that both system quality and information quality influence use and user satisfaction. The amount of use and user satisfaction can affect the scale of user satisfaction positively or negatively and vice versa. Ultimately use and user satisfaction have an impact on the user of the system that leads to individual impact which in turn eventually leads to the effect on the organization, thus leading to organizational impact.

The advent of end user computing in the early 1980's caused organizations to play dual roles of information providers and service providers. The current measurements of information systems available at that time concentrated on products rather than on the services of the information systems function. As a result of this dual responsibility for organizations, DeLone and McLean updated their instrument to include Service Quality and Net Benefits.

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[78] DeLone, WH and McLean, E.M . 2003.

2.6.1 System quality

It is interesting to note that numerous researchers are interested in evaluating the contribution of the information system to the organization. Measures for system quality that most researchers are interested in include: response time, system reliability, system accessibility, and flexibility of the system, ease of use, data accuracy, content of database and ease of learning. Saarinen[79] contends that measuring information product quality is always based on users' perceptions about the characteristics of the system. When talking about high quality IS the implication is that it must possess high system quality and high information quality.

2.6.2 Information quality

With reference to information quality a critical question needs to be asked which relates to an understanding of quality information. According to Muhlenberg College[80] information quality depends on how it is perceived and used by its customers. Therefore analysing the quality of information depends on two underlying principles, namely, highlighting – ie. - which attributes are important and how those attributes affect customers. Information quality depends on the user's perception about how such information assisted the individual. Hence it is crucial to design an information system that will respond to users' needs, i.e taking users' requirements into consideration.

Muhlenberg College[81] also presented attributes that could be used as benchmarks to demonstrate information quality:

- Relevance: This dimension indicates that information must be relevant to users' needs, failing which users will find such information inadequate.

- Accuracy: This attribute refers to precise information that should always reflect reality for use in different contexts.

Information quality is measured in terms of information and data stored in the information system. O'Brien in Bocij et al… [82]argues that information quality is measured in terms of content, form and time. Rai et al...[83] have a different view of substituting time with accuracy. Broadly speaking these attributes include the following dimensions:

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[79] Saarinen, T. 1996.

[80] Muhlenberg College, 1990

[81] Muhlenberg College, 1990

[82] Bocij, P et al ... 2006

[83] Rai, A. et al... 2002.

- Time dimension: timeliness, currency, frequency and time period

- Content dimension: accuracy, relevance, completeness, conciseness and scope

- Form dimension: clarity, detail, order, presentation and media.

Other dimensions that are not included and which may be considered important are:

- Reliability- Information that is of consistent quality in terms of accuracy and conciseness will make users feel confident in the output of the information system

- Confidence- accurate and reliable information received in the past builds confidence amongst users.

- Appropriateness: The widespread use of computer-based information systems creates sensitivity amongst users about the appropriateness of the information received for the activities they perform, i.e., having an information system that restricts information from being supplied if it lies beyond the duties of the recipient.

2.6.3   Use

This refers to the recipients' consumption of the output of an information system**.**

Depicted as the core of the Delone and McLean model, it is considered to denote the consumption of information systems output relating to individual impact which in turn relates to organizational impact. The use of this construct was questioned by theorists such as Seddon[84] in that it carried different connotations. For instance, Seddon's [85] opinion on *"use"* is that it has a threefold meaning e.g.

- IS *"use"* as a proxy for benefits from the user.

- A variance model of IS *"use"* as a behaviour.

- Where IS *"use"* is used as an outcome leading to individual impact and organizational impact.

Seddon further argues that *"use"* is considered to be a behaviour reflecting an expectation of net benefits from using the system.

2.6.4   User satisfaction

This refers to a response demonstrated by the user with regard to the output of an information system**.** According to DeLone and McLean[86] this construct is associated with user attitudes

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[84] Seddon, P.B. 1977.

[85] Seddon, P.B. 1977.

[86] DeLone, WH and McLean, E.M . 2003

towards a certain information system. As this depends on different attitudes of users towards a certain information system, it is critical to include the attitude of users themselves. Özkan[87] argues that including users' attitudes will help in that the bias of effects of attitudes is controlled in the analysis. Bailey and Pearson in Saarinen[88] further articulate that user satisfaction is the extent of users' beliefs about the efficiency of the information systems available at their disposal to meet their information requirements.

2.6.5 Individual impact

This is the effect of information on the behaviour of the recipient. By using an information system the user or the recipient has experienced a change in performing a certain task In other words, using an information system has made the user more productive or has given the user the wisdom to make better decisions relating to the task at hand.

2.6.6 Organizational impact

This measures the extent to which an information system may assist the organization in achieving its intended objectives. This construct relates to the effect of an information system in the performance of an organization. Danziger in Delone and McLean[89] identified five productive measures like staff reduction, cost reduction, increased work volume, new information and increased effectiveness in serving the public. Studies on the effect of information systems in organizations concentrate on return on investment, cost, revenue and benefit analysis as well as what changes the information system effected on the organization. The effect of information systems on the organization does not mean that changes in the organization effect changes in the organizational structure, but rather the following:

- Improving the work processes
- Making the decision-making process more effective.
- Intensifying the controls in the organization
- Improving communication inside and outside the organization.

2.6.7 Service quality

This measurement is applicable when measuring the overall success of the information system as opposed to measuring single systems. This dimension was found to be critical for inclusion in IS success measurement causing DeLone and McLean to include it as part of the model

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[87] Özkan, S. 2006

[88] Saarinen, T. 1996

[89] DeLone, W.H. and McLean, E.M . 2003

they developed. Pitt et al...[90] are of the opinion that service quality is a comparison between what the users feel they should be getting and what is currently provided. This is an important dimension that must not be excluded during an evaluation of information systems because it compares users' expectations against what the system is offering. This dimension will serve the purpose of gathering facts that users expect to obtain from the information system.

2.6.8 Intention to use

DeLone and McLeans' response to criticisms by Seddon of multiple meanings of the term 'use', resulted in the replacement of 'use' with 'intention to use'. This was replaced without a strong supportive theoretical framework.

2.6.9 Net benefits

Because the impacts of information systems go beyond the user to work groups, inter-organizational impacts and societal impacts, researchers felt that a measurement that would encompass all the factors should be included. To avoid confusion, DeLone and McLean grouped all measures related to impacts into a single benefit category, namely, net benefits.
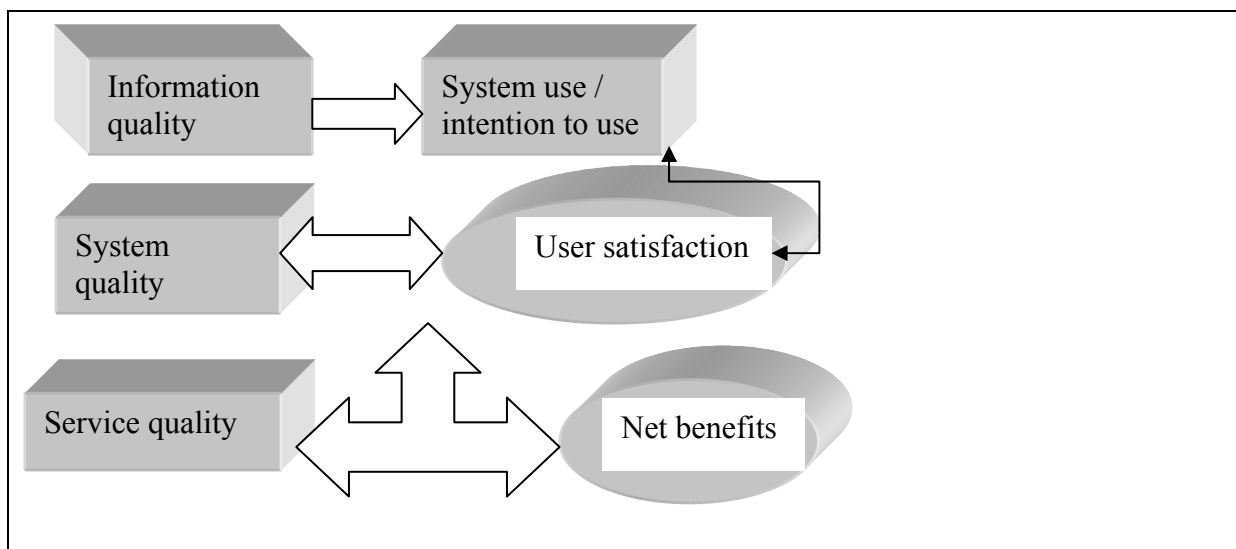
Figure 2. 4: Updated DeLone and McLean IS success model.
Source: DeLone and McLean, 2003.

2.7   Debates on the DeLone and McLean IS success model

Every instrument which has been developed over time is subject to critical scrutiny. DeLone and McLeans' model was also criticised due to certain gaps identified by most of the researchers mentioned above. Even DeLone and McLean concluded that their model needed

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[90] Pitt, L.F. et al... 1995.

further development and validation. The principal difference highlighted by Seddon[91] involved the concept of use as illustrated above. Seddon[92] believed that use precedes impact and benefits although it does not cause them. Seddon[93] claimed that perceived usefulness, user satisfaction, individual impact and organizational impact, mark the IS contribution to society. These have become an aggregate construct called net benefits. DeLone and McLean explained that their model of information system success was used to provide a framework for analysis of data. Seddon used the same model to extend and replace the constructs previously used by McLean and DeLone. DeLone and McLean's[94] original model has been tested in various organizational settings, both public and private. This model will be used in the study because it is believed that it has been tested widely by researchers in the field. The model is chosen because of its ability to demonstrate interrelatedness as an acceptable characteristic of any system. This interrelatedness found that DeLone and McLean's dimensions for measuring information systems, when used in combination, lead to the success of an information system.

Four dimensions that will be used are as follows: system quality, information quality, individual and organizational impact. The other constructs for information systems success are not singled out in this study because it is believed that both information quality and systems quality are determinants for use and user satisfaction. There can be no use and user satisfaction unless the system and its information is of good quality. In other words, there is a correlation between use, user satisfaction and information and system quality. Information and system quality both affect the *USE* and *USER SATISFACTION*. Once there is use and user satisfaction, there is definitely an impact on the individual and this ultimately contributes to organizational impact. Ballantine et al (1996) and Seddon, 1997 in Roldån and Leal[95] pursuing the same argument, contend that DeLone and McLean's model made several contributions to the understanding of information systems success. Such contributions comprise the following:

- It provides the foundation to classify different measures of IS success that have been proposed in various studies.

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[91] Seddon, P.B. 1977

[92] Seddon, P.B. 1977

[93] Seddon, P.B. 1977

[94] DeLone, W.H. and McLean, E.M . 2003

[95]Roldan, J.L. and Leal, A 2003

- It provides a model of temporal and causal interdependencies between stakeholder groups

- It has been generally accepted by the IS community

- It has been considered an appropriate base for further empirical and theoretical research.

After an analysis of the dimensions to measure information systems success as presented by the theorists discussed above, the following dimensions in table 2.1 below will be used as indicators to guide this research.

Table 2.1: **Dimensions and indicators for information systems success.**

Source: Adopted from Ifinedo[96]

Dimensions	Indicators / Measures
System quality	Adaptability / flexibility
	Availability
	Reliable
	User friendly or ease to use
	Allows data integration
	Distribution to relevant stakeholders
	Is it efficient
	Meets users' needs
	Infrastructure – reliable
	Allows collaboration
Information quality	Accuracy
	Timeliness
	Relevance
	Available when needed
	Means of verification at all levels
	Correctness and completeness
	Consistency
Individual impact	Job effectiveness
	Quality of work
	Beneficial for decision making
	Saves time for individual tasks and duties
Organizational impact	Reduction of manual tasks
	Increases user satisfaction
	Supports decision making
	Information systems strategy alignment
	Performance targets set.

The effectiveness of an information system depends on end users' perceptions. For instance, users may prefer not to use the information systems for one reason or another, therefore such

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[96] Ifinedo, P. 2007.

information systems cannot be deemed successful. This means that a number of variables are used to determine an information system's success, e.g. employees' perception that using the system would enhance their performance. Management, on the other hand, believe that the success of an information system is attributed to saving costs, user satisfaction, value to the organization and how well the information system interacts within the organization. All these characteristics will be considered when a conclusion is reached based on the findings on whether the information system (EMIS) is effective or not.

2.8   Other critical success factors for information systems

Information systems (IS) are considered expensive to acquire and maintain in most organisations. Although most organisations hold this perception, there are numerous benefits associated with investing in information systems. These include enhanced efficiency, effectiveness and competitive advantage. A number of studies which review the success of information systems look critically at the system itself as if the information system operates in isolation from the other intrinsic factors in the organisation which can also contribute to the success of an information system. Kelegai and Middelton [97] argue that DeLone and McLean reviewed 130 articles and came up with six dimensions for measuring an IS success model. The study concentrated on system issues and ignored human factors. Lee and Hong[98], on the other hand, argue that the successful implementation of new management ideas requires consideration of several factors such as organizational structure, culture, human resources, Information Technology and top management support. These authors view these factors as critical and essential. Although this study will analyse the system issues, the other critical factors as mentioned above will also be considered in order to assess whether these factors contribute positively or negatively to the success or failure of EMIS in the Free State Department of Education.

The executive managers in organisations have to take cognisance of the fact that the achievement of effectiveness of information systems also requires consideration of other factors when managing these systems. Nicolaou[99] also agrees with previous research that the effectiveness of information systems depends on a variety of factors most of which relate to user participation, involvement in system development, the extent of business processes and

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[97] Kelegai, L. and Middelton, M. 2004.

[98] Lee, S.M. and Hong, S. 2002.

[99] Nicolaou, A. 2004.

needs assessment during the analysis stage of the system development process and the level of data integration designed into the system. Hussein et al[100], in their study on organizational factors on information systems success identified top management support, decision-making structure, management style, managerial IT knowledge, goal alignment and resource allocation. Their study emphasised the equal importance of these organizational factors in relation to the other success dimensions. From the literature reviewed it became clear that the evaluation of information systems of any organisation must not be treated in isolation from other key success factors for information systems. Aouad et al...[101] argue that the study by Childe et al.. (1996) revealed that IT systems in business process engineering is hindered because these systems were put in place for operational purposes rather than as enablers of process improvement. To overcome this, Alshawi and Aouad (1995) in Aouad et al... propose a comprehensive model with interrelated factors. These factors include top management support, decision-making structure, management style, managerial IT knowledge and resource allocation. Other related studies include culture and goal alignment as the highest predictors of information systems success as articulated by Hussein et al...[102].

2.8.1   Adequate funding

The public sector is faced with the huge challenge of operating under budget constraints due to varied societal demands. Information systems are amongst the areas that are often neglected. Noting this challenge, Remenyi et al...[103], postulate that many organisations do not provide enough financial resources for information systems. They further state that information system managers always express the view that they are attempting to get a gallon of service out of a pint of resources. The limited financial resources then result in the information systems department not achieving the intended objectives for its establishment in the organisations. The limited funding allocation of financial resources for information systems is one of the reasons why such systems do not perform according to expectations. The level of knowledge and literacy, management and understanding of an information system contribute to management's perceptions of an information system, its responsibilities, usefulness and strategic value to the organisation according to Kelegai and Middelton. A clear

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[100] Hussein, R et al... 2007.

[101] Aouad, G et al… 1999.

[102] Hussein, R. et al ... 2007

[103] Remenyi, D. et al... 2000.

understanding of the value of an information system in the organisation, makes it possible for resource allocation in terms of budget and human resources to be increased. Mugerezi[104] echoes that EMIS development is a long-term undertaking which needs take-off funds that must be increased annually for training, maintenance and to acquire the necessary hardware and software. The World Bank Development Report[105] further notes that knowledge - management systems programs require substantial commitment of financial resources to be successful. It is further revealed in this report that a total of five percent of the total organization's budget is required on an annual basis to achieve success. This perspective should spur the Free State Department of Education on to allocating adequate funding to deploy information systems that enable the creation, organization, storage and dissemination of organizational knowledge to stakeholders as envisaged by the National Education Information Policy of 2005.

2.8.2   Alignment of information systems with an organisation's strategy

Alignment of information systems strategy with corporate strategy is considered critical for the success of the information systems of an organization. Saunders and Jones in Hussein et al...[106] believe that to promote the achievement of organizational goals , information systems planning must be tied to organizational planning. Remenyi et al...[107] are of the opinion that the lack of synchronization of information systems policy with the overall organisation's strategy could lead to information system ineffectiveness. An alignment of information systems strategy with the corporate strategy becomes realistic when a strategic information systems plan (SISP) is conducted. Saunders and Jones (1992) in Hussein et al...[108] are also of the same view that to promote the achievement of organizational goals, Information Systems planning must be tied to organizational planning. According to Remenyi et al...[109] such strategy becomes effective when users and the information systems' professionals are fully involved in the information systems planning process. During the strategic information system planning a programme for implementation and use of information systems is

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[104] Mugerezi, E. 2002.

[105] World Development Report, 1998.

[106] Hussein et al...2003

[107] Remenyi, D. et al... 2000.

[108] Hussein R. et al... 2003., p.4

[109] Remenyi, D. et al... 2000.

developed. The views presented by the authors mentioned above beg the question as to whether the vision and objectives of the National Education Information Policy are sufficiently represented in the strategic plan of the Free State Department of Education. This is based on the premise that if the objectives of the policy are not well represented in the corporate strategy, there is doubt that the department will achieve the vision of the policy. Remenyi, et al...[110] argue that without proper information systems planning and careful attention given to strategic alignment, poor investment decisions are likely to occur, resulting in inappropriate application of systems or inappropriate infrastructure being developed. Poor alignment of organizational planning with IS result in organizations paying less attention to procurement of appropriate hardware and software and curtailing funding. Inadequate funding ultimately results in poor training and support of system users.

2.8.3 A knowledge-sharing culture

Numerous studies have highlighted the fact that organizational culture plays a critical role in the successful implementation and operation of information systems. Gold, 2001 in Robles-Flores and Kulkarni[111] explains that the biggest hurdle to effective knowledge management is organizational culture. He further advises that ignoring the culture of the organization when studying the impact of the knowledge-management systems on business processes may lead to erroneous conclusions. Such statements imply that the culture of the organization may positively or negatively influence the collection of data, and its conversion and distribution to stakeholders of the organization. Creating a positive culture in an organization can be achieved in numerous ways, such as the establishment of communities of practices or informal social meetings amongst stakeholders where data is shared and compared. This will eventually lead to the collection of quality data from stakeholders. Top management can also instil a positive culture of quality data gathering. This will eventually lead to quality information from stakeholders and a commitment to the strategic importance of management of core knowledge of the organization. Mathi[112] believes that a culture of pervasive knowledge sharing needs to be nurtured and enabled within organizations as well as aligned with organizational objectives. The use of a reward system can also contribute to employees'

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[110] Remenyi. D. et al... 2000

[111] Robles-Flores, J.A. and Kulkarni, U.

[112] Mathi, K. 2004.

commitment to providing quality data, the better the quality of data collected from stakeholders, the higher the value of data in the EMIS database.

2.8.4   Technology architecture

According to Lee and Hong[113] world class organizations view information technology as a key enabler for the implementation of a new management paradigm to improve organizational processes. It is critical that the role of information technology is not underestimated because it can be used in each step of the knowledge development cycle. Information technology applications are used to support the creation, analysis, storage and dissemination of information. Lee and Hong[114] further argue that different information technology architectures like expert systems and decision-support systems can be used for knowledge creation, while intranet technology can be used for knowledge distribution. Kucza[115], in line with Lee and Hong's viewpoint, laments the fact that technology includes tools that are used to locate specific content, transferring such content to be viewed in different contexts. Axelsson and Landelius[116] argue that computers and networks have created a potential for knowledge transfer as well as opening up opportunities for knowledge management. Gounaris et al...[117] makes pointed references to the fact that, with the use of information technology, benefits such as improved reporting systems are evident. Moreover it becomes easy to process information from various sources in an integrated manner with the information technology infrastructure. Denning[118] reveals that the availability of information technology infrastructure, if well resourced and implemented, provides a comprehensive knowledge base that is speedily accessed, interactive and of immediate value to the user.

Skyrme[119] termed the different kinds of technologies into knowledge technologies according to the purpose for which they are intended, as illustrated below:

- Knowledge repositories: Data warehouses, document management, online databases

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[113] Lee, S.M. and Hong, S. 2002, .p.17.

[114] Lee S.M. and Hong, S. 2002, p.19.

[115] Kucza, T. 2001. p

[116] Axelsson, M. and Landelius, H. 2002.

[117] Gounaris, S.P. et al... (2007)

[118] Denning, S. 1998.

[119] Skyrme, D.J. 1999.

- Collaborative technologies: Groupware, intranet, videoconferencing, intranets and document management

- Knowledge discovery tools

- Data mining (which uncovers associations and patterns without the user having to know in advance what questions to ask. These tools are good at identifying sequences, associations and clusters), and text mining (identifies relationships in vast amounts of data).

The World Development Bank Report[120] further postulates that the critical issues that need to be considered in providing technology are:

- Responsiveness to user needs whereby continuous efforts must be made to ensure that the information technology in use meets the varied and changing needs of the users.

- Content structure whereby, in large systems, the cataloguing and classification especially becomes critical so that items can be easily found and quickly retrieved.

- Content quality requirements: The standards for admitting new content into the system need to be established and met to ensure operational relevance and high value.

- Integration with existing systems: Since most knowledge-sharing programs aim at embedding the knowledge sharing of staff as seamlessly as possible it is key to integrate knowledge-based related technology with pre-existing technology choices.

- Scalability: Solutions that are seen to work well in small groups (HTML, websites) may not be appropriate for extrapolation organization wide or on a global basis.

- Hardware – software compatibility is important to ensure that choices are made that are compatible with bandwidth and computing capacity available to users.

- Synchronization of technology with capabilities of users is important to take full advantage of potential tools particularly where the technology skills of users differ widely.

The drive for the analysis and interpretation of data requires that the software tools selected must be able to assist in generating association and patterns easily for users' benefit. One of the objectives of the National Education Information Policy is that information analysis must take place at the source of entry. This means that if analysis has to take place at any level of the system the software tools must allow users to do this without requesting assistance from the data analyst who might be busy with other competing priorities. Suurla et al...[121] echo that

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[120] World Development Report, 1998.

[121] Suurla, R. et al...2002.

information systems management includes compatibility between various technical devices and software packages installed in various environments and availability and ease of use. In conclusion, the choice of simple technology that allows users to retrieve what they want in less than three clicks invites users to use the system with increasing frequency. This goes along with adequate training because an information system with the vast wealth of well organised and systematic information becomes useless if users are technologically illiterate and cannot use the system at their disposal. Suurla et al...[122] argue that virtual networks will fail to function if the people involved are not familiar with the technology. Training is critical for users to know how to use the information system appropriately. Without training and support the information system remains unused by its intended users. The training referred to by these authors was also identified as critical in the objectives listed in the National Education Information Policy. This means EMIS Free State has to ensure that means are derived to invest in the training of the system-wide users. Trucano[123] strongly argues that institutional building goes along with making sure people have the necessary skills to operate and maintain EMIS at all levels of the education system.

2.8.5 Top management commitment

Experience confirms that for any project to be successful in the public sector there should be sustained political commitment and commitment from the Executive Management. Once this has been established, more resources, namely, human resources and an adequate budget should be pumped into the project for its implementation. Davenport in Kalbasi[124] on the same view, points out that successful implementation is only achievable when high level executives have a strong commitment to the project. Davenport also believes that the attitude of senior managers will affect not only the flow of funds and information to the project but this attitude is transferred to subordinates who will value the impact of the project on the company. King and Teo, (1996) in Hussein et al [125], in their study also identified that top management support facilitates the deployment of strategic IS applications while lack of top management support inhibits the strategic use of IT / IS. As discussed above, once there is political senior management commitment, a shared vision and goals which are aligned with

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[122] Suurla, R et al.... 2002,

[123] Trucano, M. 2006b. p.13.

[124] Kalbasi, H. 2007.

[125] Hussein, R. et al...2003 p.4

business objectives are assured. Cassidy[126] sharing the lessons and challenges to be learnt for the development of EMIS argues that sustained high-level support and political will is essential. Furthermore Cassidy believes that shared vision and clearly defined, realistic expectations are essential. It is believed that once there is a shared vision which is clearly articulated as a strategic objective of the department, all stakeholders will understand the value of EMIS to the organisation. The World Development Bank Report[127] reveals that a clear vision that answers the questions such as with whom, what and how, will fail if there is lack of management commitment.

2.9   Factors to consider for EMIS development and implementation

EMIS development and implementation philosophy requires consideration of the following:

- Appointment of an ICT champion: The development and implementation of an information system requires the recruitment of experts in the field who make sure that the planning, development and management of the information system takes place without fail. Experts in Information Systems must be recruited. According to Mugerezi[128], an ICT champion must display commitment, and must take the lead to convince and encourage everyone.

- Development of an information systems strategy: The strategy involves the statement, mission, and vision with clear objectives as directed from top management. The strategy outlines the framework judging the existing and proposed systems infrastructure investments as well determining priorities. The strategy also identifies the major systems and supporting resources and investments required over the medium term, it identifies management and technical policies that determine the means and ground rules by which information systems will be developed and managed as well as looking at the migration plan needed to carry the work forward.

- Training programme: Without training provided to clients the information system is faced with challenges. It is critical that the strategy outlines how the training will be rolled out and to whom. The roll out of training goes hand in hand with budget availability to sustain the training interventions. Executive Management as well as Directors in the organization

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[126] Cassidy, T. 2005.

[127] The World Development Report, 1998.

[128] Mugerezi, E. 2002. p.80,

must also be targeted for training in order for them to understand the processes that will be involved to develop and implement EMIS.

- Take-off funds: The development and implementation of EMIS require a sustained budget to ensure that the information system will not be a ghost. Management must make sure that enough funds are allocated to develop and implement the EMIS of an organisation.

- Management support: The support of management is critical for the development and maintenance of EMIS.

The above development and philosophy requirements need to be taken into consideration by any organisation like the Free State Department of Education, to ensure that the success of an information system is not compromised.

Essentials that will result in improved information management system as discussed by Mugerezi[129] for the municipality must be adopted by the EMIS Free State Department of Education.
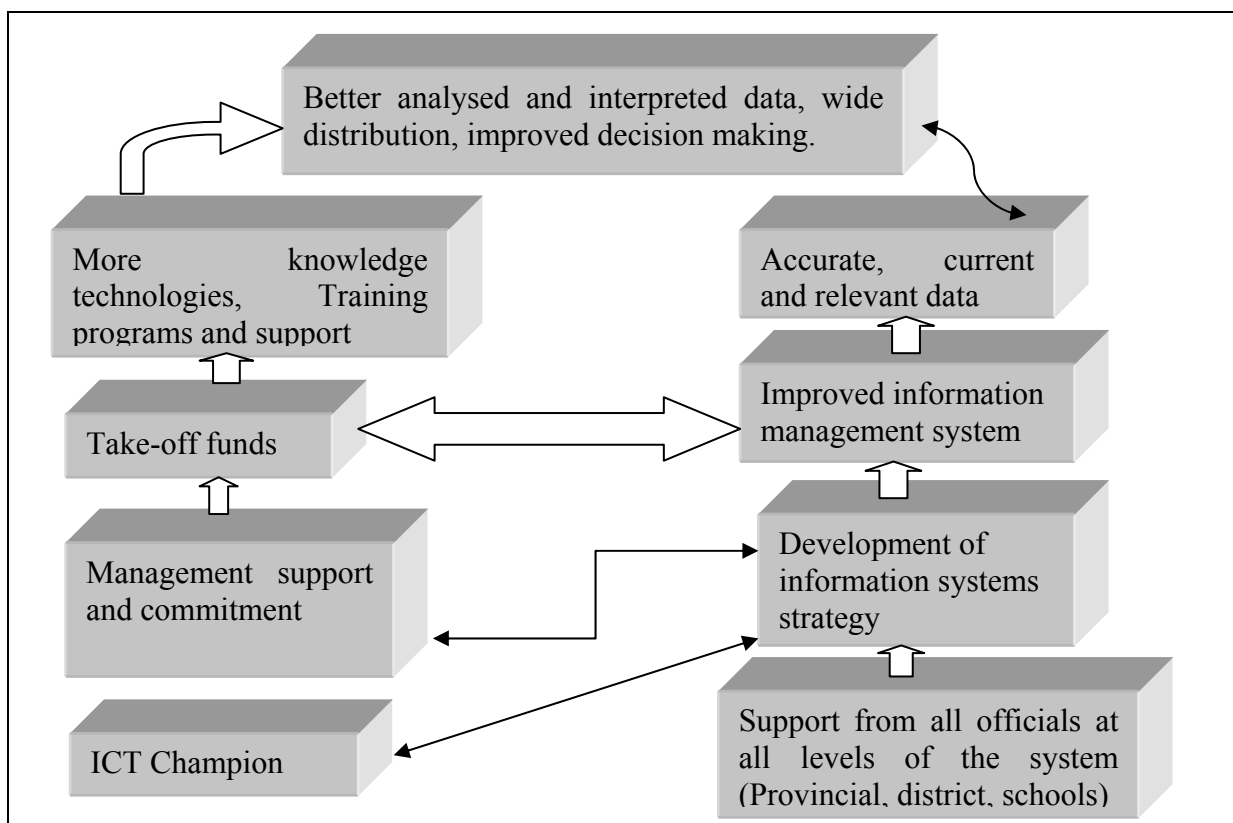
Figure 2.5: Essentials to improve information management systems.
Source: adopted from Mugerezi. 2002

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[129] Mugerezi, E. 2002. p.80.

2.10 Education Management Information Systems in other African countries

It is crucial to analyse information systems in other African countries to learn best practice and to understand what other African countries are facing. This study does not analyse EMIS from other provinces because it is believed that all the other provinces are following the same direction as prescribed by the National Department of Education.

2.10.1 Education Management Information Management System

Data gathered through EMIS is used for various purposes like improving planning, reporting, measuring, monitoring and evaluating, identifying trends, showing the extent of impact, predicting trends and scope and supporting advocacy[130]. These authors further argue that through EMIS those working in the education sector are informed of what the real situation is with regard to education institutions. For planning purposes EMIS has to provide all management in education with relevant data to support informed decision making in their operations.

An understanding of the purpose of EMIS and how it functions in other African countries is critical in order to understand whether the Free State Department of Education EMIS provides the kind of service it is intended to provide. As a result, EMIS systems in Zimbabwe, Ghana, Namibia and Tanzania have been analysed and it has been discovered that, like EMIS Free State, EMIS was established to produce and manage educational data and information whose processes involve the collection, processing, utilising and dissemination of educational data to stakeholders in all these African countries.

2.10.2 EMIS in Zimbabwe

In a study of EMIS in Zimbabwe one must take note of Wako's argument that the success of EMIS depends on a strong vision that must:

- Demand responsiveness – whereby a chain of information management begins with taking the users' mindset into consideration.
- Be based on the needs of the clients whereby periodic surveys of consumers' needs are undertaken to determine the information needs of consumers and the capacity needs of producers.

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[130] Heard, W and Badcock-Walters, p. 2006.

- Be self- sustainable whereby an emphasis on capacity building of decentralised and distributed statistical functions is maintained, thus preventing a system from becoming a graveyard.

- Be governed by an independent body representing the stakeholder partnership (National Advisory Council) – This is a forum for negotiation and policy-level commitment, mobilizing human and institutional resources and issuing directives across the system. The National Advisory Council could ensure that EMIS does not operate in isolation but through an integrated approach as well as ensuring that users have a place to voice their opinions about the services received from EMIS.

Critical to the above, Zimbabwe emphasises an integration of decentralised and distributed sub-systems as it is through integration that the loose parts become effective when quality control procedures are put in place at all levels. This is possible through the use of common data processing software and quality control measures that allow each level of the sub-system to perform statistical functions for their own planning, policy and management needs at all levels of the government. The critical success factor that needs to be taken into consideration using the Zimbabwean experience is that of political commitment which ensures that directives to mobilise and authorise financial, material, human and institutional commitment to the implementation of the adopted strategy are followed. Good governance has also been identified as a critical success factor because if all stakeholders who are have vested interests in the outcome are actively participating in the decision making, then an exercise of their oversight function as well as the issuing of guidelines and standards will be achieved.

Lastly, the sharing of responsibilities, expertise, costs, facilities and resources will ensure that a positive outcome is achieved to a far greater degree than when acting in isolation.

Zimbabwe strongly emphasises the capacity building of schools as the main source of educational information and such training focuses mainly on a records-management system, awareness of the use of information for planning and decision-making purposes.

2.10.3 EMIS in Tanzania

In Tanzania, EMIS also starts with a vision, mission as well as objectives and strategies. In Tanzania, in addition to the Ministry of Education which has been collecting data through various methods, other government organizations such as the Teacher Service Department, President's Office Public Service Management, Ministry of Health, National Bureau of Statistics, and the President's Office Regional Administration and Local Government also

collect data for their own needs, which is done without coordination. This causes an overlapping and varying of data collected which can contribute to low validity, untimeliness and inaccessibility of the data collected[131].

2.10.4 EMIS in Namibia

Before Namibian independence, the national education statistics were processed by the Statistics Division which worked closely with the central education department and the statistical education committee. Only a small portion of data was entered and the processing of data was done manually. Between 1990 and 1991 during the change of government, the Namibian Education Management Information System which included the Geographic Information System was developed to provide a record of existing schools and their locations. As Voights 132 explains, this came about as a result of the Minister, Senior Managers and donors requiring a comprehensive record of schools in each region. As in the case of Zimbabwe, the needs of the users, the means of presentation to be used and the level of aggregation were taken into consideration.

2.10.5 EMIS in Ghana

In Ghana, the policy for decentralisation is aligned with the collection and analysis of education data at the district level making it possible to help in the development operational plans that are linked to budget for implementation. Through EMIS and the provision of reliable and accurate data the allocation of resources becomes more efficient and responsive to the local needs. EMIS objectives assist the Ministry of Education and Science in developing strategic policies, developing operational plans and monitoring progress towards pre-defined targets. There is evidence of a strong collaboration between EMIS and the Policy, Budgeting, Monitoring and Evaluation Unit. Trucano[132] believes that this working relationship ensures that EMIS provides reliable data to the unit which analyses it in order to produce performance and monitoring reports for the Ministry. Ghana ensures the participation of stakeholders in making inputs in the monitoring process by the establishment of the Education Sector Technical Advisory Committee. This committee uses EMIS to monitor progress of policies towards set targets and to take action to ensure that policies are

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[131] Voights, G.G.F. 2004.

[132] Trucano, M. 2006b

successfully implemented. The calculation of budget allocations per district is based on the number of trained teachers, pass marks for Science, Maths and English, type of classroom structure, availability of water and seating capacity. EMIS is used to determine budget allocations according to identified local needs.

In line with Ghana's practice, the Free State Department of Education could use the data from schools for budget allocation. Free State EMIS does not have an advisory committee that serves to advise the Executive Management on issues of information management and budgetary issues that will affect the performance of EMIS, Free State.

Chapter 3.

A SYSTEMS ANALYSIS OF THE FREE STATE EMIS

3.1   MODELLING EMIS IN THE FREE STATE DEPARTMENT OF EDUCATION

The national department, like any other government department, has a responsibility to account and report to parliament and the public on how resources were allocated and used. As a result, Education Management and Information Systems emanated from the National Department of Education as a means to integrate the previously prevailing available information collection systems that could not talk to each other. EMIS is a new term in the education field which came into being in the 1990's. Prior to this, education statistics were used. The importance of information for decision making and evaluation as echoed by the National Treasury also necessitated the establishment of the Education Management and Information System. Therefore EMIS was established to ensure that data and information relevant to education planning is collected, analysed and reported. EMIS is mandated by the National Education Information and Management System to ensure that the objectives of the National Education Information Policy of 2005 to guide the functioning of EMIS in the various provinces are achieved. The guiding principles of this policy are highlighted in its vision. For the purposes of this research only guiding principles relating to the provincial education departments will be highlighted:

- The aim of an information system is to improve efficiency of the education system to introduce more transparency in the management of the education system, as well as the education departments, and to ensure greater accountability regarding the use of scarce public resources.

- Any EMIS must facilitate public access to accurate, timely and relevant information within the legal framework to all role players.

- Information on education inputs, processes and outcomes at all levels of the system should be accessible to the public with the exception of personal information where confidentiality should be ensured.

- Data flow should be bi-directional both vertically and horizontally

- Ideally data should be processed, analysed, and published close to the collection point.

- EMIS should facilitate capacity building, support and training on collection, processing and analysis, dissemination and use of information at all levels of education.

- There should be a mechanism for coordination between the national and provincial levels to accommodate the diverse needs of provinces especially in establishing a core data set and the use of appropriate and compatible technology.

According to the Department of Basic Education's National Education Information Policy Act[133], EMIS must facilitate public access to accurate, timely and relevant information within the legal framework to all role players. The act further emphasizes that information on education inputs and processes should be accessible to the public with the exception of personal information where confidentiality should be ensured. In the interests of the guiding vision of this act, it is understood that this vision must be clearly articulated in the Free State strategic plan indicating how the department will respond to achieving the vision as articulated in the act. The EMIS Sub-directorate, established to liaise with the National Department of Education, is part of the Infrastructure Planning, IT / IS systems Directorate. This replaces the Information and Knowledge Management Directorate approved in 2005 which was headed by a Director. However, the post of the Director was never filled, nor did the department prioritise the filling of the vacant posts of the three Sub-directorates according to the structure that was approved in 2005. EMIS's purpose is to ensure that information is readily available and that knowledge-management systems are in place to assist the department with regard to planning, monitoring, informed decision making, improved service delivery and organizational performance. [134]

Its functions include the following:

- To gather, capture, record and store data to be used by a variety of clients and stakeholders.

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[133] South Africa. Department of Basic Education. 2004.

[134] Free State. Department of Education. 2005. Approved Macro Structure.

- To process and analyse data and disseminate information for improved planning, monitoring and decision making.

- To effectively use information and knowledge to increase productivity, the use of resources and reducing costs incurred in the education system

- To provide systems support to the information and knowledge functions.

EMIS collects data from schools through different surveys, the primary one being the snap survey (10th day survey), which must reach schools within ten days of the schools' yearly re-opening. Data fields in this survey include the following:

- general information about the school,

- learner information (learner enrolment per gender and class and learners with special needs) ,

- staff, including teaching staff and non-teaching staff for schools and hostels depending on whether the school has a hostel or not (number of staff who are permanent, temporary or substitutes),

- staff remunerated by the department or school governing bodies,

- class groups available and multi-grade teaching (if applicable)

- the language of teaching which requires information related to the number of teachers involved in teaching a particular language and the number of learners involved per language of teaching per class.

- RSA citizenship

- Security at the school.

- General information about the school (physical address and contact details of the school, lowest and highest grades at the school, total number of multi-grade classes, information related to whether the school has a double shift or not, platooning school, total number of learners enrolled at the school during the current academic year per grade, number of classes for each grade)

- Learner information pertaining to learners registered at the school for the current academic year when the form is filled in,(learner distribution, hostel boarders, number of learners excluding ELSEN, learners per race, gender and grade, primary disability, number of learners according to grade and age including ELSEN learners, males and females separated, learners excluding ELSEN or SNE classes according to home language and grade, both males and females counted together, ELSEN learners per class

according to language of learning and teaching and disability, number of learners preferring to receive instruction in a specific language per grade excluding ELSEN learners, ELSEN learners in mainstream classes per disability and grade, female and males separately, ELSEN learners in mainstream according to learning barriers, gender and grade, number of female learners that fell pregnant during the previous year, number of transfers to and from the school. If the school keeps records of learners registered for receiving social grants the number per grade is needed, number of learners who dropped out, or were not promoted last year and are repeating a grade, Grade 1 first-time enrolments, number of learners who have attended pre-primary programmes, mortality statistics of learners during the previous academic year, mortality statistics for educators during the previous academic year, number of learners whose parents are deceased).

- Curriculum information : This field requires information related to languages in the GET band, number of learners according to languages, subjects and phase, number of learners (Grade 10) taking secondary subjects according to gender and race, number of learners (Grade 10) taking language subjects according to gender and race, number of learners taking subjects of other assessment bodies that are approved according to gender and race, number of learners (Grade 11-12) taking secondary subjects according to grade, gender, race and subject grade

- Resources and equipment

- General: information pertaining to the annual fees charged by the school per learner during the previous year.

- Number of classrooms (general classrooms, multi-purpose classroom, biology or science laboratories, art room, typing room, technical drawing room, home economics room, design and technology room, workshops, computer room, media centre, library)

- Educator information (for all educators at the school, substitutes and permanent) includes surname, identity document, race, age, contact details, disability, post level, home language, nature of appointment, qualifications, years of teaching, subject or learning area teaching, hours per week). Each educator is expected to fill in the form. The Department of Basic Education,[135] prescribes the submission of snap and the annual surveys annually by every school, and ultimately provinces submit the data to the department. As a result, the date for the submission of these surveys is set by the National

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[135] South Africa. Department of Basic Education. 2007.

Department. Schools are informed through a circular about the date of submission to the provincial office via the district offices.

In addition to the above, EMIS Free State also gathers data through the following surveys: Life Skills surveys, Common examinations, Grade 12 results and ICT infrastructure.

3.2   The flow of data in the Free State Department of Education

In order to carry out the above mandate of the policy, the EMIS at the Provincial Office comprises the Chief Education Specialist: EMIS, Deputy Chief Education Specialist, the Senior Education Specialist, Statistician and data capturers.   There are also five EMIS coordinators based at district level, one in each district. They are responsible for capturing data filled in by the schools on the survey forms. Once captured, this information is sent to the Provincial Office for capturing in the Provincial database. In the past, manual survey forms were used to gather data from schools. However, since 2006, the department has rolled out the South African Schools Administration Management System (SA-SAMS) to schools that have at least one computer for administration purposes. The roll out of SA-SAMS only applies to public schools, and excludes farm schools. This means farm schools still use the manual survey forms. The researcher learnt from an interview[136] that the Provincial EMIS installs SA-SAMS in all public schools that have at least one computer for the capturing of data electronically. The schools then either complete the manual survey form or capture data electronically. Electronically captured data is updated on an ongoing basis. Owing to the absence of electricity and computers in farm schools, the manual survey forms with relevant fields are sent to farm schools to capture the profile of each school. CDs containing SA-SAMS are sent to the districts for the attention of School Management and Governance Developers i.e. officials responsible for the management and governance of a certain number of allocated schools each. These are used to capture data electronically on SA-SAMS, or manually using survey forms. The schools use admission registers and learner application forms to gather data related to learners. At school level, the clearance document is signed by the principal or any other delegated official. The purpose of this clearance document is for the principal to confirm that he / she commits himself or herself, and that the information provided is correct. He / she further commits him or herself to the fact that, where there is

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[136] Kok, F. 2009a.

more than one table provided, the information corresponds e.g. under Learner number: Home Languages, the totals must be the same as the learner enrolment for the whole school.

The schools print the surveys, write the database on CD and do an export of an XML file. The clearance document and the CD are checklisted to the district office via the School Management and Governance Developer who has to verify that the original form is submitted and that all the fields have been completed. From the SMGD the form goes to the EMIS coordinator at district level who has to verify the correctness of fields and check for obvious errors like incorrectly completed fields. The data on CD and the clearance documents are sent to the Provincial Office. EMIS uploads this to the warehouse from where data is extracted as necessitated by the system. The Provincial Office verifies data as it arrives from the districts by signing and stamping a date of verification. This is done by officials employed at entry level with a minimum of Grade 12. These officials capture data from the districts and are responsible for specific districts and where there is a vacancy, the work is divided amongst them. Phosa 137 maintains that the shortage of staff in the EMIS Sub-directorate compelled EMIS Sub-directorate to use the same officials who are doing capturing to also do check listing and verification. Phosa also emphasised that ideally one official has to do the verification which entails scanning for mistakes and checking whether the appropriate fields have been filled in correctly. In addition to the staff complement at the provincial office, there should be a supervisor who supervises the verifiers' and capturers' work. With a limited staff complement available, EMIS Sub-directorate solved this challenge by using the swapping method whereby an official who has captured a particular district verifies another official's work. The Chief Education Specialist and the Senior Education Specialist are responsible for data analysis using various tools such as databases, EXCEL, Statistica and GIS. As Kok 137 observes, analysis is an ongoing process.

Graphically the above process can be explained as follows:
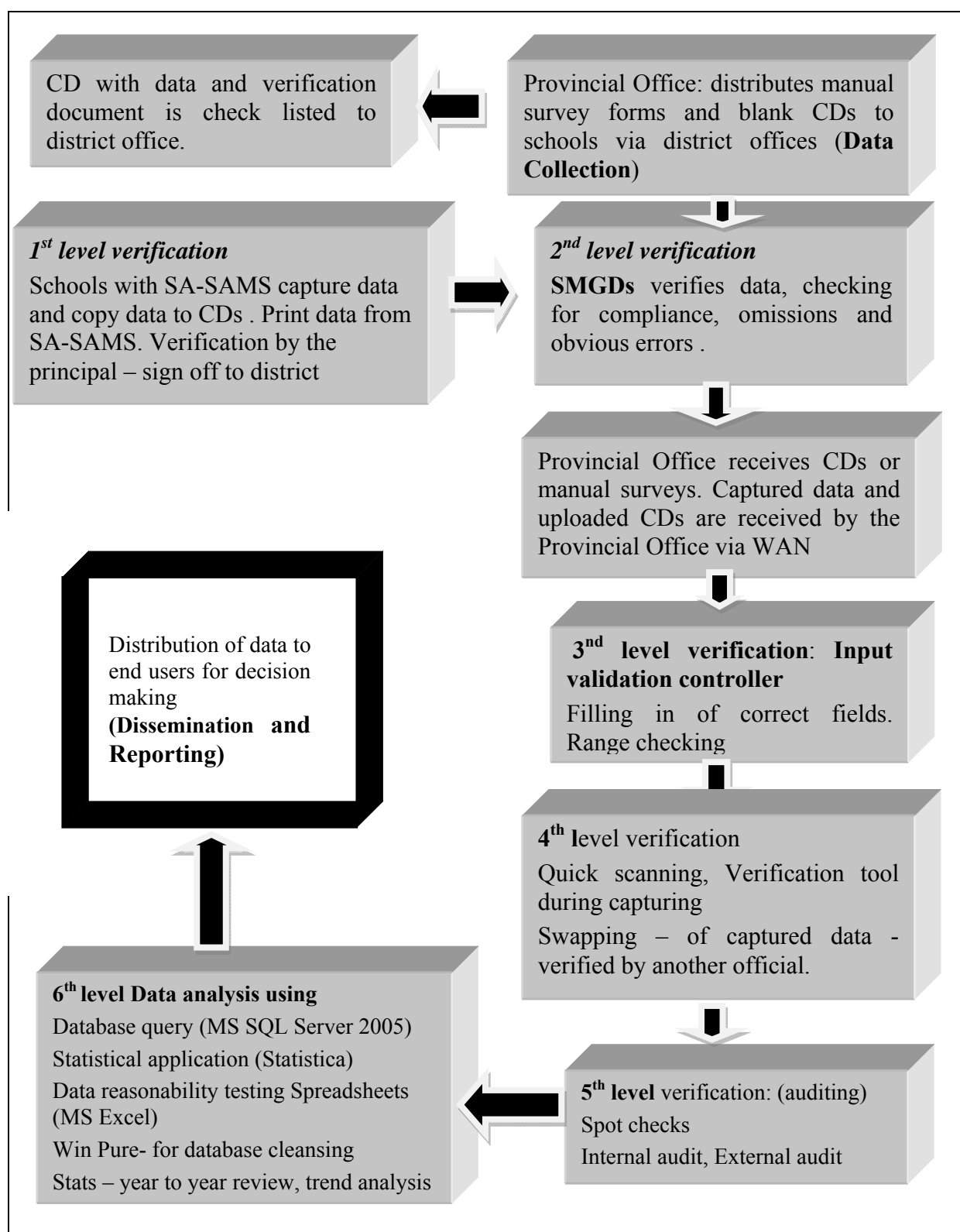
Figure 3.1: Graphical representation of the flow of data – EMIS Free State.
Source: EMIS interviews, Free State Department of Education

The National Education Information Policy prescribes that information must be distributed to all stakeholders for informed decision making and proper planning. EMIS Free State distributes information using EMIS online or the Intranet. Information is also incorporated in a GIS as part of the Business Intelligence System. In addition, the information is distributed through a booklet that contains a statistical report about the schools' profiles. This booklet is distributed annually in May and reflects the statistics of schools as an outcome of the snap surveys conducted on the 10th day after schools' re-opening in January.

3.3   Study design and setting

A research design specifies the operations that will be used to test the phenomenon under study. It involves specifying the steps that will be followed to test the hypothesis under study. The research design also involves the consideration of the unit of analysis from which to draw up the sample as well as the instrument that will be used to gather data. This research targets EMIS (Education Management Information System) which is located in the e-Education Directorate. The purpose of the study was to investigate how data is generated at school level up to the stage where it is analysed at the Provincial Office of the Free State Department of Education. In order to achieve the aim of the study, the research question, with several related sub-questions were developed. The research question for this study is as follows: **"***Are information systems (EMIS) in the Free State Department of Education effective in supporting decision making?***"** In order to answer this question, the research instrument adopted from Xu's[137] study was used as a framework to guide the researcher's findings. The development of the research instrument was also guided by the use of data quality standards as well as the objectives of the National Information Education Policy.

3.4   Validity and reliability

In order to reduce the risk of obtaining incorrect answers to the research question, validity and reliability were considered to be critical in this research. The terms are explained before an attempt is made to discuss measures undertaken to overcome the risks mentioned in the statement above.

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[137] Xu, H. 2003.

3.4.1 Reliability

Joppe[138] defines reliability as the extent to which the results are consistent over time. An accurate representation of the total population under study is referred to as reliability and if the results of a study can be produced under similar methodology then the research instrument is considered reliable. In other words, reliability relates to the consistency of the research instrument whereby it achieves the same results when used the same way under the same conditions on the same subjects. Charles[139] believes that reliability is the extent to which an experiment or test or any measuring procedure yields the same results after repeated trials. Reliability in this study will be achieved through the use of a research instrument which derives from Xu's study. However, the findings of Xu's study will not influence the research findings of this particular research project.

3.4.2 Validity

Validity is a concept explaining whether the research has achieved what it is intended to measure. According to Joppe, it is the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure. This study embodies the opinion presented by Golafshani[140] on the constructivist approach, valuing multiple realities that people have in their minds. In this regard, and in order to achieve validity in the research, multiple and diverse approaches and multiple methods of gathering data were used in this study. For instance, document reviews, interviews, self-administered questionnaires and follow-up interviews to clarify questions answered were used. Engaging multiple perspectives included data-gathering methods like self-administered questionnaires as well as structured interviews that were administered to the principals of schools. Follow up telephonic interviews with respondents from the Provincial Office were conducted. In an interview in pursuit of clarity, the EMIS policy documents as well as the Business Plan were consulted as source documents to verify the answers provided. In order to obtain a rich picture about the outcome of this research, the participants were chosen because of their direct involvement with the processes of the Education Management and Information System at different levels of the system. Data was gathered from different participants according to the roles they play

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[138] Joppe, M. 2000.

[139] Charles, C.M. 1995.

[140] Gholafshani, N. 2003.

in the Education Management and Information System. Interviews with the EMIS Provincial officials with regard to processes involved during the gathering of data from schools were also conducted. Telephone calls were made to the district and Provincial EMIS coordinators to ensure a clear understanding of the processes of data capturing and verification. Testing the effectiveness of EMIS was also conducted through following up on any unstructured questions which may have been asked. The questions posed were as follows:

- Please provide me with the names of schools that have a shortage or surplus of LTSM. The answer provided was that it was not possible to get such information because no survey tool requests schools to answer that question.

- Please provide me with the number of teachers teaching Home Language only as well as First Additional Language only. The answer provided was that there is always double counting as the system does not record particular teachers teaching a specific language but instead records all those teaching either Home Language or First Additional Language or both.

- Please provide me with the number of learners who have attained acceptable outcomes in Grades 3 in Numeracy and Literacy, in Grades 6 in Mathematics and Languages and in Grades 9 in Mathematics and Languages. The answer provided was that the schools' results are not captured per Learning Area but provide the pass rates per Grade. This creates problems as the Department of Basic Education requires the department to report on the above performance measures at the end of the year.

3.5   Sampling

Without doubt, if one wants to collect accurate data from a group, the best strategy is to examine every single element of that group. Ideally, gathering data from all the schools would be a reliable strategy to achieve the outcomes of this research. It is also expected that the study on evaluating information systems would consider gathering data from all the schools and the users of the information systems (EMIS) of the department. Due to the widely dispersed geographic distribution of the schools, district offices and offices of the participants in this study it would have been impractical to access the required data within the limited time available to complete this study, therefore only a sample of the entire population was targeted in this study. The sampling of the population group in this study is judgemental or purposive because the researcher uses the understanding and knowledge that she has about

relevant participants in the department. Such knowledge has been gathered from experience as well as from using information gathered from the EMIS Sub-directorate. It is hoped that such a group of choice will provide data relevant to the achievement of the objectives of this study. This approach is based on Bless and Higson- Smith's[141] viewpoint that it is also possible to reach accurate data by examining only a portion of the total group. Bless and Higson-Smith further assert that sampling, when compared to collection of data from the entire population offers the following:

- Gathering data from the entire group of the study is more time consuming. For instance, in the case of this study the researcher is expected to reach 1495 schools.

- The researcher is expected to distribute questionnaires to all schools in the Free State. Some schools do not have electricity or fax and e-mail facilities. Reaching 1495 schools would take almost as long as attaining the objectives of this research.

- A larger population might be scattered over a large geographical area. This scenario applies to the Free State as well.

- Sampling is the most effective way of collecting data when the population is extremely large.

This statement is supported by Berg[142] who states that the logic of using samples is associated with making inferences about the larger population from a smaller one. Such a representative sample will allow for the generalisation of the research findings.

The above positive statement in relation to the sampling of data creates a sense of confidence in the researcher that the findings of this study will be valid and could be generalised to include all the schools in the province that have computers for administration purposes. This study acknowledges the fact that farm schools form part of the entire population for the study group. The study has certain limitations in that it does not include all the districts as well as all the schools in the Free State. Farm schools are also excluded in this study because most farm schools in the province do not have electricity and are subsequently not provided with computers for administration purposes, which would enable the use of SA-SAMS. The results of this study could be generalised to inform the department on whether EMIS Free State is reliable and valid, or not. The results could also be used as a basis for future decisions

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[141] Bless, C and Higson-Smith. 2000.

[142] Berg, B.L. 2004. p.35

on how to improve EMIS Free State further, for the purpose of delivering an effective information management system in the province.

For the purposes of this study, sampling was used as a method to generate data and the findings were generalised to represent a picture of whether the information system (EMIS) is reliable and effective. The participants were chosen because of their direct involvement in data collection, verification and analysis of EMIS data before it is captured in the Provincial databases. For example, the schools were chosen because of their direct involvement in the completion of the surveys manually, or electronically on SA-SAMS. The principals were chosen for their direct responsibility as managers in ensuring that correct, accurate data is submitted to the district and provincial offices. Obtaining information from all schools in the Free State would have been the ideal; however the limited time available to complete this study necessitated a sampling from Botshabelo schools in the Motheo district only. The name Botshabelo means a "*place of the refugee*." This township was established in 1978 after the non-speaking Tswana people were forcibly removed by the Bophuthatswana government. It became a Sesotho-speaking location under Dr Mopedi during 1979. There is a population of approximately 180 000 which makes it the largest township in the Mangaung Local Municipality. Botshabelo township was chosen because of the shared cultural identity of people who have the same history and background. As Botshabelo is situated 50 kilometres from Bloemfontein, people commute mostly by bus to Bloemfontein to earn a living. Out of sixty schools in Botshabelo, ten were selected as the sample for this study. Five primary schools and five secondary schools were chosen to represent all the schools in the province. This means the researcher did not have to travel vast distances to reach all the schools in the province. Only public schools were chosen because public schools have at least one or two computer(s) for administration purposes. SA-SAMS is installed in these computers by the Education Management Information Systems Sub-directorate for schools to capture data easily and effectively.

The second group of participants were the School Management Governance and Developers (SMGDs) who were also chosen to participate in this study for their direct responsibility in verifying data from schools and overseeing the correction of mistakes. In addition, as managers of schools, the School Management and Governance Developers have to ensure that the schools they are responsible for do not provide erroneous data as this could result in the incorrect allocation of funds according to the data provided.

Currently there are eighty-five School Management Governance Developers employed by the department per district as indicated below:

Table 3.1 : Distribution of School Management and Governance Developers per district	
District	Number
Xhariep	8
Motheo	19
Lejweleputswa	21
Fezile Dabi	18
Thabo Mofutsanyana	19
TOTAL	*85*

The third group of participants in this study consisted of data capturers who are based either in the Provincial office or in the district offices. The data capturers, called EMIS coordinators, were chosen because of the critical role they play in verifying the correctness of data. These participants were chosen because of their role in data verification during capturing onto the EMIS database. This is the third level verification process that needs to take place before uploading of data takes place. These data capturers have to work closely with the schools to ensure that mistakes detected are immediately corrected by the schools. The data capturers also have a pool of previous data for each school. Therefore, it is their responsibility to double check the current data submitted against previous years for discrepancies. For any discrepancy found, the school must be informed in order to effect the necessary changes. Currently there are six data capturers appointed by the department. Two of these data capturers for Motheo and Xhariep are based at the Provincial Office due to lack of office space in these districts. There is no EMIS coordinator in Lejweleputswa as the previous incumbent resigned. There is one EMIS coordinator in Fezile Dabi. As a result, the EMIS coordinators, irrespective of their location, are performing the same duties thus ensuring that each district is catered for during the data verification process.

The fourth group of participants comprised the Chief Education Specialist and the Deputy Chief Education Specialist who are responsible for ensuring that data is quality assured and verified before storage in the provincial database. These two participants were chosen because of their managerial roles in the administration of data quality for collection, storage and

analysis. These are the officials with expertise in the prescribed processes who have to guide schools and other stakeholders in data gathering. The Chief Education Specialist was also chosen because of his/her fundamental role in lobbying the department to increase the EMIS budget and membership of the influential Heads of Education Committee (HEDCOM) sub-committee on EMIS which advises Provincial Heads of Education and the Council of Education Ministers on how EMIS could be improved in provinces. The CES and DCES were also chosen because of their management functions in setting standards for data quality and setting of targets and performance measures in the Strategic Plan as well as the Annual Performance Plan of the department. They are ultimately responsible for the analysis of data.

3.6   Data collection

There are many ways of collecting data from participants. Ideally it would have been helpful to observe schools during the process of completing the survey forms as well as the districts during the process of capturing and verification of data from schools. This was not possible because the study was conducted at a time when the schools had already completed the snap as well as annual surveys. Data was collected from various sources such as primary and secondary sources to gather relevant information pertaining to the study. Primary data was collected from the participants mentioned above through the use of a questionnaire which was adapted to suit the needs of this study. This research was conducted at a time when the filling in and capturing of survey forms had already been done. It was not possible for the researcher to visit the schools and assess how the capturing was indeed done.

The study followed various ways to get rich information that would assist in achieving its purpose. The survey tools were designed according to the target groups of this study. To avoid re-inventing the wheel, various survey tools that had been used in the past to analyse information system success were scrutinised. The process of scrutinising the previously tested survey tools was to make sure that a similar format was adopted for the study to achieve a validity status. The EMIS tool that was developed by the Department of Basic Education was also examined. It was discovered that this tool was aimed at the Provinces to check whether EMIS units had been established and whether there was compliance with the National Education Information Policy. The adoption of an available instrument which has already been tested on numerous studies would guarantee the validity and reliability of this study. The survey tools used in this research were adopted from the study conducted by Xu. These tools were tested in the research conducted on "Critical success factors of information

systems for data quality in accounting." The dimensions for information systems success, the elements of data quality standards and the objectives of information quality were used as a framework to develop and adopt the survey tool for this study. The constructs for information system effectiveness that were discussed by McLean and DeLone in their study were also used as a guide for the adoption and development of the survey tools used in the study. The survey tools targeting the school principals as well as the School Management Governance and Developers followed the dimensions presented by McLean and DeLone. The principals and the School Management and Governance Developers are believed to be critical role players at the entry point for the capturing of credible and reliable data. This would also apply equally to recipients and users of an information system in this study. Each dimension had sub-questions assessing whether EMIS presents credible and reliable data. The participants were required to fill in the self-administered questionnaires that address the above dimensions.

The respondents were required to assess each dimension using a rating scale from 1-7, where 1 represented "absolutely disagree, 2 represented disagree, 3 represented mostly disagree, 4 represented neutral, 5 represented mostly agree, 6 represented agree and 7 represented strongly agree." The self-administered questionnaire that was addressed to the principals as well as the School Management and Governance and Developers assessed the following dimensions:

3.6.1   System quality

System quality was chosen to analyse how well EMIS Free State performs its functions of data creation and storage, and how well schools are supported to use EMIS effectively.   As discussed by Seddon in Chapter Two, system quality that is of a high standard attracts users to use the system more frequently. The more the system is used the greater the impact on the individual as well as on the organisation. To evaluate this dimension, different indicators of success were used.

The indicators for system quality were formulated to assess how effective EMIS is, in data collection, storage, transfer and application. Its ease of use and the quality of the EMIS program itself were also evaluated. In order to measure the dimension of system quality the questions directed to principals and the School Management and Governance Developers were different in nature. Different sets of questions assessing how effective EMIS is in terms of the indicators discussed above were put to each group of participants.

3.6.2   Information quality

The objective of questions that were asked in relation to information quality was to assess whether EMIS ensures that the information captured and generated by EMIS meets the success indicators of relevance, timeliness and accuracy. In other words, this dimension is aimed at assessing whether the right information is collected, captured and made available to the relevant users on time. The respondents were required to assess each dimension using a rating scale from 1-7, where 1 represented "absolutely disagree, 2 represented disagree, 3 represented mostly disagree, 4 represented neutral, 5 represented mostly agree, 6 represented agree and 7 represented strongly agree".

Although the questions posed either to the school principals or the School Management and Governance Developers followed the same structure or format, the types of questions asked were relevant to the target group. The questions asked of each group of participants were grouped according to the indicators of success addressing relevance, timeliness and accuracy, etc. These were asked because they are presented as success indicators in the data quality standards as well as in the National Education Information Policy.

3.6.3   Individual and organizational impact

The positive measures for system quality and information quality exert a positive influence on the individual and organizational impact. These two dimensions were combined in this study because it is strongly believed that the success gained by EMIS on system quality as well as information quality has a positive effect on organizational and individual impact. Information use and user satisfaction were not measured in this study because it is also believed that these two dimensions are influenced by system quality and information quality success measures. To measure individual and organisational impact, a set of related questions assessing whether EMIS is effective in assisting the participants in performing their duties or making informed decisions was developed. The questions were rated using a seven scale rating where, "1 represented absolutely disagree, 2 represented disagree, 3 represented mostly disagree, 4 represented neutral, 5 represented mostly agree, 6 represented agree and 7 represented strongly agree". Although the questions followed the same structure according to the dimensions presented above, the sub-questions were dissimilar. One difference was that section A of the survey tool for School Management and Governance Developers required participants to rate EMIS data using a five point rating scale ranging from "very poor, poor,

neutral, high and very high." Another difference was that the survey tool for the principals was followed up with structured interviews.

3.7   The survey tools

3.7.1   The survey tool for School Management and Governance Developers

The survey tools for the School Management and Governance Developers were distributed using the e-mail address of the Chief Education Specialist, the immediate supervisor of the target group with an instruction to print and make copies for all the School Management and Governance Developers whom he / she supervises. It was also taken into consideration that a request to print and distribute the survey tools depended entirely on the attitude of the recipient who may feel that the distribution was not part of his / her job description. As a result, a set of printed copies was sent via messengers to School Management and Government Developers. The purpose of distributing 85 copies to the whole group of School Management and Governance Developers was based on the assumption that not all participants would respond for one reason or another. Of the 85 copies distributed to five districts, 19 responses were received from the following districts:

- 7 responses from Lejweleputswa district

- 10 responses from Thabo Mofutsanyana district

- 2 responses from Motheo district

There were no responses from Fezile Dabi and Xhariep districts.

This sample of received responses was used to generalise the findings of the study. Participants were allowed four weeks to complete the survey tool. Extracting responses from participants was difficult. Responses were received after three reminders, which were made telephonically to the participants. Because the participants are field workers and are not always in their offices, their lack of response was perhaps understandable. It was also difficult to make appointments with this group of participants for follow-up interviews because of the nature of their work.

3.7.2 The survey tool for school principals

The survey tool for the school principals was faxed to the principals' offices. After confirmation of the fax, the school was phoned to check if the fax had been received. This means of communication with the schools was the quickest method that was available because not all the schools surveyed have e-mail facilities. The fax was received by the school clerk. The school principals were allowed two weeks to complete the survey tool. For follow-up structured interviews, an appointment was made with the schools. The purpose of the structured interview was to interact with principals and to engage with them on how the process of data capturing is done at school level. Questions asked during the interview were also aimed at getting a rich picture of how the schools manage the capturing of data, as well as to check whether the schools are aware of the National Education Information Policy objectives as well as data quality standards. The structured interview also provided an opportunity to clarify answers provided in the self-administered questionnaire. Some of the questions were aimed at assessing whether the school had control measures in place to ensure that data submitted to the Provincial office via the district offices is quality assured and by whom. The structured interview lasted for an hour and a maximum of three schools were covered per day except for the first day when four schools were covered. The principals of the schools were cooperative and it was easy to conduct interviews at these schools.

3.7.3 The survey tool for EMIS management

A self-administered questionnaire was also prepared for the EMIS Provincial analysts. Only two participants were targeted. No sampling was done because there are only two officials responsible for providing leadership and operational direction to achieve the EMIS mandate. The questions asked in these survey tools were aimed at determining whether EMIS Free State meets the criteria of a good system, as has been discussed in Chapter Two. The questions also sought to determine whether EMIS Free State is aligned with the data quality standards as well as the objectives of the National Education Information Policy. In Chapter Two above, it has been argued strongly that the deployment of information systems depends entirely on political commitment, top management support, adequate funding, technology architecture, etc. The hardware and software infrastructure, system-wide integration as well as training and support are highlighted as strong pillars for effective information systems. In order to assess whether EMIS Free State meets these requirements, various questions directed to the Chief Education Specialist as well as the Deputy Chief Education Specialist were asked

in the self-administered questionnaire. These participants are critical in ensuring the success of EMIS Free State. They have been appointed to provide operational leadership in the implementation of the National Education Information Policy and Data Quality Standards that were developed by the Department of Basic Education to guide provinces about data-collection processes from schools. The first part of the questionnaire required information related to the participant's role in the data management, their qualifications as well as the role that the participant plays in influencing any budget increases. In Chapter Two above, Mugerezi[143] argues that the appointment of an ICT champion with expertise in the field will ensure that the planning and development of an information system is achieved. The ICT champion, according to Mugerezi, must be both committed and convincing, and should encourage everyone to push the development and implementation of an information system forward. The questions asked of the participants assessed whether EMIS Free State meets the requirement of the appointment of a committed expert who is able to influence and convince all levels in the system for successful development and implementation of information systems. The self-administered questionnaire also assessed whether the EMIS Provincial managers have played a leading role in ensuring that all stakeholders are aware of the objectives of the National Education Information Policy and data quality standards. It is also stated in the objectives of the Education Information Policy that data must be distributed through various media to be analysed at entry point. The self-administered questionnaire also addresses this requirement when a question focusing on the means of distribution of analysed data to all schools including those that do not have Internet was asked. In Chapter Two above, technology infrastructure has been identified as crucial in capturing and analysing data. For instance, data mining has been identified by different theorists such as Skyrme[144] as well as Lee and Hong[145] as a powerful technology infrastructure that is used in data analysis to identify trends and patterns from huge pools of data. A question assessing whether data mining is used in the Free State was put to the Provincial EMIS participants. The questions asked were intended to assess whether the participants understood the type of questions that one has to ask during data mining, thus enabling the retrieval of relevant data for the query.

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[143] Mugerezi, E. 2002

[144] Skyrme, D.J. 1999

[145] Lee, S.M. and Hong, S. 2002

3.7.4   The survey tool for EMIS coordinators

The last group of participants identified for this study were the data capturers. This group was identified due to their role in the verification of data before it is captured in the Provincial databases. In Chapter Two, checks and balances during data capturing were identified as extremely important in the EMIS storage of reliable data. The data capturers based at the Provincial Office were also identified to participate in this study. It is argued strongly in Chapter Two that there should be checks and balances at each level to ensure the quality of data stored in EMIS databases. It was critical that the data capturers were included in this study to assess their role in this EMIS data gathering process. It was critical also to assess whether the verification as discussed in the earlier chapter is properly conducted by the data capturers. The question linked to the verification process was put to the data capturers in order to identify whether there are gaps in the data verification process. The questions related to verification were based on whether the participants discover mistakes during data capturing. It was also assessed whether, after the mistakes are detected, there is a process followed to make sure that the data is corrected before it is uploaded in the EMIS database. The self-administered questionnaire also sought to assess the qualifications that the participants possess. In Chapter Two, the EMIS reception of electronic and hard copies of surveys for capturing and for filing purposes was discussed. In line with what was discussed in this chapter, participants were asked to indicate the different types of surveys they receive from schools and the filing system that is used to keep records of the surveys. The self-administered questionnaire was distributed via e-mail. The information about the data capturers and where they are based was gathered from their immediate supervisor. It was interesting to find that there are districts that do not have data capturers due to non-filling of posts or lack of space in the district to accommodate the officials. For instance, in Lejweleputswa there is no data capturer because the post is vacant. Data capturers for Motheo and Xhariep are based at the Provincial Office due to lack of operational space in the districts. This means the EMIS data capturers perform the same duties irrespective of their location. As a result, one questionnaire was prepared for participants. Eight questionnaires were distributed to all the participants according to the number provided by their supervisor. The participants were given four weeks to respond. Four responses were received and these were analysed to represent the target group.
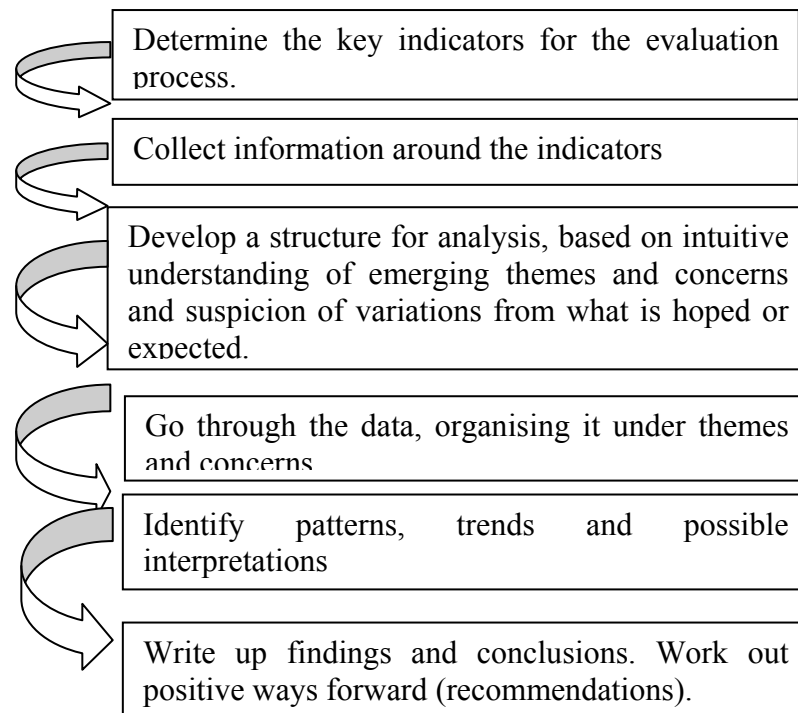
3.8 Data capturing and analysis

The rich textual data gathered through the filling in of questionnaires and interviews was captured using a Microsoft Excel Spreadsheet. Captured data was analysed by breaking it up into manageable relationships or patterns. Data was also analysed by turning the detailed information into an understandable representation of patterns, trends and interpretations. The starting point of analysis was an understanding of key themes emerging from the information gathering process. Based on Mouton's[146] argument, the findings of the research were compared with the existing theoretical framework, checking whether the results are supported or falsified by new interpretation. The nature of this research is qualitative, therefore the researcher will analyse data checking for consistent patterns within the data. Bless and Higson-Smith[147] emphasise that a nominal scale of measurement is used to analyse data thus allowing for the classification of information into categories which cannot be compared against one another as they are qualitative in nature.

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[146] Mouton, J. 1996. p.109.

[147] Bless and Higson-Bless 2000 p.99.

The process of analysis that was used in this study, followed the pattern below as outlined by Janet Shapiro[148]

Determine the key indicators for the evaluation process.

Collect information around the indicators

Develop a structure for analysis, based on intuitive understanding of emerging themes and concerns and suspicion of variations from what is hoped or expected.

Go through the data, organising it under themes and concerns

Identify patterns, trends and possible interpretations

Write up findings and conclusions. Work out positive ways forward (recommendations).

Figure 3.2: Process for analysis of data.   Source: Shapiro, J. 2000.

The above are some of the questions that were asked from a Management point of view to assess whether the system responds to the needs of users. The next chapter presents the analysis of the findings as well as conclusions drawn regarding the efficacy of EMIS Free State.

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[148] Shapiro, J. 2000.

Chapter 4

A SYSTEMS EVALUATION OF THE FREE STATE EMIS

4.1   Introduction

In Chapter Two, an analysis of different theories was presented to determine the criteria used when evaluating the success of an information system. Chapter Two also offered a discussion on the objectives of the National Education Policy as well as the data quality standards, which are used as a framework by Provinces to determine the success of EMIS. These frameworks serve as a guide to the various provinces, for the purpose of ensuring that EMIS is standardised to produce quality information that will enhance informed decision making and better planning by the department. The set of questions used for structured interviews with principals was also analysed to guide the argument presented in this chapter.   Theories discussed above in Chapter Two (including those attributed to McLean and DeLone, Bocij, Seddon and others) argue that the quality of information must meet characteristics which are consistent with the elements discussed in the data quality standards that the EMIS Free uses as a framework. These include the following.

Relevance – the extent to which the data meets the real needs of the clients. Bocij et al.. in Chapter Two also confirm that when information is relevant it has to assist in the decisions made by the organisational members.

Accuracy - The degree to which the information correctly measures what it was supposed to measure.

Timeliness - The information must be produced in a timely manner

**Accessibility -** Refers to the ease with which information is obtained from the department.

In relation to the above quality standards, DeLone and McLean presented an information system success model that has been tested in various organizational settings. The information quality that McLean and DeLone used as the dimension for information-system success

demonstrates the same indicators that are presented in data quality standards, hence the information quality was evaluated from participants. To evaluate the information quality dimension, five questions rating data quality from very poor to very high were asked, as well as seven questions rating information quality between 1-7 (1 being absolutely disagree and 7 being strongly agree). The participants were mainly School Management and Governance Developers, of which 14 out 19 rated data quality within a range of high to very high.

4.2 Analysis of SMGD responses : Section A

| Table 4.1: Raw data for responses from SMGDs		
	Rating	Responses
Overall data quality		
	Very poor	0
	Poor	1
	Neutral	4
	High	13
	Very high	1
Accuracy of data		
	Very poor	0
	Poor	2
	Neutral	5
	High	9
	Very high	3
Timeliness of data		
	Very poor	0
	Poor	2
	Neutral	6
	High	9
	Very high	2
Completeness of data		
	Very poor	0
	Poor	1
	Neutral	9
	High	8
	Very high	1
Consistency of data		
	Very poor	0
	Poor	1
	Neutral	9
	High	8
	Very high	1

4.2.1 Analysis for overall data quality
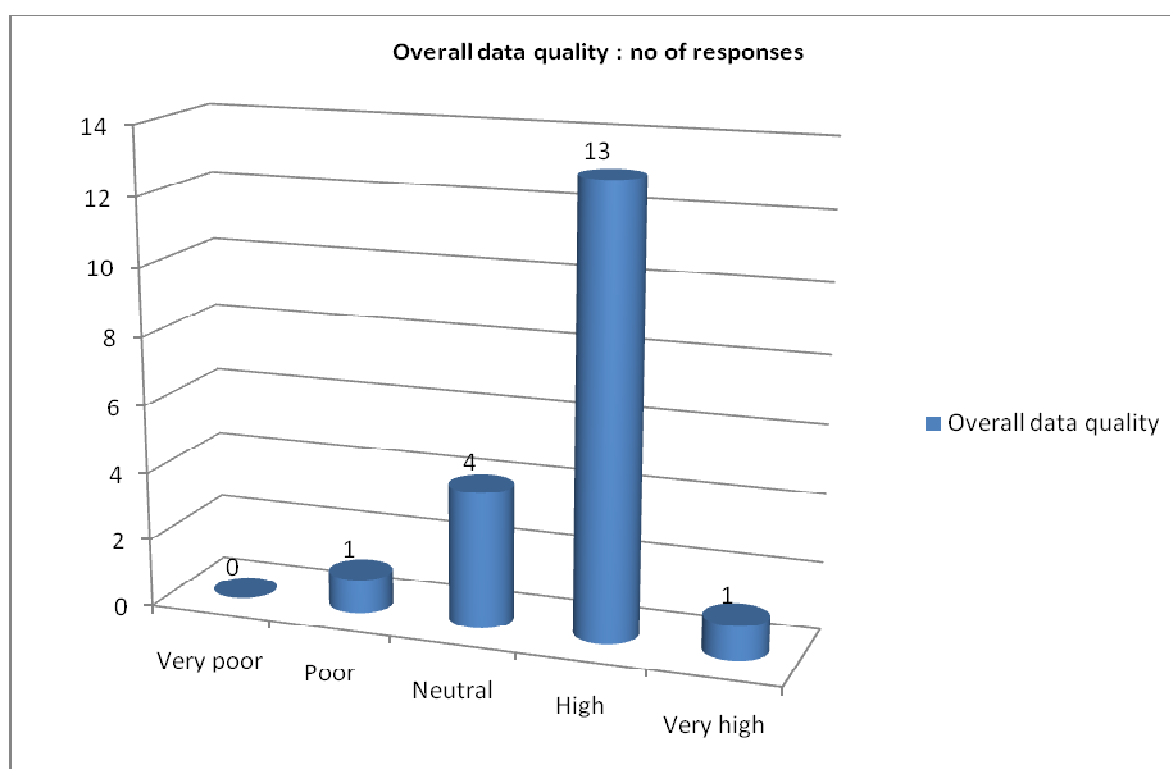
Figure 4.1 : Analysis of responses on overall data quality by SMGDs

The respondents were required to rate the overall data quality using the following rating scale:

"Very poor, poor, neutral, high and very high." It is clear from figure 5.1 above that respondents are satisfied with overall output from EMIS because fourteen out of nineteen participants rated overall data quality as ranging between high to very high. This means that EMIS output conforms to the data quality standards prescribed

4.2.2 Analysis of accuracy of data
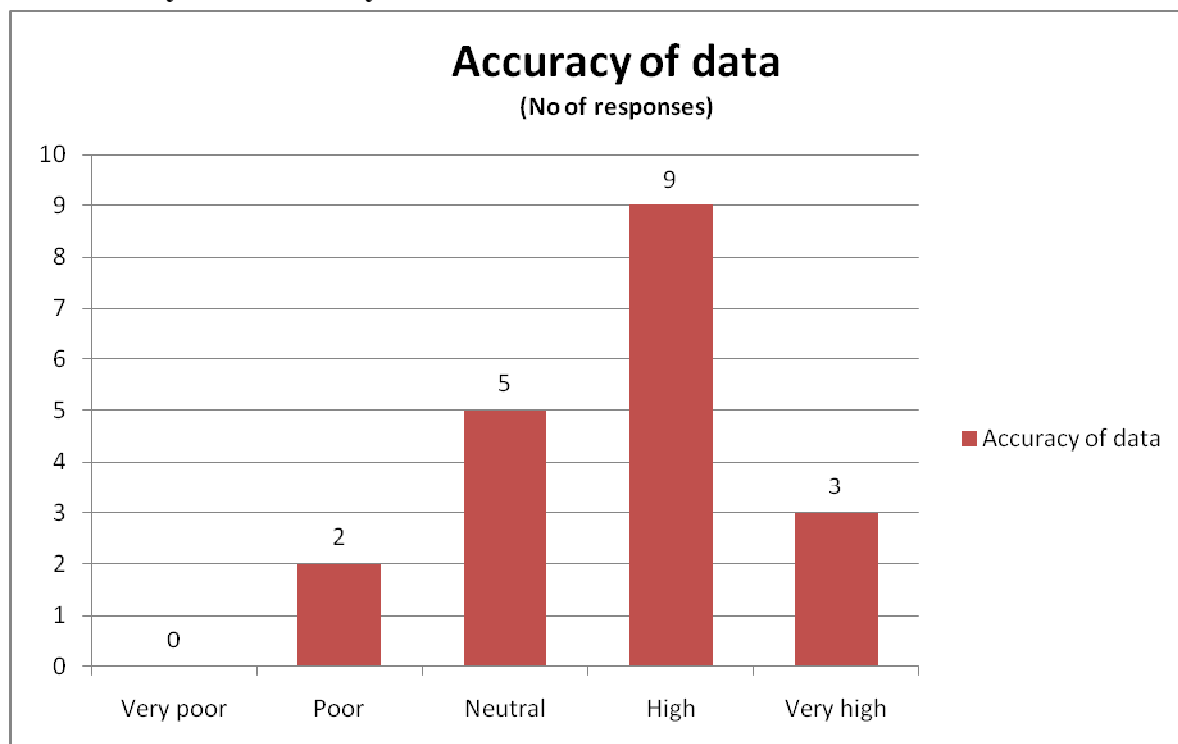
Figure 4.2: Analysis of responses on accuracy of data by SMGDs

Twelve respondents rated accuracy of data between high and very high, whereas nine respondents indicated that data from EMIS is accurate, whilst three of the respondents rated the accuracy of EMIS data as very high. This demonstrates that there is a correlation between the rating for overall data quality and the responses from the participants regarding this indicator.

4.2.3   Analysis of timeliness of data
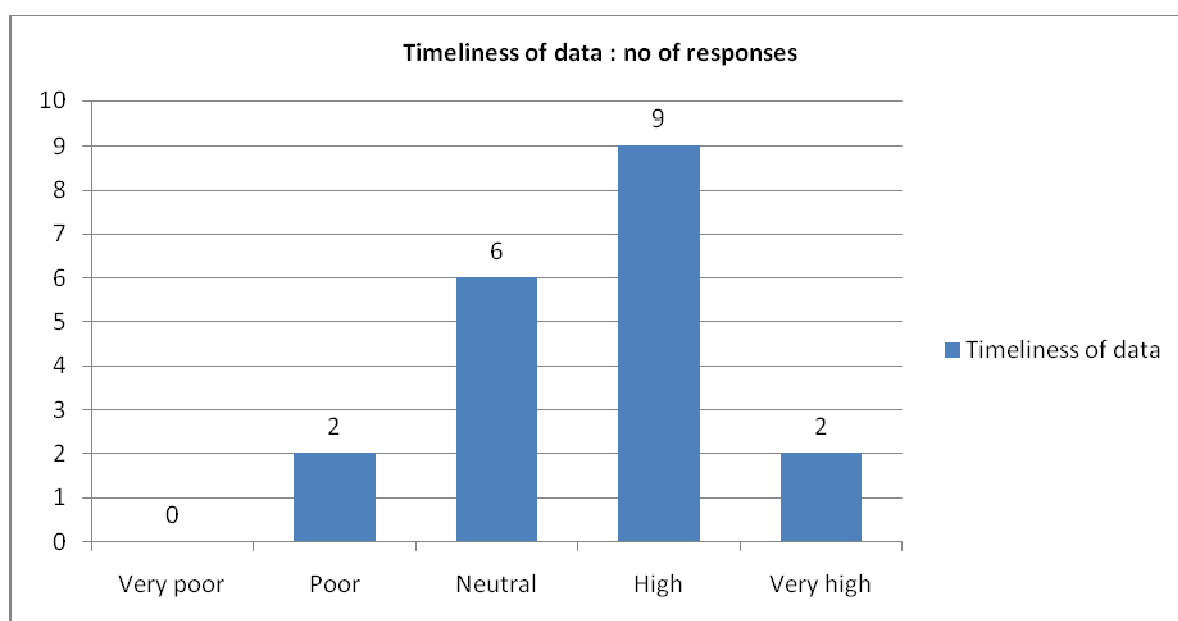
Figure 4.3: Analysis of responses on timeliness of data by SMGDs

Figure 4.3 above also depicts positive evaluation of the timeliness of data by the eleven participants. From the remaining eight participants, six were neutral about the statement whilst two indicated that timeliness of data is poor.

4.2.4 Analysis of completeness of data
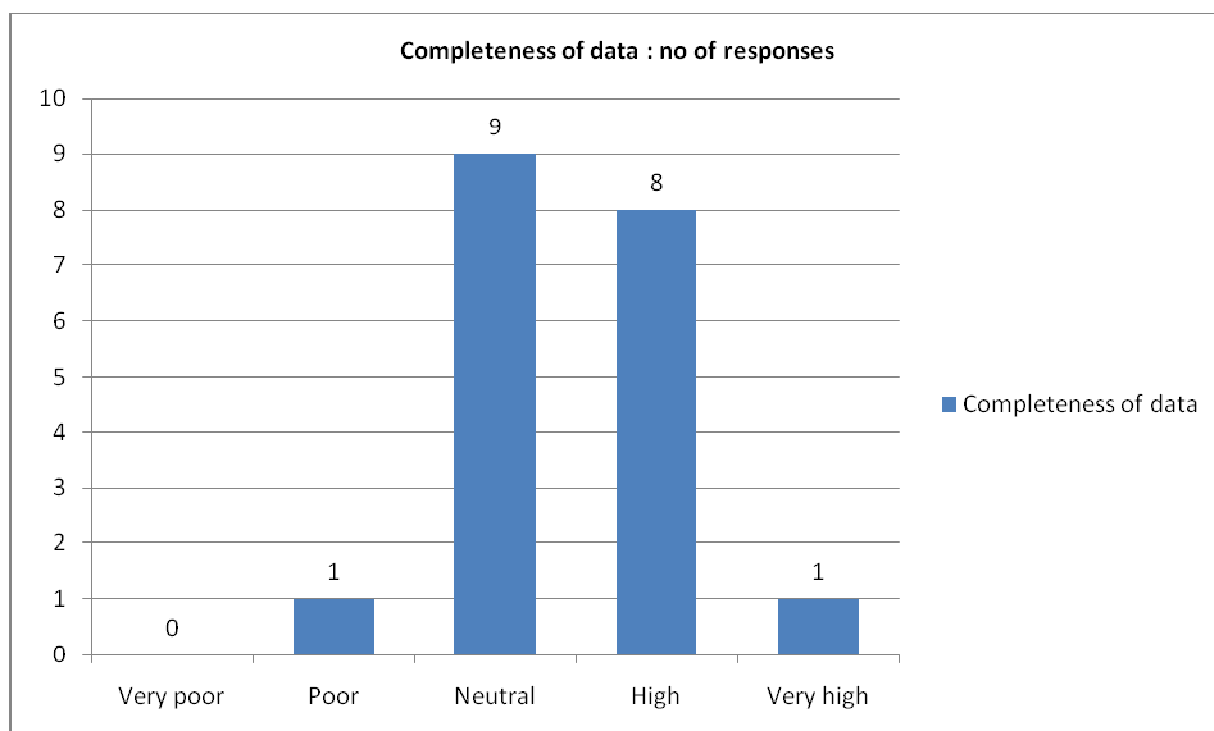
Figure 4.4: Analysis of responses on completeness of data by SMGDs

The rating for completeness of data depicts that nine participants rated completeness of data between "high and very high." Of the ten participants remaining, nine were neutral while one participant indicated that the completeness is poor.

4.2.5 Analysis of consistency of data
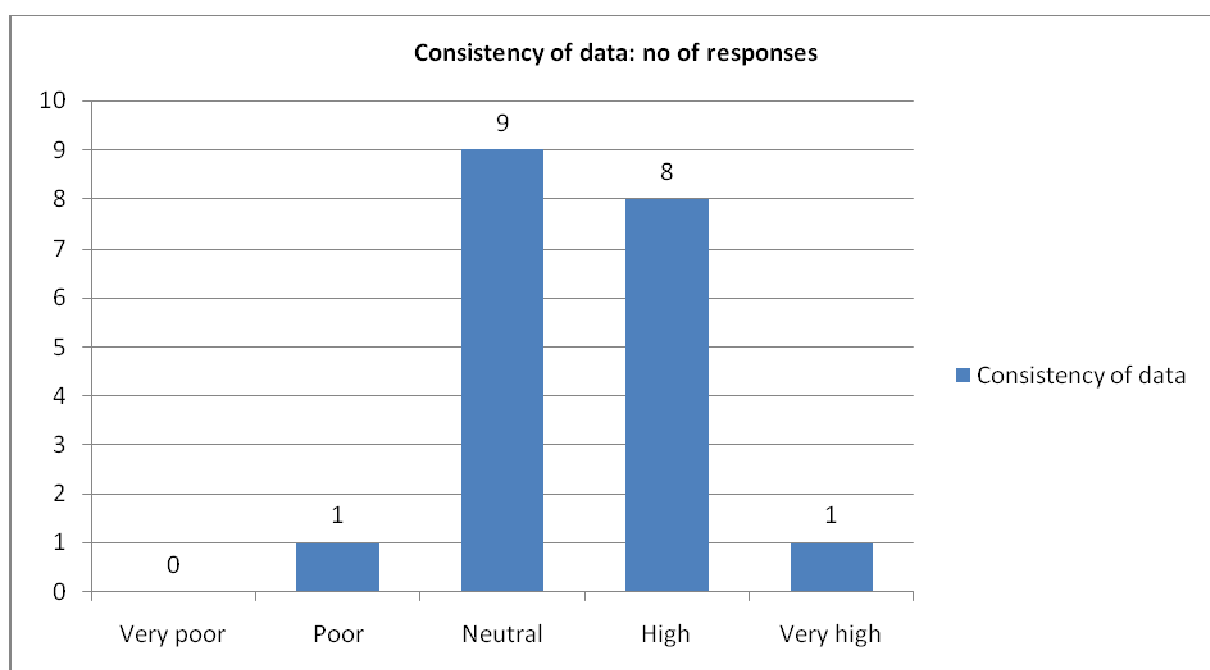
Figure 4.5: Analysis of responses on consistency of data by SMGDs

Figure 4.5 shows that consistency of data was rated between "*high and very high*" by nine participants. The remaining ten participants rated consistency of data between neutral and poor. Because of the work environment of the participants it was not possible to follow up on this question to clarify the answers provided.

4.3 Analysis of responses from School Management and Governance Developers : Section B

Four questions rating system quality were posed to participants. Each question required participants to use a seven point rating scale which is explained as follows:

1-3 means : strongly disagree with the statements listed on your left hand side.

4 means : neutral about the statements on the left hand side.

5-7 means : strongly agree with the statements on the left hand side

4.3.1 Assessing the dimension for system quality
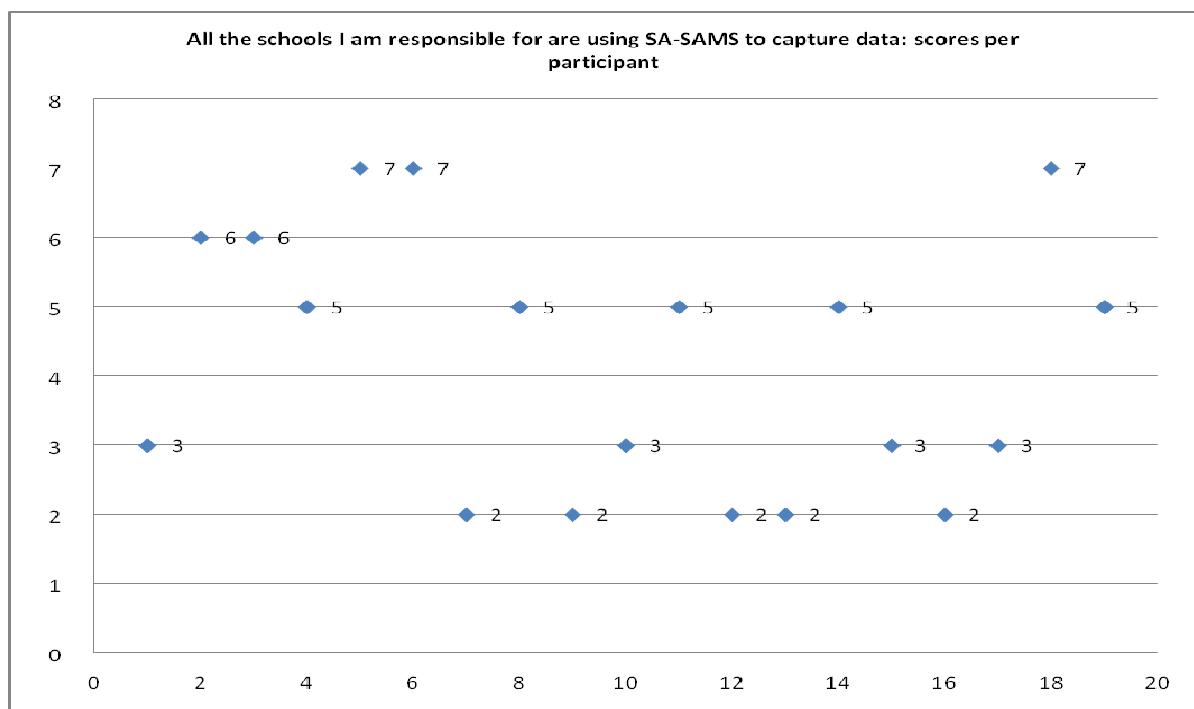
Question 1.1

Figure 4.6: Analysis of responses on system quality by SMGDs sub-question 1.1

This question was aimed at assessing whether all the schools that the participants are responsible for have access to SA-SAMS to facilitate the capturing of data. Ten out of nineteen respondents strongly agree that the schools they are responsible for have access to SA-SAMS. Although these answers may be true for township or urban schools that have electricity, it is argued that farm schools in the province are not electrified and are therefore not using SA-SAMS. For this reason the study only concentrates on township and urban schools.
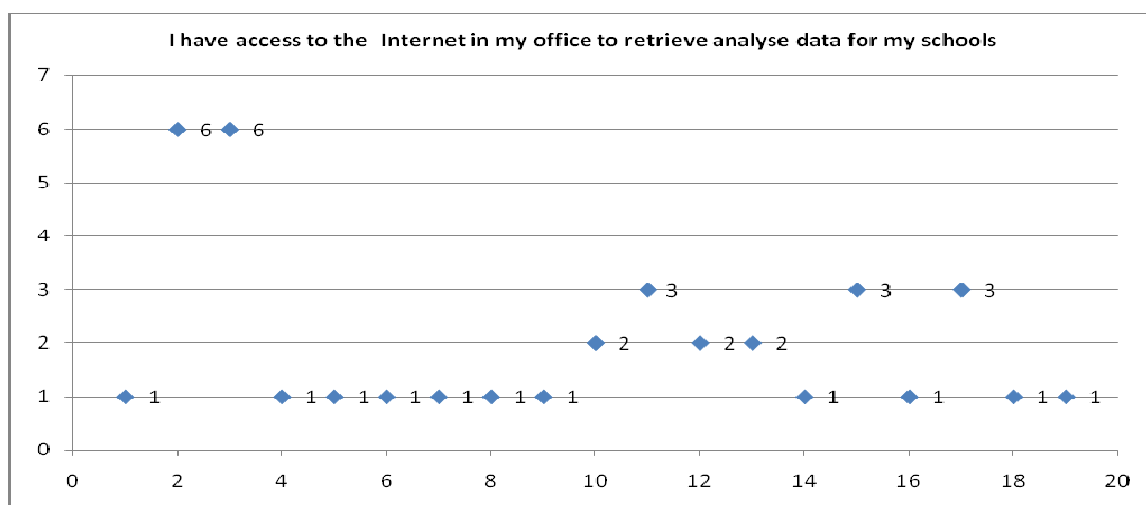
Question 1.2

Figure 4.7: Analysis of responses on system quality by SMGDs sub-question 1.2

Figure 4.7 above depicts that seventeen out of nineteen participants strongly disagree with the statement. This indicates that these participants are denied opportunities to access the data regarding their schools, thus making it difficult to contribute meaningfully to planning and decision making. This problem contradicts the objectives of the National Education Information Policy which emphasises that EMIS must yield data and statistical information needed for planning and monitoring at all levels of the system.
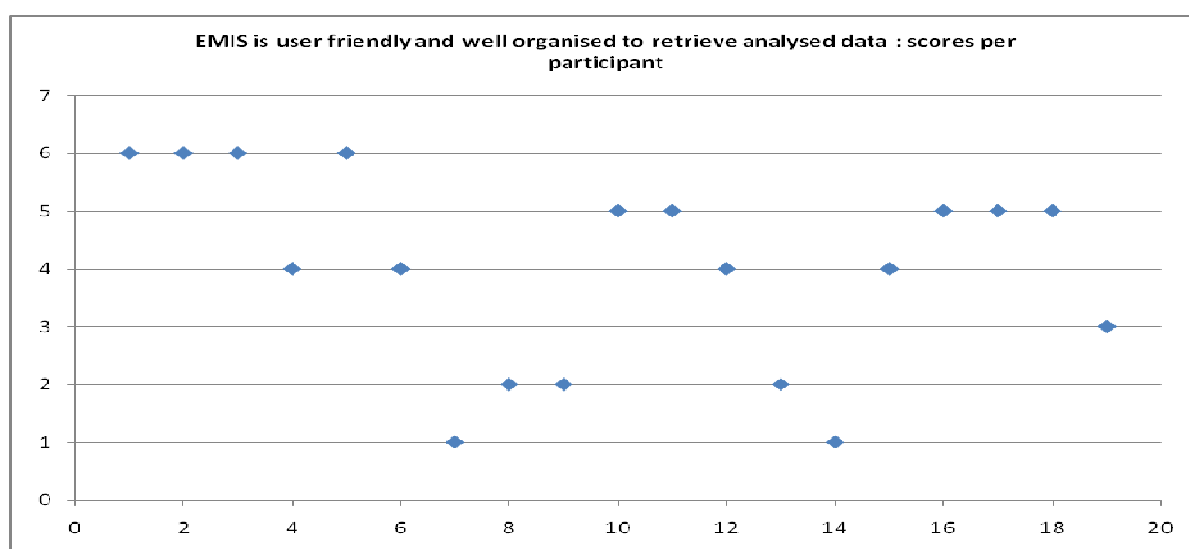
Question 1.3

Figure 4.8: Analysis of responses on system quality by SMGDs sub-question 1.3

Figure 4.8 above was aimed at assessing whether EMIS is user friendly in retrieving analysed data. Nine participants strongly agreed with the statement, four were neutral about the

statement and six participants disagreed with the statement. Seddon, in Chapter Two above argues that system quality entails ease of use as well as the quality of documentation. Seddon also highlighted that "the high level of System Quality contributes to more use of the system" The participants' rating of system quality below 5 poses a challenge because according to Seddon the high level of system quality contributes to more frequent use of the system and increased user satisfaction. There is a correlation between the answers provided for question 3 and the answers provided for question 2. It is argued that if most participants do not have access to the Internet to retrieve analysed data it will be difficult to assess the question posed.
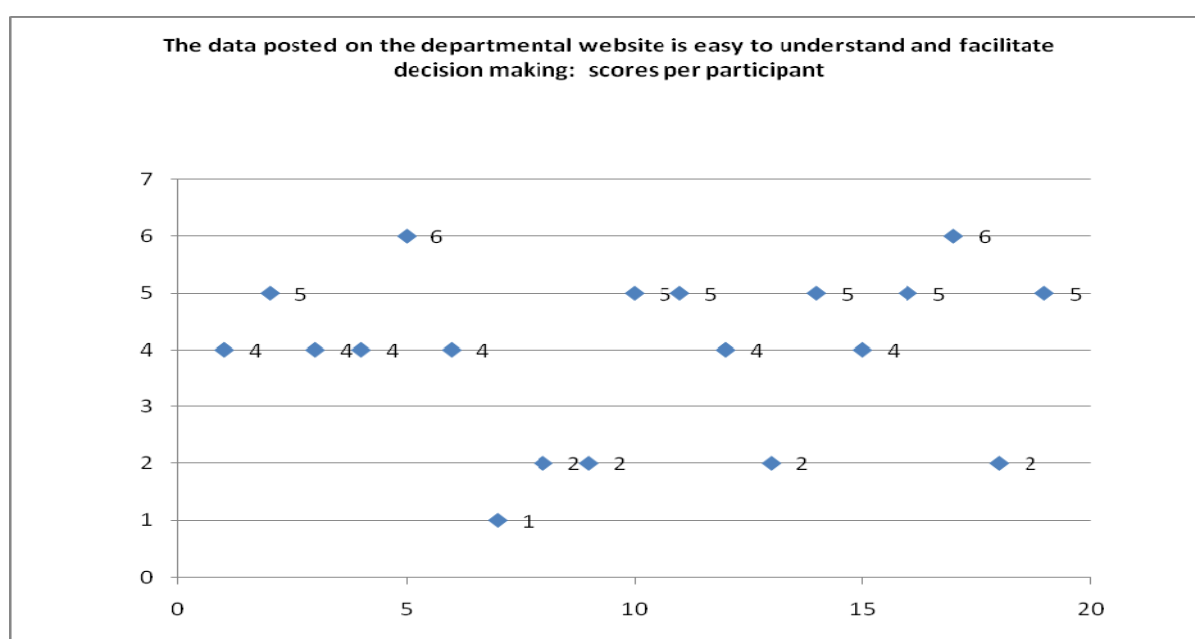
Question 1.4

Figure 4.9: Analysis of responses on system quality by SMGDs sub-question 1.4

The analysis of responses for this question depicts that eight participants strongly agreed, whilst six participants remained neutral and five participants strongly disagreed.

As pointed out in the National Education Information Policy, information on EMIS must be accessible and analysed close to the entry point and this means that the participants without Internet access are unable to view the data on Statistical Reports that is displayed under the link "Statistical Reports," or to check which schools have not submitted their surveys under the link " Outstanding Surveys" that would make it possible for these officials to follow up on the defaulting schools so that data is captured timeously for access by stakeholders.

4.3.2 Assessing the dimension for information quality

Seven questions rating information quality were asked of participants. Each question required the participant to use a seven-point rating scale which is explained as follows:

1-3 means : strongly disagree with the statements listed on your left hand side.

4 means : neutral about the statements on the left hand side.

5-7 means : strongly agree with the statements on the left hand side

Question 2.1

Figure 4.10: Analysis of responses on information quality by SMGDs sub-question 2.1

The analysis as depicted by figure 4.10 above indicates that four participants strongly disagreed with the statement, four participants were neutral about the statement whilst eleven participants strongly agreed with the statement. The fact that eight participants rated this question below rating 5 indicates that there is no clarity regarding the roles that participants are supposed to play in so far as the verification of data is concerned.

Question 2.2

Figure 4.11: Analysis of responses on information quality by SMGDs sub-question 2.2

Figure 4.11 above depicts that nine participants strongly disagreed with the statement, five participants were neutral whilst five participants strongly agreed with the statement. This means that more than half of the participants indicated that feedback about captured data is not distributed to role players for final verification.

Question 2.3

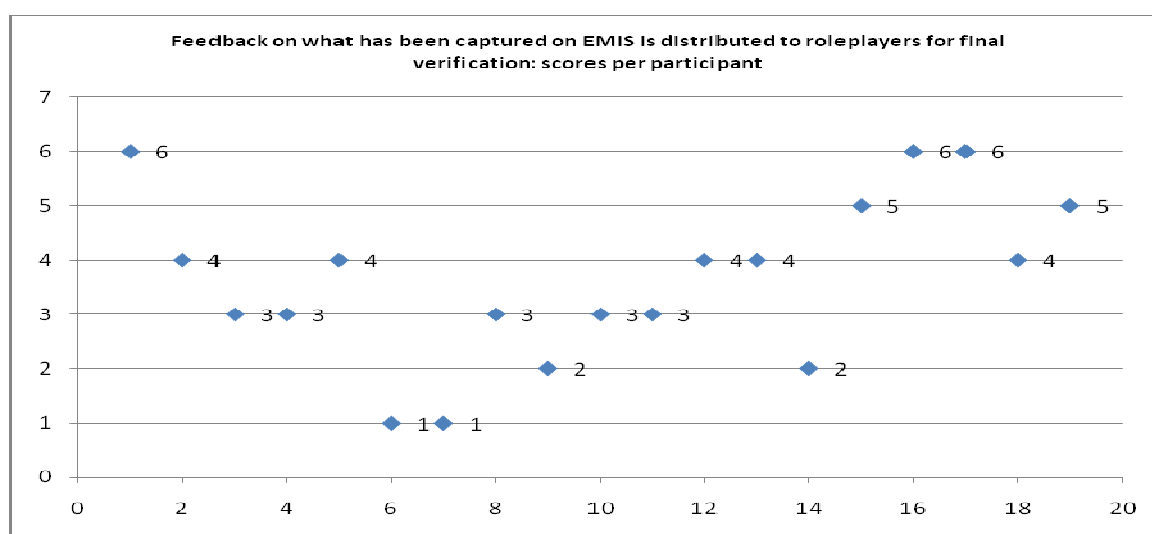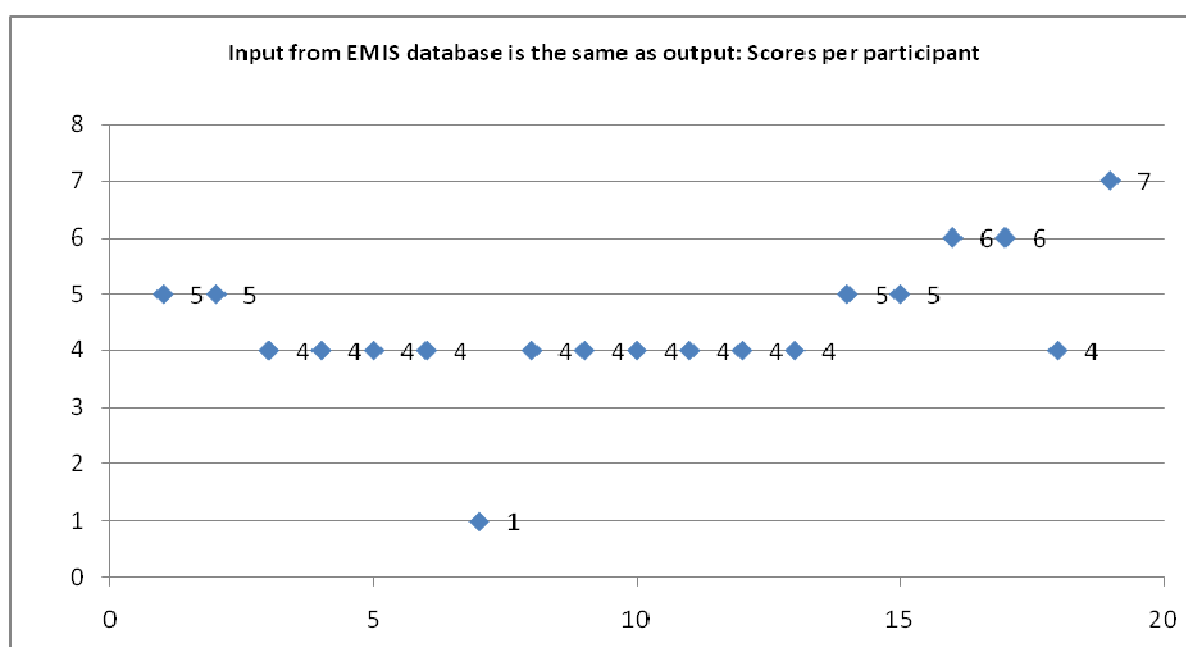*Figure 4.12: Analysis of responses on information quality by SMGDs sub-question 2.3*

Figure 4.12 above depicts that eleven participants were neutral regarding the statement. This reflects a correlation with the answers provided above regarding access to the Internet where

it was clear that more than half of the participants did not have access to the Internet. Only seven participants strongly agreed with the statement. This shows that EMIS output is not accessible to participants. This deficiency contradicts the policy objectives, where it is stipulated that EMIS output must be distributed to stakeholders using different forms of media to enhance informed decision making.

Question 2.4

Figure 4.13: Analysis of responses on information quality by SMGDs sub-question 2.4

Five participants from figure 4.13 above strongly disagreed with the statement, four participants were neutral whilst ten participants strongly agreed with the statement. The Department of Basic Education's National Education and Information Policy has outlined its objectives and what is required of each province. These participants have to give direction to schools with regard to governance and management – they therefore need to be aware of this policy to provide proper and adequate guidance to the schools.
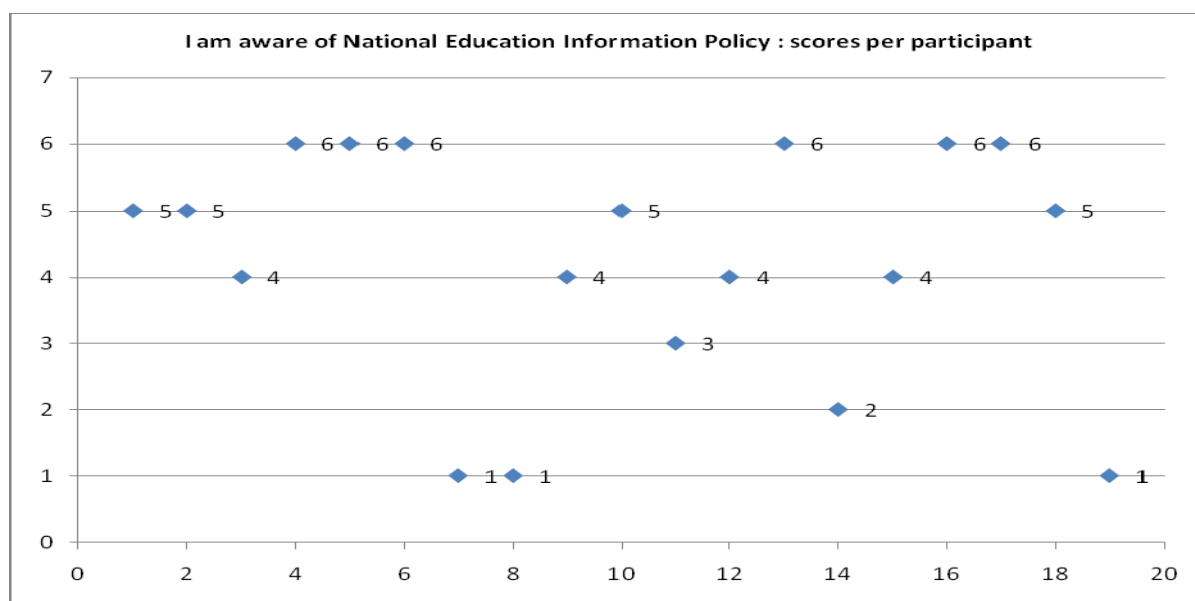
Question 2.5

Figure 4.14: Analysis of responses on information quality by SMGDs sub-question 2.5

Seven participants from figure 4.14 above strongly disagreed with the statement, five were neutral regarding the statement, whilst seven strongly agreed with the statement. This analysis shows that more than half of the participants are not aware of the data quality standards, the national prescriptive which guides the various provinces on data quality.

Question 2.6
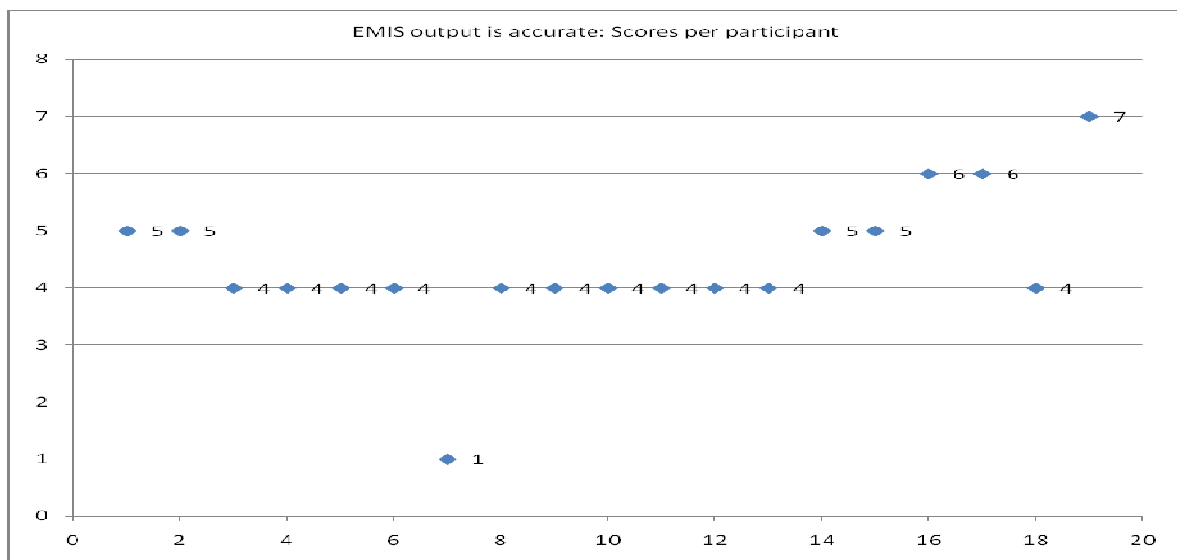
Figure 4.15: Analysis of responses on information quality by SMGDs sub-question 2.6

The analysis of responses for this question as reflected in figure 4.15 above, depicts that seven participants strongly agreed with the statement, whilst ten participants were rated as neutral and one participant strongly disagreed with the statement. It is then argued that the accuracy

of EMIS data depends almost entirely on data capturers either at school, district or provincial level because the question referring to feedback on what had been captured for final verification was answered very poorly. It is also argued that there is no correlation between the responses provided in the assessment of quality of data in section A of this survey tool by the same respondents, where it was clearly demonstrated that the quality of data rates between "high and very high."

Question 2.7
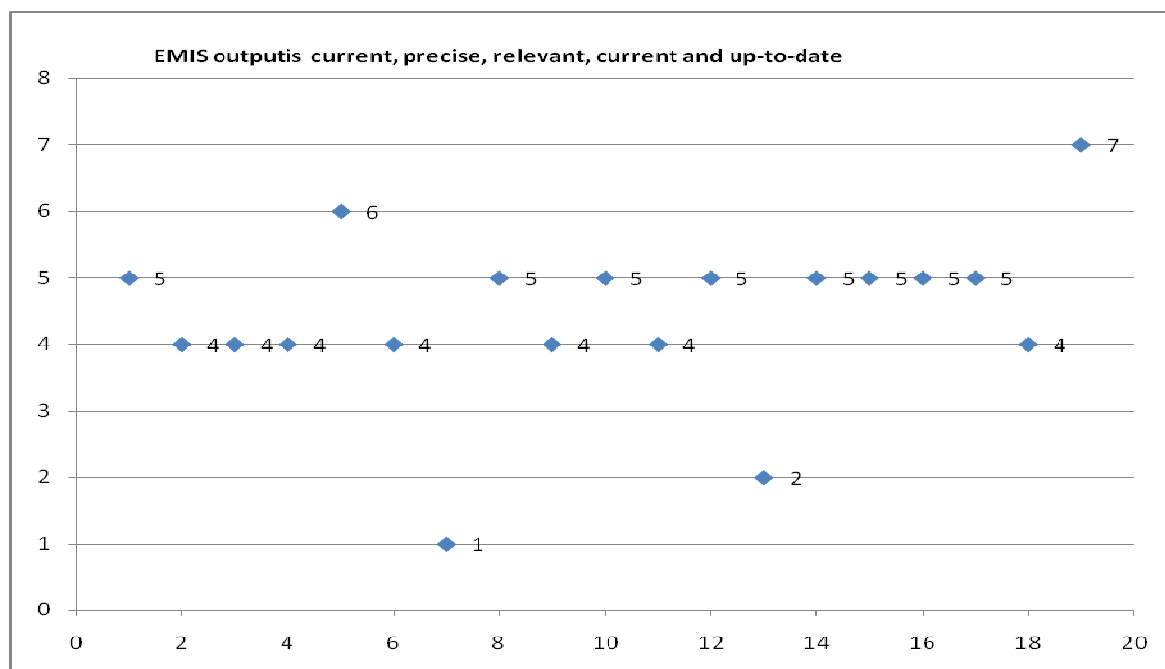
Figure 4.16: Analysis of responses on information quality by SMGDs sub-question 2.7

Figure 4.16 above depicts that ten participants strongly agreed that EMIS output conforms with the elements of data quality standards as current, relevant, precise and up-to-date. This shows that EMIS data conforms to the elements of data quality standards. There is also correlation with the answers provided and the overall data quality assessment presented above. Of the remaining nine participants, four were neutral and five strongly disagreed. This shows that although there is an agreement on quality of data within EMIS, there are also elements where one finds data that is not up-to-date or current. From a manager's viewpoint, it is argued that sometimes one receives data that is not up-to-date as expected, for example, farm schools that were closed down two years ago still appear on departmental lists. The use of this information for planning purposes could result in the utilisation of incorrect data. Such minor mistakes could be corrected if there were a strong collaboration between Management and Governance as well as the EMIS Sub-directorate.

4.3.3 Assessing the dimension for individual and organizational impact

The analysis of DeLone and McLean as well as Seddon earlier in Chapter Two demonstrated that the quality of information invites more frequent use of the information system. A system that does not frustrate users also contributes to frequent use by the users. This in turn contributes to individual and organizational impact which Seddon refers to as outcomes which start with information use. Seddon further argues that user satisfaction contributes to individual impact and organizational impact. Individual and organizational impact, the consequences of use, determines whether the system is successful or not. The evaluation of information quality above has demonstrated satisfaction on the part of participants.

Five questions rating system quality were asked of participants. Each question required the participant to use a seven-point rating scale which is explained as follows:

1-3   : strongly disagree with the statements listed on your left hand side.

4   : neutral about the statements on the left hand side.

5-7   : strongly agree with the statements on the left hand side

Question 3.1

Figure 4.17: Analysis of responses on individual and organizational impact by SMGDs : sub-question 3.1

Figure 4.17 above depicts that six participants strongly disagree that they use the analysed data to assist schools, one participant rated is neutral and twelve participants strongly agree that they use analysed data to assist schools. This reflects that there is an understanding of the National Education Information Policy objectives where it is stressed that EMIS data must be analysed at the entry point.

Question 3.2

Figure 4.18: Analysis of responses on individual and organizational impact by SMGDs: sub-question 3.2

The analysis in figure 4.18 above indicates that fourteen participants strongly agreed that the EMIS database has increased the quality of decision making in the department. This is a good indication that one can rely on the EMIS database to make informed decisions.

Question 3.3

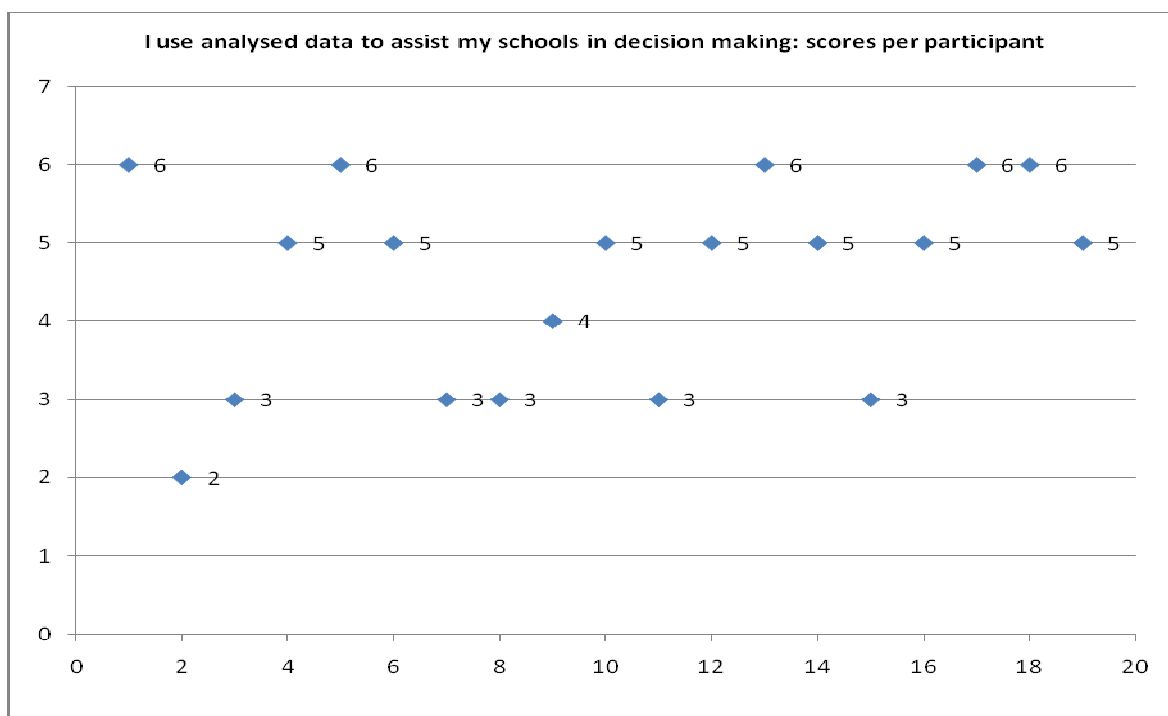*Figure 4.19: Analysis of responses on individual and organizational impact by SMGDs sub-question 3.3*

Figure 4.19 depicts that eleven participants out of nineteen participants strongly agreed that the department caters for all the needs of its clients by ensuring that various forms of distribution of EMIS data are used. This has also been highlighted very strongly in the National Education Information Policy - EMIS output must reach all stakeholders so that they may make informed decisions.

Question 3.4

Figure 4.20: Individual and organizational impact by SMGDs ; sub-question 3.4

Figure 4.20 above depicts that ten participants strongly agree that the schools are aware of the objectives of the National Education Information Policy. This shows a correlation with answers provided by the EMIS managers where awareness was created regarding the National Education Information Policy. The principals who participated in this research also agreed that they were aware of this policy. They were able to mention at least one objective of this policy.

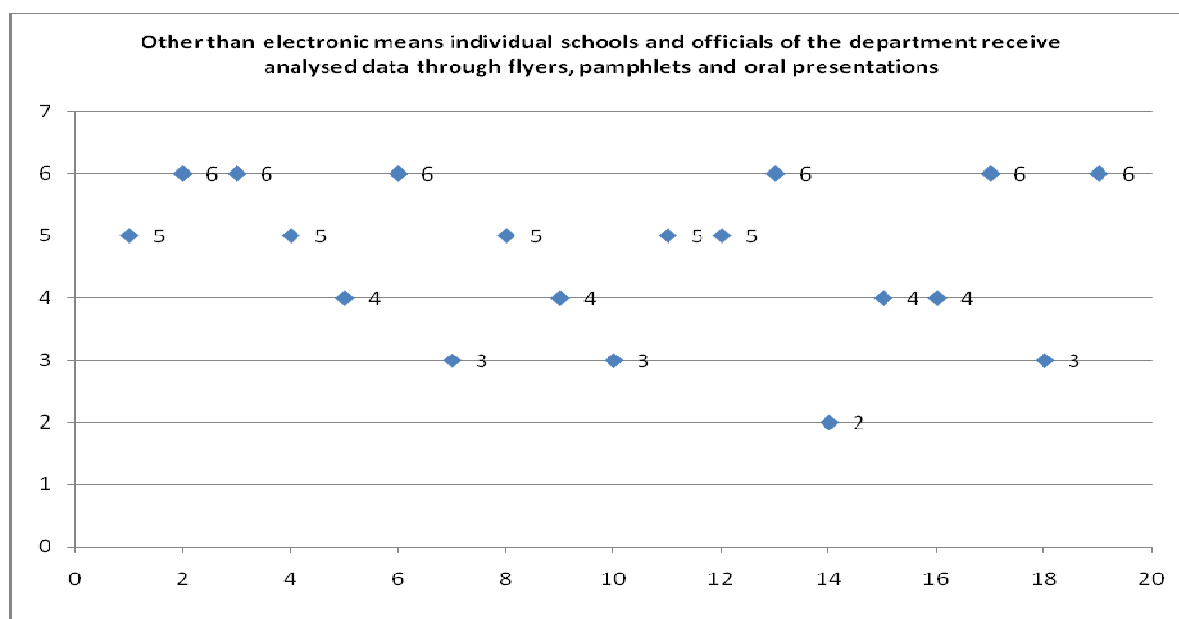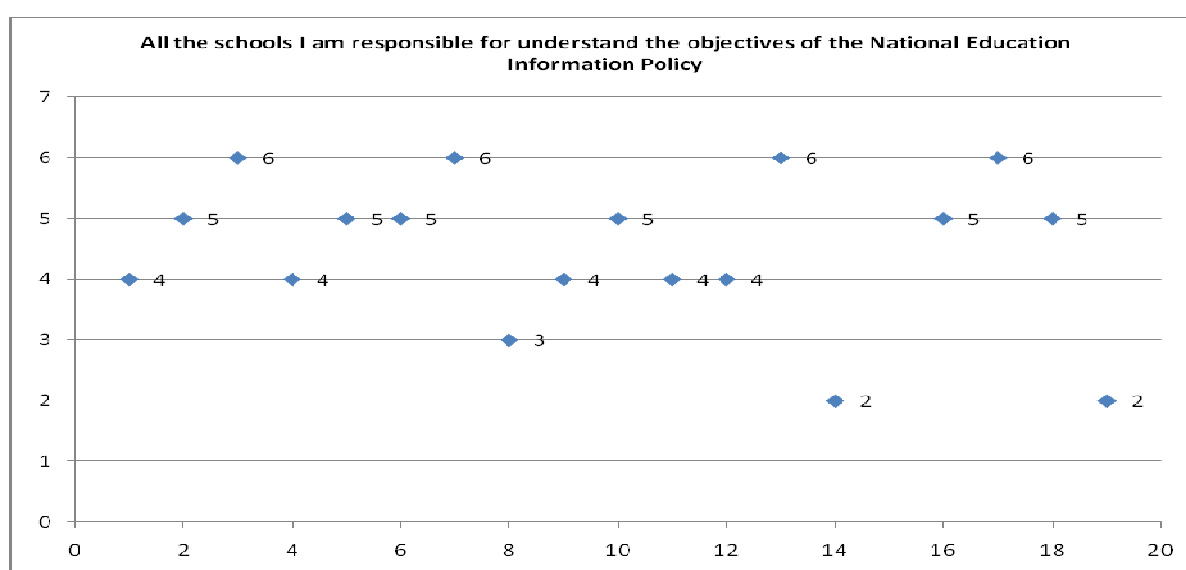**Question 3.5**
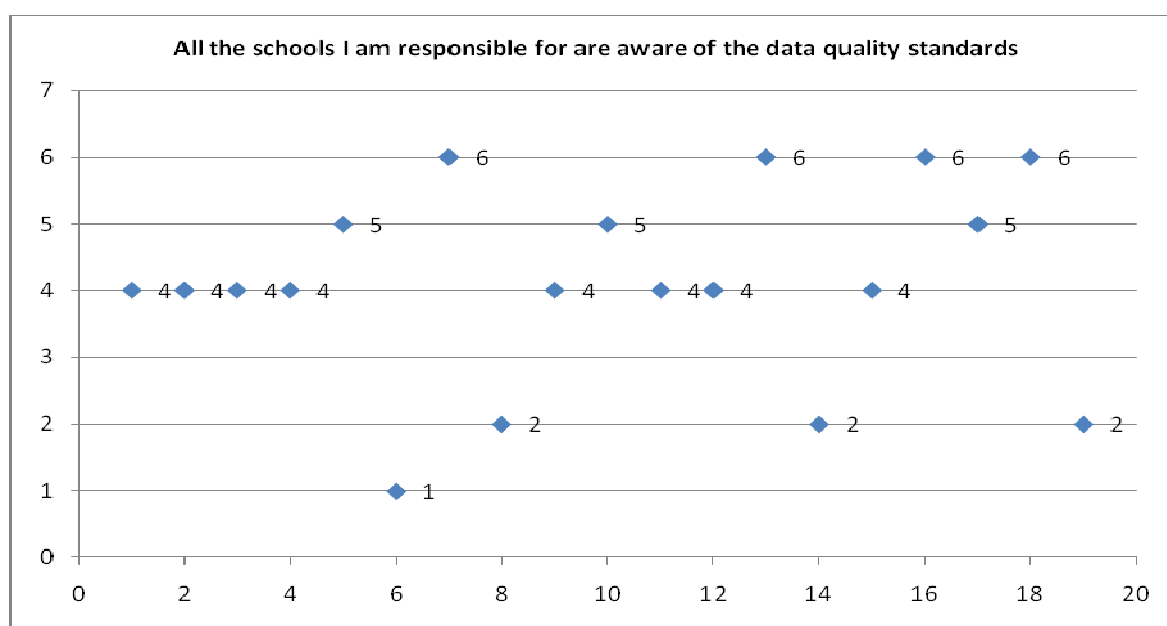
Figure 4.21: Analysis of responses on individual and organizational impact by SMGDs ; sub-question 3.5

Figure 4.21 above depicts that only seven participants strongly agreed with the statement, whilst eight out of the remaining twelve participants were neutral and four strongly disagreed with the statement. This shows that more than half of the participants indicate that schools are not aware of data quality standards. This in turn shows a huge gap which needs to be addressed through information sessions to stakeholders, as data quality standards provide a framework for the provision of quality data to the provinces.

4.4 Analysis of responses from 10 school principals for system quality, information quality and individual and organizational impact

Each question required the participant to use a seven-point rating scale which is explained as follows:

1-3 : strongly disagree with the statements listed on your left hand side.

4 :   neutral about the statements on the left hand side.

5-7 : strongly agree with the statements on the left hand side

4.4.1 Assessing the dimension for system quality

Seven questions rating system quality were asked of participants. Ten school principals participated in this study.

Question 1.1
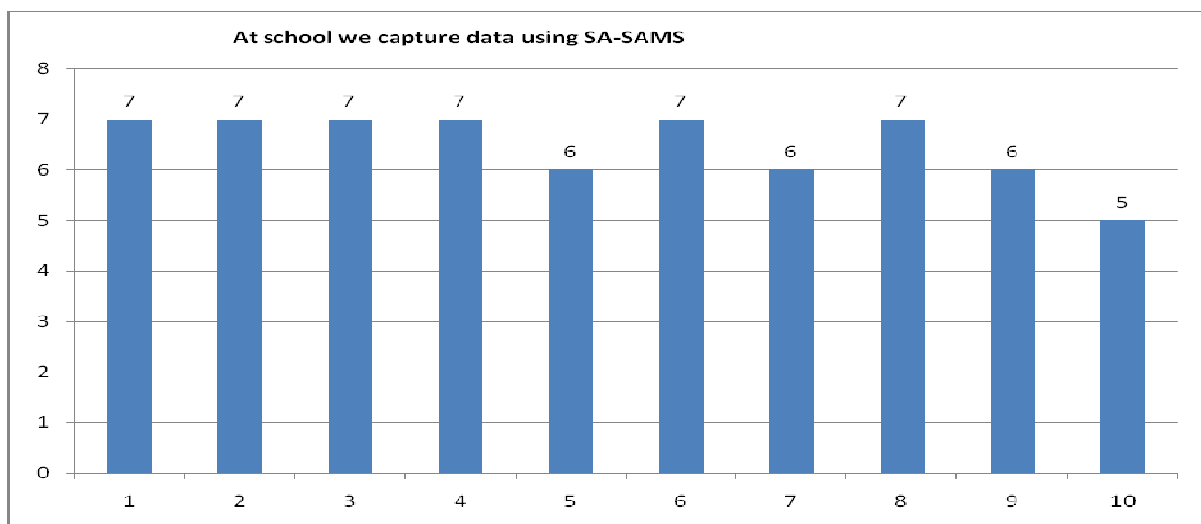
Figure 4.22: Analysis of responses on system quality by school principals sub-question 1.1

The rating for all ten participants depicts that they all strongly agreed with the statement. This means the schools have access to SA-SAMS for the capturing of data.

Question 1.2
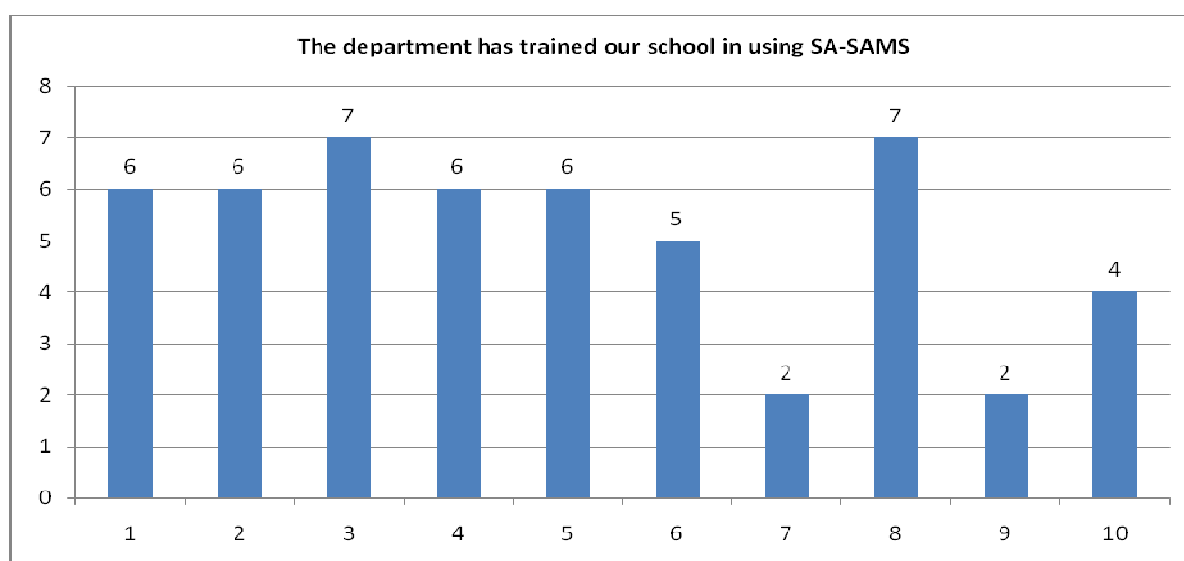
Figure 4.23: Analysis of responses on system quality by school principals sub-question 1.2

The analysis in figure 4.23 above demonstrates that seven participants strongly agreed with the statement that training on SA-SAMS was done at schools. Training is one of the objectives of the National Education Information Policy. Therefore Free State EMIS demonstrates a clear understanding of the objectives of this policy.

Question 1.3

Figure 4.24: Analysis of responses on system quality by school principals sub-question 1.3

Ten participants strongly agreed that SA-SAMS has made the capturing of data much easier than before. This means users are able to use the system frequently thus contributing to individual impact and organizational impact.

Question 1.4
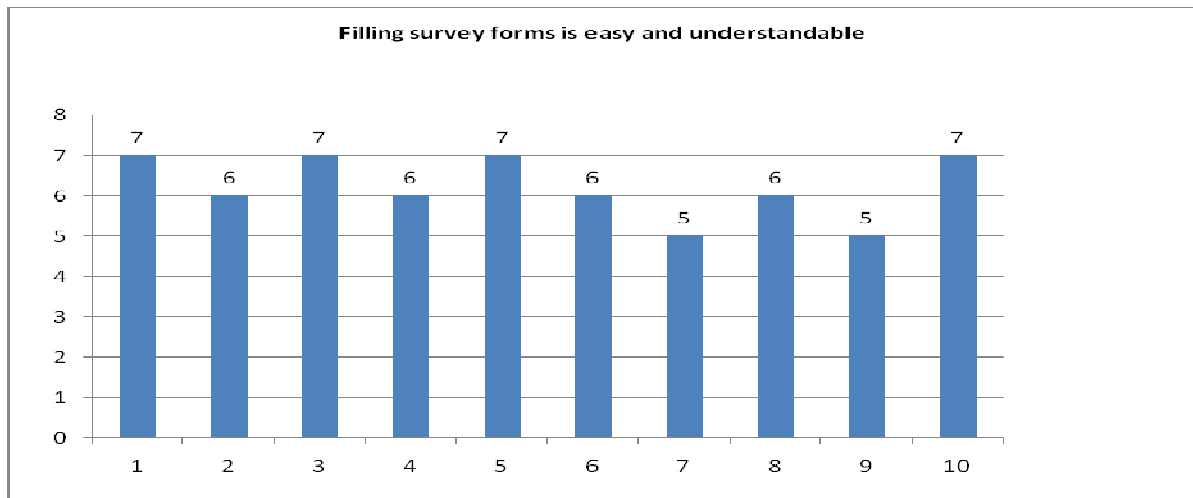
Figure 4.25 : Analysis of responses on system quality by school principals sub-question 1.4

Ten participants strongly agreed with the statement. This also contributes to more frequent use of the system. One concludes then, that EMIS complies with the requirements for information systems success as illustrated above by DeLone and McLean.

Question1.5
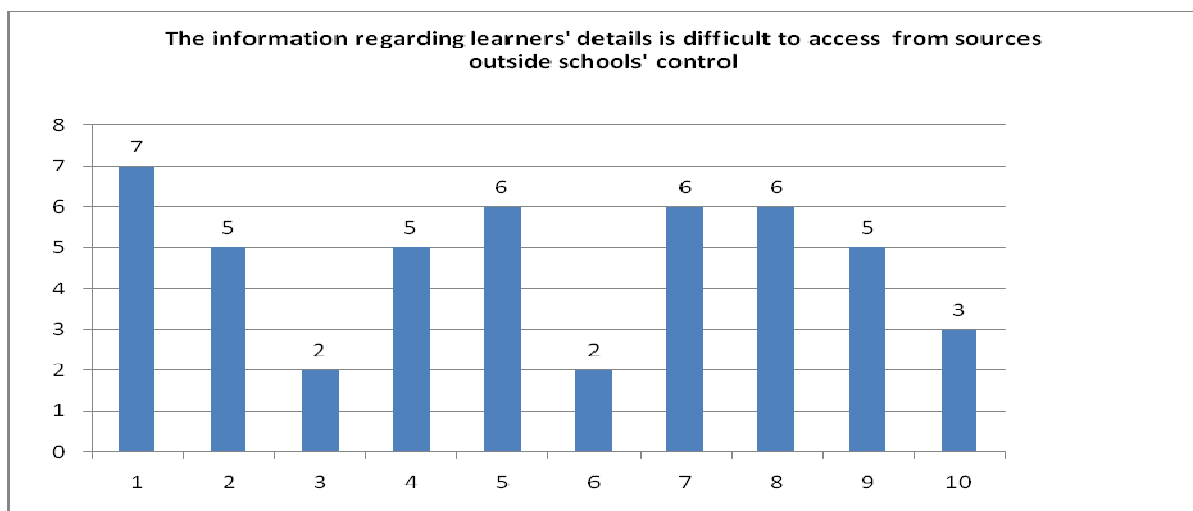
Figure 4.26: Analysis of responses on system quality by school principals sub-question 1.5

Seven participants in figure 4.26 above strongly agreed with the statement that it is difficult to find information regarding learners' details from outside the school. This information is needed for planning purposes. Advocacy to stakeholders outside the department therefore needs attention.

Question 1.6

Figure 4.27: Analysis of responses on system quality by school principals sub-question 1.6

The analysis as depicted in the above figure 4.27 demonstrates that eight participants strongly agreed with the statement that the department allocates enough time for the completion of survey forms.
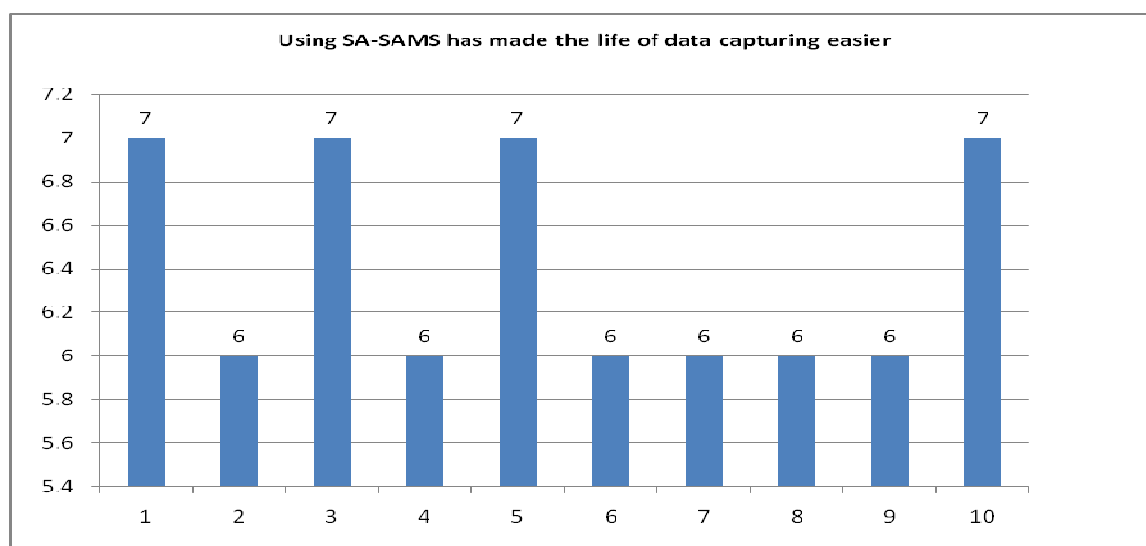
Question 1.7
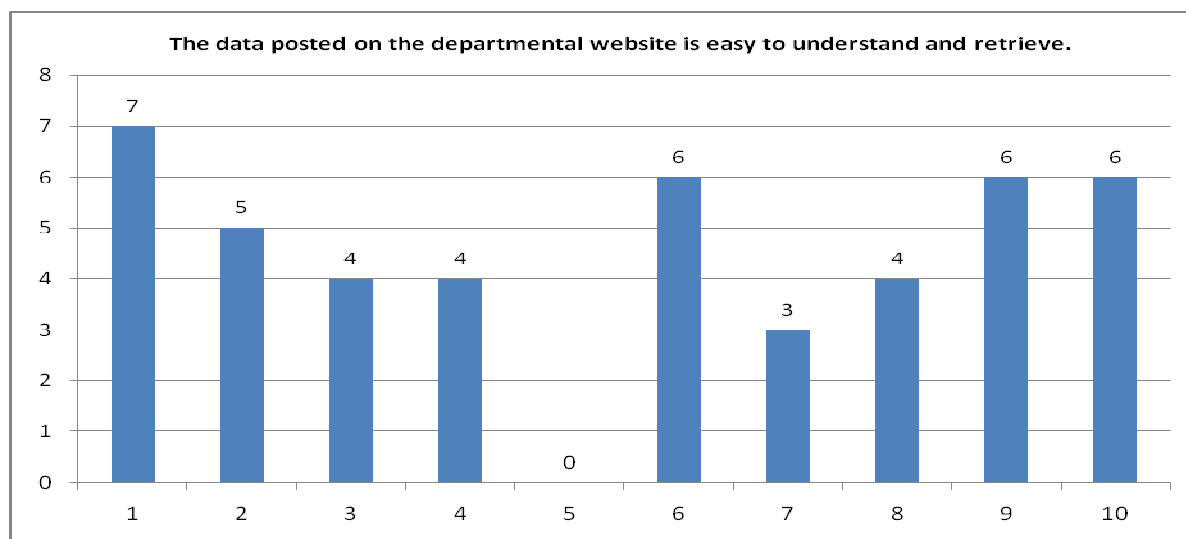
Figure 4.28: Analysis of responses on system quality by school principals sub-question 1.7

It is demonstrated in the above figure 4.28, that five participants strongly agreed that the data that is posted on the departmental website is easy to understand and retrieve. It is clearly stated in the Nation Education Information Policy that data must be distributed to

stakeholders using different forms of media. EMIS Free State, therefore, complies with the objectives of the National Education Information Policy.

4.4.2 Assessing the dimension for information quality

At the outset, this chapter presented the characteristics of information quality which are embedded in the data quality standards, the objectives of the National Education Information Policy as well as the dimensions discussed in McLean and DeLone's model for information system success. These theories argue that information quality must be measured in terms of relevance, timeliness and accuracy of information generated by the information system. Evaluating the quality of information of EMIS Free State was determined by seven questions grouped as indicators of information quality. These questions were asked of the principals to evaluate their satisfaction with the information generated by EMIS Free State. It is understood that the better the quality of information in an information system, the higher the information use by its clients.

Question 2.1
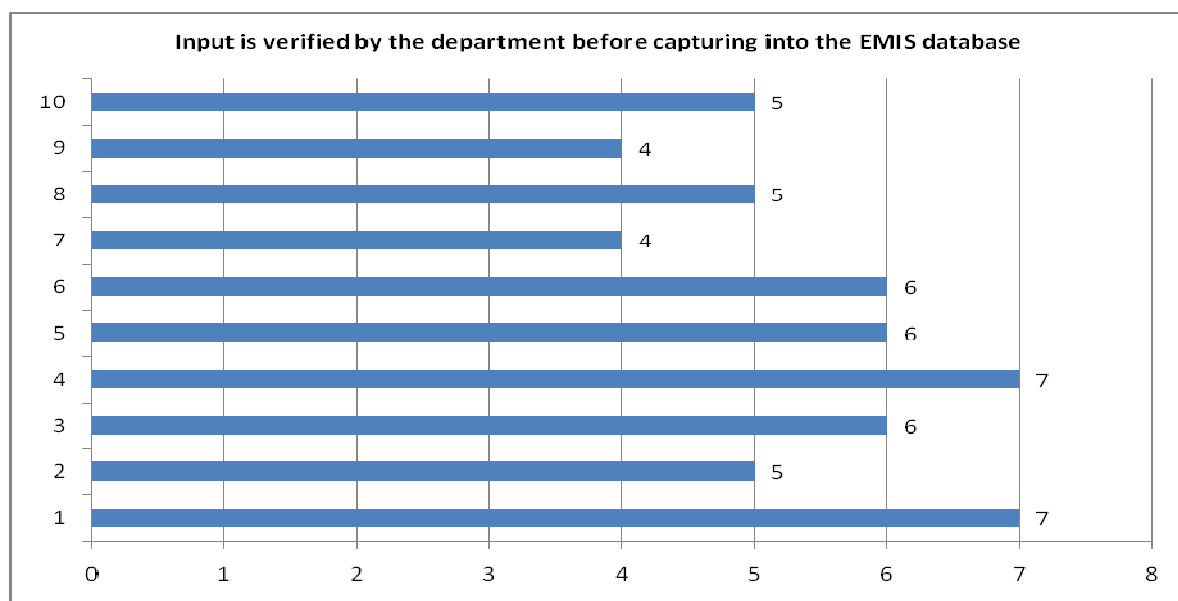
Figure 4.29: Analysis of responses on information quality by school principals sub-question 2.1

Eight participants in the above figure 4.29 strongly agreed with the statement. This is an indication that the verification at schools level is conducted as discussed in the EMIS flow of data in Chapter 3. Verification is one of the processes that results in quality data. This is demonstrated by the fact that the SMGDs rated overall data quality between "high" and "very high"
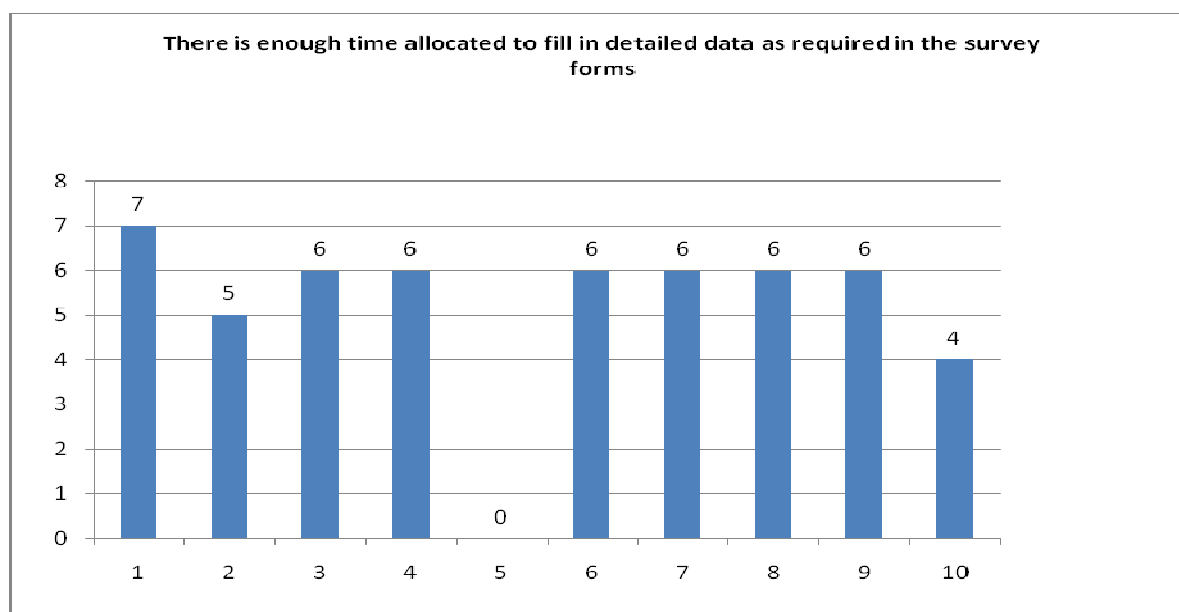
Question 2.2
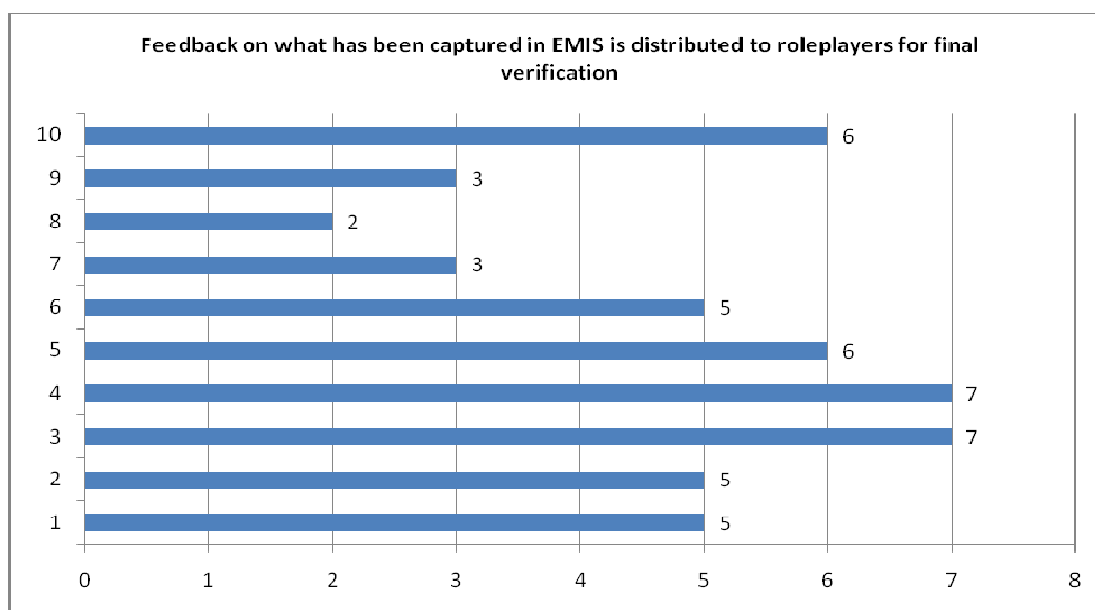
Figure 4.30: Analysis of responses on information quality by school principals sub-question 2.2

Six participants in figure 4.30 above strongly agreed that feedback regarding what was captured was sent back to role-players for verification. This answer correlates with the information provided by EMIS managers who also indicated that the information is sent back to schools for verification.

Question 2.3
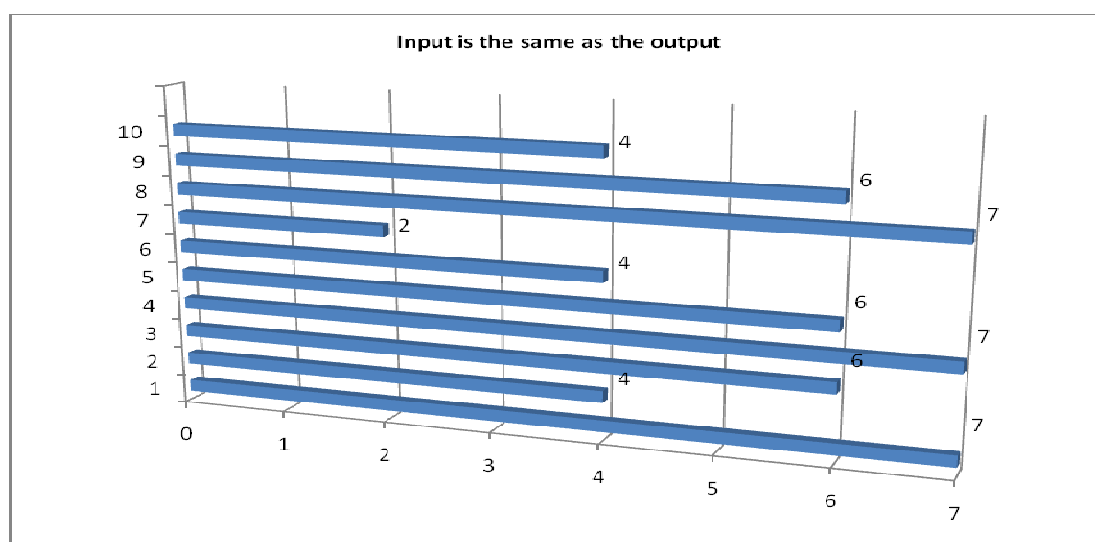
Figure 4.31: Analysis of responses on information quality by school principals sub-question 2.3

The above figure 4.31 depicts that six participants strongly agreed that the output is the same as input. This indicates that EMIS Free State conforms to the elements of the data quality standards that serve as guidelines to provinces to produce reliable and credible data.

Question 2.4
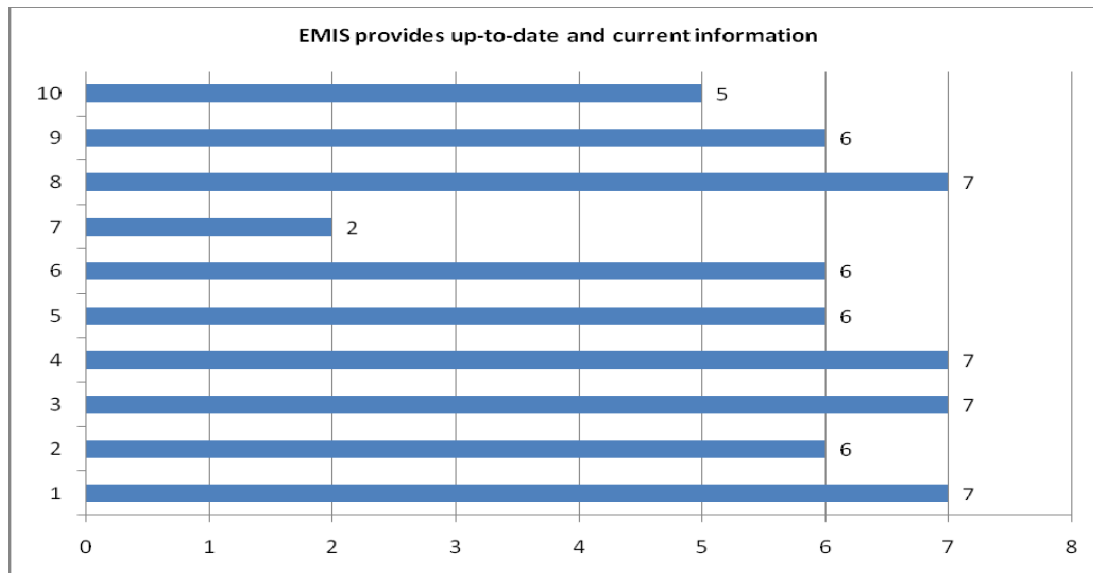
Figure 4.32: Analysis of responses on information quality by school principals sub-question 2.4

Seven participants strongly agreed with the statement. This means EMIS provides up-to-date and current information. This in turn confirms that EMIS Free State conforms to the elements of data quality standards.

Question 2.5
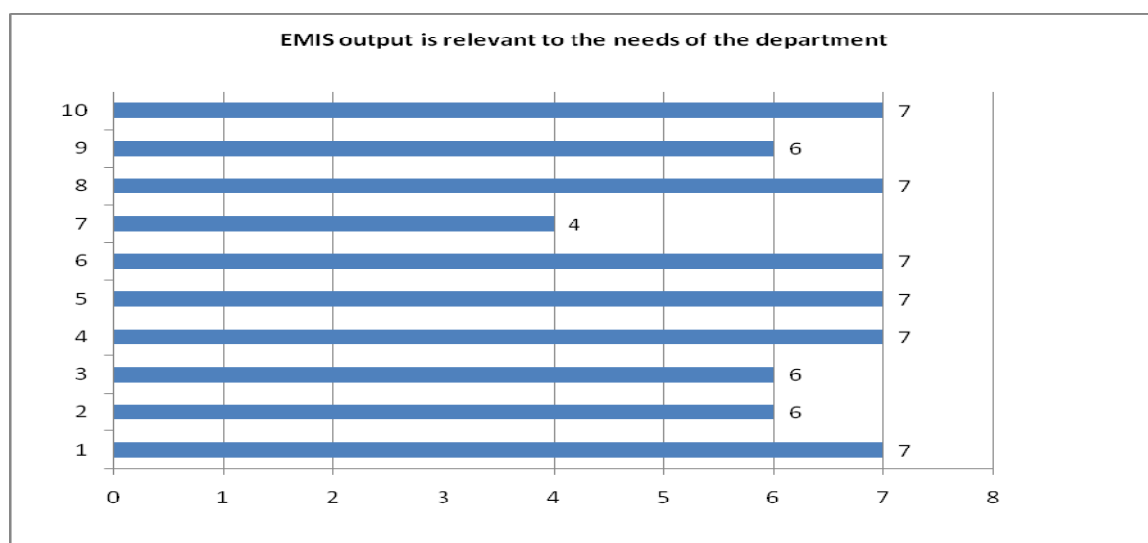
Figure 4.33: Analysis of responses on information quality by school principals sub-question 2.5

The analysis of data in the above figure 4.33 depicts that nine participants strongly agreed that EMIS output is relevant to the needs of the department. This demonstrates that EMIS output demonstrates relevance as one of the elements constituting data quality standards. This also shows that EMIS Free State meets the characteristics of quality information.

The answers provided in the analysis of the sub-question for information quality are indicative that the output of EMIS information is of good quality because it meets the dimensions employed to measure information success as articulated in the theories mentioned above.

4.4.3 Assessing the dimension for individual and organizational impact

This shows that there is satisfaction from the users' point of view with the quality of information provided by EMIS. As argued by Seddon it is the quality of information that contributes to system use as well as user satisfaction. The frequent use of information from EMIS contributes to individual and organizational impact.

Question 3.1
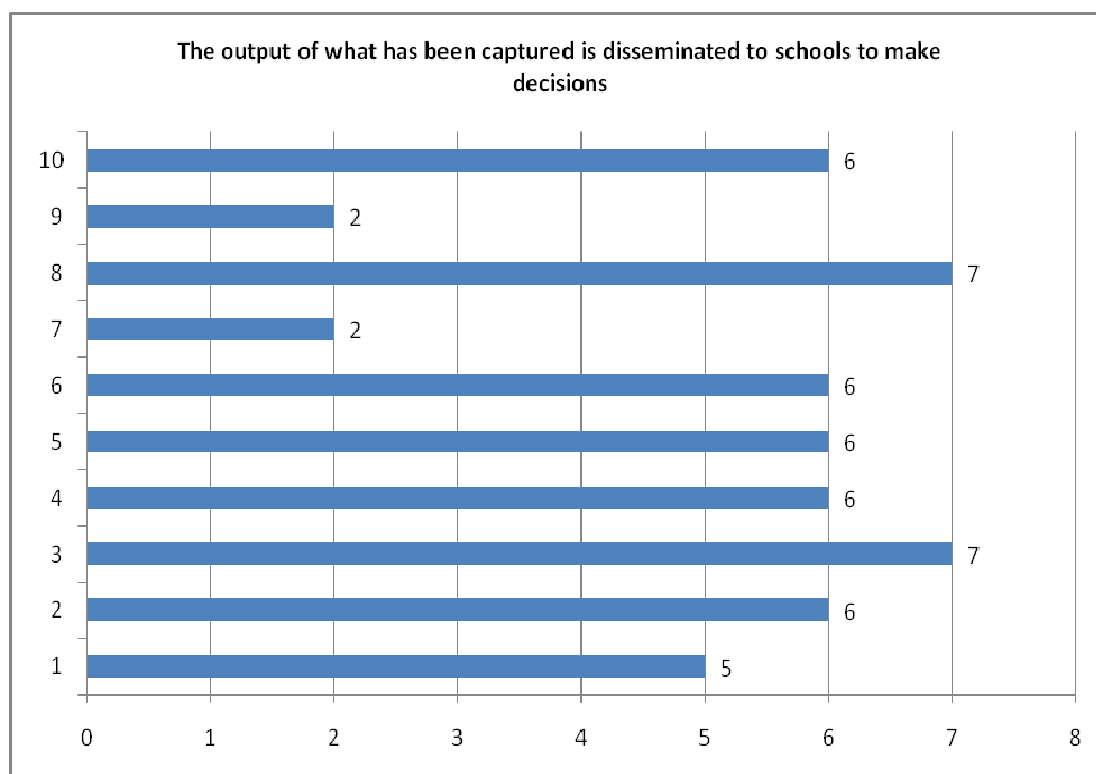
Figure 4.34: Analysis of responses on individual and organizational impact sub-question 3.1

Figure 4.34 above shows that eight participants strongly agreed that information is used at school level for decision making. This is one of the objectives of the National Education Information Policy.

Question 3.2
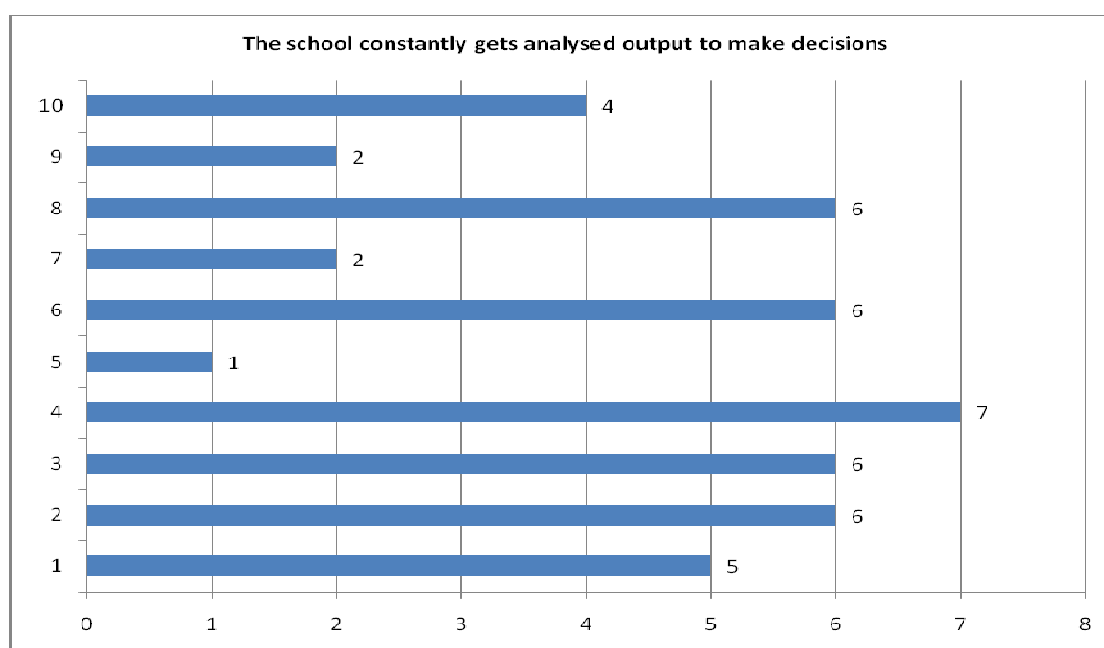
Figure 4.35: Analysis of responses on individual and organizational impact sub-question 3.2

More than six participants strongly agreed that the schools receive analysed data to make decisions. The reliable and credible data makes it possible for the organization to make decisions and this contributes to individual and organizational impact.

Question 3.3
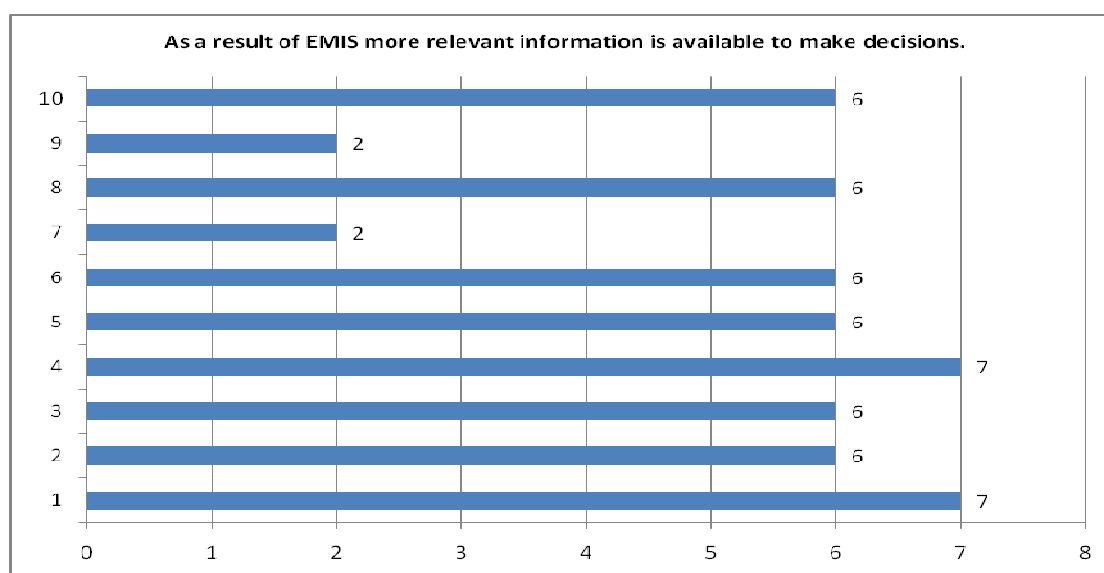
Figure 4.36: Analysis of responses on individual and organizational impact sub-question 3.3

Eight participants strongly agreed that EMIS information is relevant to decision making. This demonstrates that EMIS meets the characteristics of information quality. Relevance of

information contributes to users' interest in using the information and this in turn contributes to individual impact which ultimately contributes to organizational impact.

Question 3.4

The timeframe allocated to fill in data is not enough taking into consideration the data needed in the data fields
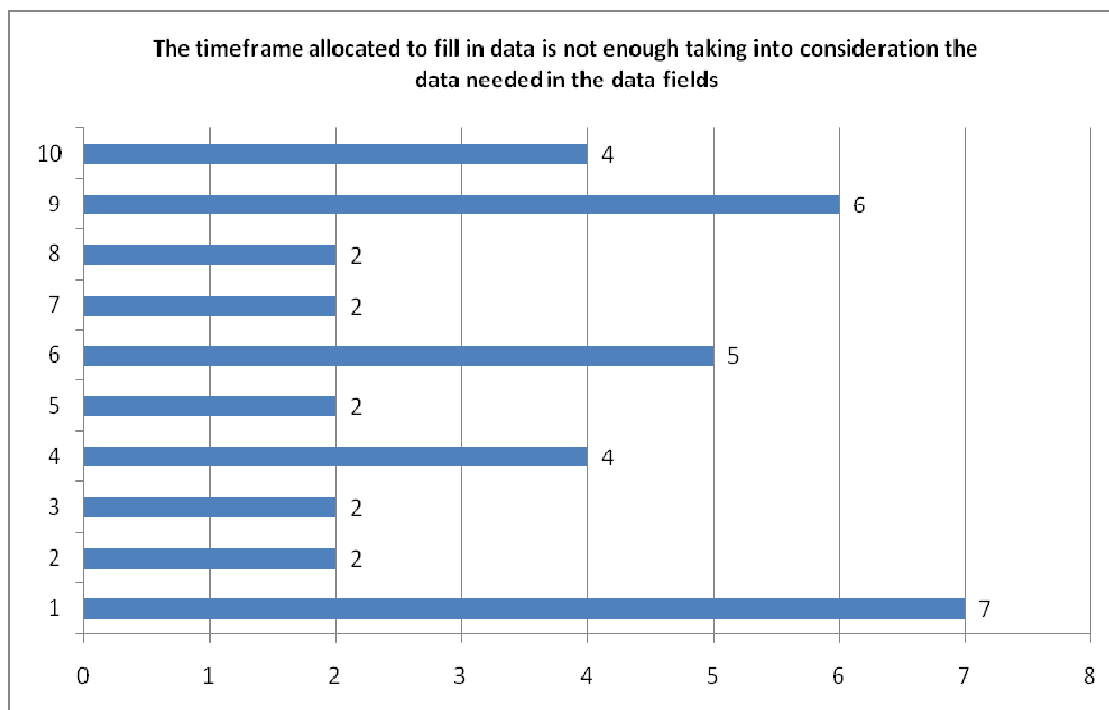
Figure 4.37: Analysis of responses on individual and organizational impact sub-question 3.4

Figure 4.37 above depicts that five participants rated this question at 2, which shows that they strongly disagreed that the time allocated for filling in the survey forms was insufficient. The conclusion is that the time given to schools to fill in and submit survey forms to district offices is adequate

Question 3.5
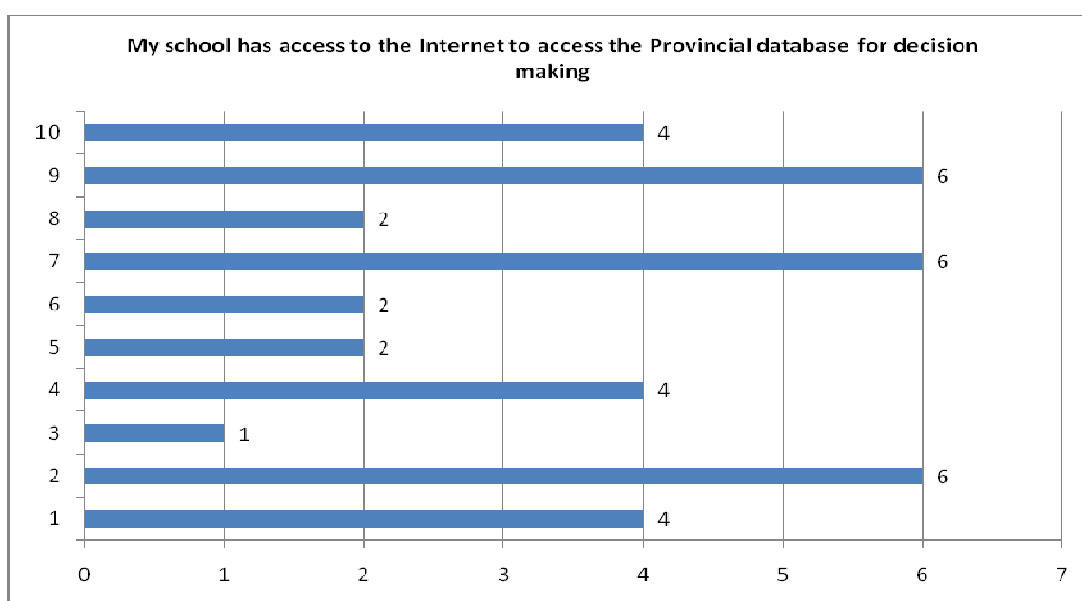
Figure 4.38: Analysis of responses on individual and organizational impact sub-question 3.5

Only three participants strongly agreed with the statement, whilst four participants strongly disagreed and three participants were neutral regarding the statement.

Question 3.6
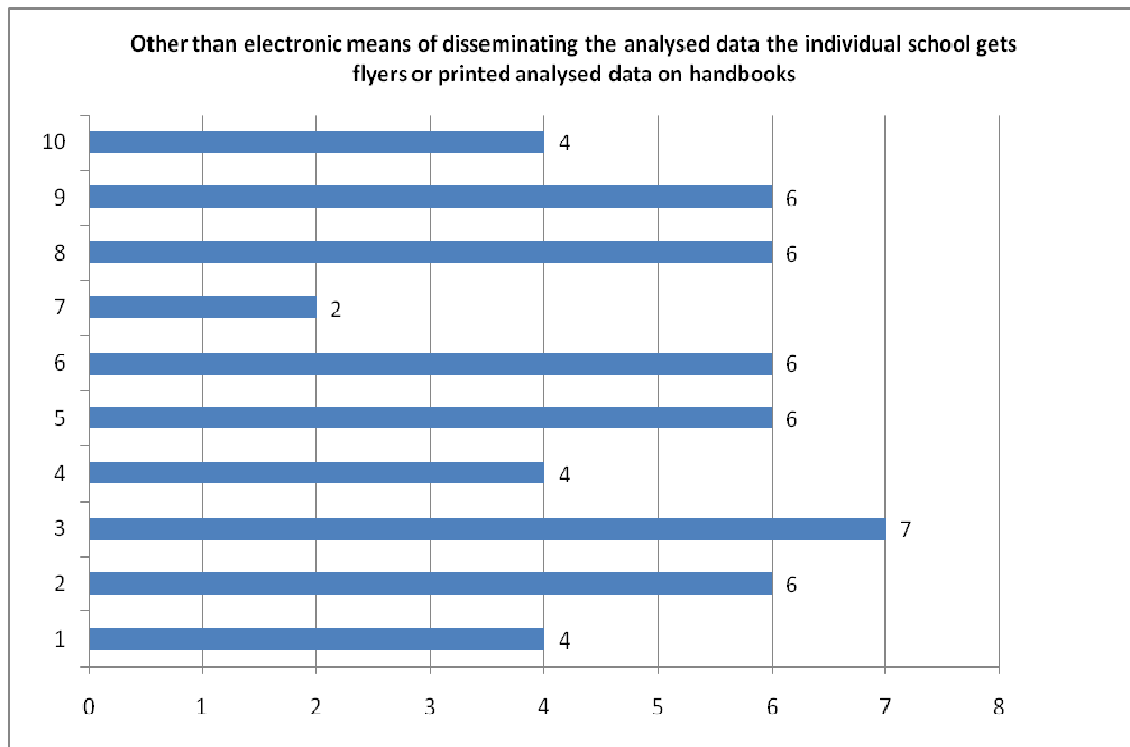
Figure 4.39: Analysis of responses on individual and organizational impact sub-question 3.6

The positive response from seven schools out of ten indicates that the department uses other means to disseminate information. This proves that EMIS Free State complies with the objectives of the National Education Information Policy in which it is emphasised that information must be accessible through various media.

In conclusion, the mean score and the standard deviation for each indicator were compared through the student test analysis to check the level of statistical difference of the descriptive analysis of system quality and information quality, system quality and individual and organisational impact, information quality and individual and organizational impact. It was discovered that:

- There is no statistically significant difference between the mean score for system quality and for information quality. (at $p = 0.7824$, $t = 0,2804$ at 95% confidence interval $df = 18$)

- There is a statistically significant difference between the mean of system quality and individual and organizational impact. (at $p = 0,0232$; $t = 2.408$ at 95% confidence interval $df = 18$).

- There is an extremely statistically significant difference between the mean score of information quality and individual and organizational quality (at p= 0,0048; t= 3,2193 at 95% confidence interval df=18)

4.5 Findings for structured interviews with school principals

A follow-up structured interview was conducted with each of the ten principals of the sampled schools to validate the answers received from the self-administered questionnaires. The findings were as follows:

In response to the question about their awareness of the National Education Information Policy, five out of ten principals indicated that they were not aware of the National Education Information Policy. When asked to mention at least one objective of the policy, there was some indication that they were familiar with the policy objectives. It was clear from the answers provided that all ten principals interviewed were not aware of the data quality standards. The lack of awareness of the data quality standards indicates a gap because the schools are integral to the collection of data that must be stored in the EMIS databases. The principals' lack of knowledge could result in the obtaining of inaccurate data from the schools. When asked a question on whether they were aware of the purpose of the surveys, all ten principals responded that they were aware of the purpose of the different surveys conducted by the department. All of them were able to mention that the surveys are used for indicating the profile of schools, thus allowing for the proper allocation of resources by the department. It became evident that all the principals interviewed have SA-SAMS installed in their schools and this is used to capture data. It was clear from the ten principals interviewed that the training provided by the department on the use of SA-SAMS targeted administrative clerks and the deputy principal, or the principal him/herself in cases where there is no deputy principal. It became evident from all the principals interviewed that the training provided lasted for about one-and –a- half hours. All felt that such training was inadequate. An interview with one deputy principal who seemed to be well informed on SA-SAMS usage, revealed that although SA-SAMS is a good system, it has pitfalls which include the following:

- When a fault has been created at school level, the school is unable to correct it until the Provincial Office is contacted.

- When a learner has been archived during the year, SA-SAMS deletes that learner automatically e.g. if a learner was at a particular school between January to June and this learner is moved to another school, the data for that particular learner from January to June is lost.

Ten principals interviewed indicated that they gather data through application forms which are updated yearly for old learners. However, it was clear that principals have difficulty in getting application forms completed on time because most parents do not respond in time for one reason or another. The answers provided to this question show no correlation to answers provided in question 3.5 above where only five participants claimed that the time allocated was insufficient. Regarding the necessary updating of teachers' information, seven out of ten principals interviewed indicated that teacher information is easily accessed. Three principals indicated that teachers sometimes forget to submit the relevant information, but when reminded of the oversight, the information is submitted. All ten principals interviewed confirmed that data is verified by using a printout against what has been captured. This is executed by the principals and the admin clerk. This confirms that the department has proper systems to verify the data from the collection point.

4.6   Findings from EMIS Managers

The Chief Education Specialist as well the Deputy Chief Education Specialist answered the same questionnaire. The first part of the questionnaire solicited information regarding the level of qualification related to the post that each respondent was currently occupying. The purpose of asking this question was to check whether there is a link between what the respondents are doing and their qualifications. It was discovered that one respondent has a basic IT qualification whereas the other has specialised in Economics. The other part of the questionnaire was based on their role in influencing budget increase as well as strategic alignment of the National Education Information Policy with the annual performance plan of the department. The last part of the questionnaire involved the creation of awareness to stakeholders on the policy objectives, the interpretation of data as well as the sort of data mining done and the distribution of interpreted information to stakeholders for the purpose of making informed decisions. Reproduced below are the answers provided to questions asked on the self administered questionnaire that was e-mailed to participants.

Does your position allow enough opportunity to directly influence the Executive Management to increase the budget for your Sub-directorate?

In Chapter Two, Murengezi[149] argued strongly that it is crucial that take-off funds, the development of information systems strategy, training and development be in place to ensure the success of information systems. A question assessing whether the participants can

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[149] Mugerezi, E. 2002

influence an increase in the allocated budget revealed that the Chief Education Specialist, the Head of the Sub-directorate, did not in fact know who was in a position to lobby for a bigger budget. The answer provided by the Deputy Chief Education Specialist indicated that either the Chief Education Specialist or the Director was responsible for this particular task. The participant whose answer was "unknown" shows that in the public service it is difficult to influence budget allocation as this depends entirely on competing priorities of government. In Chapter Two, Remenyi, Lubbe and van Heerden postulate that many organisations do not provide enough financial resources for information systems. The allocation of limited funds results in information systems failing to achieve what they were mandated to achieve.

Are objectives of the National Education Information Policy articulated in the Annual Performance Plan or strategic plan of the department?

Both participants agreed that the objectives of the National Education Information Policy are clearly articulated in the Annual Performance Plan. This was followed up with a telephone enquiry to clarify answers provided. Both respondents were requested to provide the page number where the objectives are stated in the annual performance plan, but they were not forthcoming in this regard. The annual performance plan was consulted by the researcher to get the relevant page number, and "Number of schools with SA-SAMS", was found as the performance measure on page 34.

Do you have data policy in the department?

Different answers were provided. One participant answered "no" whilst another participant answered "yes". Document analysis to verify the answers provided was done and it was found that there is no provincial data policy, except the data policy standards which were released by the Department of Basic Education.

If yes, have the objectives of the above policies been communicated to all stakeholders in the department?

The answer provided was "yes". There is no correlation between this answer and the answers gathered from interviews with the principals, who all seemed to lack an understanding of the data policy standards.

Was there an evaluation conducted in past years to determine the effectiveness of EMIS in relation to users' perceptions?

Different answers were provided. One participant answered "yes" whilst another participant answered "no." When a document analysis was done, it was discovered that the evaluation conducted in 2004, emanated from the Department of Basic Education, for purposes of evaluating whether provinces had initiated the implementation of the National Education Information Policy. This analysis was not directed to users in order to get feedback on how EMIS Free State is performing.

Do you supply schools or districts with output to verify information before it is published? Different answers were provided. One participant answered "yes" while the other participant answered "no." This demonstrates a communication gap between the Section Head and the Deputy. It was expected that both respondents would provide the same answer to this question.

You use Statistica as an analysis tool, what was the reason for choosing this tool?

Two different answers to this question were provided. One participant indicated lack of knowledge whilst the other participant indicated that it is "...widely used, ease of use [sic], talking to other systems." This demonstrates a communication gap between the Section Head and the Deputy. It was expected that both respondents would provide the same answer to this question.

Do you do data mining? If so, what sort of questions do you ask during data mining?

The participants provided different answers, which are as follows:

Participant 1: *Is data complete, is compulsory data used checked and verified (data quality questions)? What is the data used for? (to filter out sensitive or particular data e.g excluding fax numbers for data used by third parties. Who is using what piece of information? determining users of information*

Participant 2: Data quality, data origin, is it necessary to do data verification?

The answers provided indicate that there is a distinct lack of understanding of the benefits that data mining as a knowledge discovery tool possesses. Skyrme[150], argues that data mining uncovers associations and patterns without the user having to know in advance what questions to ask. Both participants provided different sets of questions that they ask during data mining. There is no indication from the respondents of an awareness that data mining assists in uncovering associations and patterns without questions being asked beforehand.

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[150] Skyrme, D.J. 1999.

Other than electronic media how do you disseminate analysed information to schools that do not have access to the Internet? Different answers were provided as follows:

Participant 1: Brochures, publications, flyers, posters. Advertisements in local newspapers

Participant 2: Mostly by printing summary information in hard copy for schools.

The answers provided also reveal lack of communication between the two participants because they both work with the processes in the same Sub-directorate with one reporting to the other should, therefore, both know the means by which the information is distributed to schools. Document analysis also showed that the print-out is sent out to schools. Evidence of flyers or newspaper advertisements could not be found.

4.7   Findings from data capturers

The same questionnaire was used for data capturers irrespective of their location because they perform the same functions. Also during situational analysis it was discovered that ideally each district is supposed to have at least one data EMIS coordinator who is responsible for capturing data from schools. Because of the workload at the provincial office, EMIS coordinators that were originally employed for Motheo and Xhariep districts are based at the provincial office to capture and verify for both of these districts and the provincial office. Eight survey forms were distributed to the provincial and district based data capturers. Out of eight survey forms distributed, four survey tools were returned and analysed. The first part of the questionnaire asked about the participants' qualifications. It was clear that data capturers possess Grade 12. There was only one participant who had completed a REQV 13 qualification. All of the participants indicated that they are aware of the National Education Information Policy. Three participants indicated that they are aware of the policy. Two indicated obtaining this information through information sharing by the supervisor whilst the other had received this information via the website of the department. All of the participants in this research responded that they scan to verify data submitted from each level of the system. It was also found that captured data is received either electronically or in hardcopy format. They all indicated that they verify the data .In response to the question on whether they detect mistakes from captured data, all of them indicated that mistakes detected during the verification process are corrected or schools are contacted. All the participants indicated that they receive huge piles of papers which are filed per district according to the type of the surveys.

Chapter 5

Conclusion and Recommendations

5.1 Lessons learnt from this study

5.1.1 The strengths of EMIS Free State

EMIS Free State's greatest strengths lie in its facilitation of the use of SA-SAMS in schools throughout the province with the exception of farm schools that do not have electricity and computers for administrative purposes) and the strategies it employed in providing training to primary users of the system.

The roll out of SA-SAMS to schools in the province with electricity has ensured a tremendous improvement in the quality of data. This improvement was evidenced by the results of the survey for overall data quality in which:

- 14 participants rated overall data quality between "high and very high".

As a result, the Free State is consulted by other provinces on how the province kick-started the implementation of SA-SAMS in schools in 2007. It is also noted that the10 school principals who participated in this study strongly agreed that the use of SA-SAMS has made data capturing easy and understandable. Free State EMIS now requires schools to submit updated data monthly through SA-SAMS. This requirement ensures a higher standard of data quality and means that EMIS Free State conforms to the objectives of the National Education Information Policy which stipulates that data has to be accurate and up-to-date.

In order to spearhead the implementation of SA-SAMS, the department employed SA-SAMS trainers on contract, one for each district except for Thabo Mofutsanyana where two trainers were employed. The trainers were responsible for training principals and clerks on the use of SA-SAMS making it possible for the department to roll out SA-SAMS to schools. Most schools, especially disadvantaged schools, did not have computers. For the implementation to be viable, the department purchased at least one or two computers for administrative purposes for schools with electricity. The computers allocated to the schools were designated for the

use of SA-SAMS only. The training and the roll out of computers ensured the implementation of SA-SAMS at school level.

To increase the number of schools participating in SA-SAMS as well as ensuring the uploading of the SA-SAMS database into LURITS by October 2010, the department has appointed six Farm School Administrators to scan manual survey forms into the SA-SAMS database. These Farm School Administrators are placed in each district. As with SA-SAMS trainers, two Farm School Administrators were appointed in Thabo Mofutsanyana district. The above demonstrates that the Free State has a strong team that ensures the validity and reliability of data gathered from schools.

Another strength of Free State EMIS is the practice of verifying data at different levels of the system to achieve reliable and valid data. For instance, verification takes place at school level, district offices as well as in the provincial office before it is captured onto EMIS databases.

 Against the above discussion, it is argued that although outsourcing is regarded as a strategy to increase the roll out of a project quickly, it also has its own disadvantages in that the organisation lacks the skills for providing support after the project has ended. It is argued that the department must continue strengthening the skills of its employees as this will contribute to the deepening of the knowledge base of its human capital.

Training is identified by the National Education Information Policy as critical to sustaining a system. EMIS Free State realised that training was essential in sustaining SA-SAMS and implemented the positive practice of training school mangers on it. This resulted in school managers owning the system and ensuring that it is used effectively in improving the quality of data gathered from schools. The use of SA-SAMS by schools has also contributed to an increased use of computers because Free State EMIS requires schools to submit monthly database submissions to the provincial office. This requirement facilitates an improvement in computer skills that are lacking amongst schools. It is also noted that Free State EMIS has advocated the use of SA-SAMS and its benefits throughout the system and this makes it possible to increase the level of participation by a number of schools. School Management and Governance Developers were also trained on certain SA-SAMS modules to create awareness of the system that is used by the schools thereby fostering a buy-in from the officials who are directly responsible for management and governance of schools.

5.1.2 The weaknesses of EMIS Free State

Although EMIS Free State does demonstrate significant strengths as explicated above, it is , however, weakened by unreliable data, budget constraints, staff shortages, inadequate training, insufficient user satisfaction, ignorance of the National Education Information Policy and lack of easy access to recorded data.

The National Education Information Policy stresses that data should be reliable and up-to-date. Generally, EMIS Free State needs to be improved as far as reliability and currency of data is concerned. For instance, from the perspective as a user of the system, the researcher has at times discovered that schools that have been closed by the department are still reflected in the EMIS database. It is also common to find that particulars of retired or deceased teachers and principals still appear in the system. Such mistakes or gaps render the information unreliable even though the findings, according to participants, indicate that the information system is reliable. From a management point of view it is argued that the gaps of unreliable and outdated information that are detected in the system create difficulties in making informed decisions. It is critical that checks and balances are implemented on a continuous basis. The process to be followed in closing schools starts at the district level whereby the SMGDs as well as the district Directors are aware of the closure of certain schools. These particulars are communicated to the Sub-directorate responsible for registration and de-registration of schools but are not always captured timeously on EMIS resulting in unreliable and outdated information. From the researcher's point of view EMIS is operating in isolation, because it does not gather information about the needs of its clients in order to design a survey tool that responds to these needs. A good system is also characterised by interaction with other sub-systems in order to achieve its mandate. Increased interaction between EMIS and other key directorates will ensure that EMIS is assisted in achieving this mandate because the collection of reliable data depends on other units in the department. Interaction with other units of the department could lead to reducing most of the problems of late submissions that EMIS is experiencing currently. It would appear that ensuring quality of data is undermined from within the department as improving data quality is not a performance measure in the Annual Performance Plan of the department and because of inadequate budget allocation. It was clear from the answer provided by the Chief Education Specialist that influencing the budget did not fall within his/her jurisdiction. This demonstrated that the official's influential role to lobby for adequate funding is limited. The budget constraints facing EMIS Free State is a serious concern as it was allocated R1,8m during the 2010/11 financial year. The progress

made by EMIS Free State in ensuring success in data collection and analysis by introducing innovative ways to manage data for the department could be hindered by limited funding .

The National Education Information Policy points out clearly that information from EMIS must be analysed at all levels of the system including the collection point. This means that when a user wants information from EMIS, that user must be able to get the analysed data at any level without having to depend on EMIS officials to get the information. This is another weakness because it has been noted on several occasions that information requests for analysed data are always channelled through EMIS officials. This demonstrates a gap in the system because there is no conformity with the objectives of the policy. It is further argued that this gap is compounded by the fact that not all officials in the department have access to the Internet that would make it be possible to access EMIS online. This statement is confirmed by the answers provided by the SMGDs, whereby seventeen out of ninenteen participants strongly disagree with the statement that, *I have access to the Internet in my office to retrieve analysed data for my schools."*

 The different answers provided by the two EMIS managers to the questions asked on data mining clearly demonstrated a lack of understanding of what data mining does in filtering large volumes of data without requiring questions asked in advance by the client. An educated guess about these answers is that the EMIS managers are not aware of the newly available software on the market that could make analysis of data easy.

It has been noted with serious concern that although EMIS Free State performs well with regard to data quality and reliability, there is a huge shortage of staff in the Sub-directorate. For instance, it has been discovered that SA-SAMS trainers are responsible for providing support and monitoring the implementation of SA-SAMS in an average of two hundred schools each. This means that some schools are not supported within a particular year. The study also revealed that some districts are not staffed whilst in other districts the provincial office is utilising posts that were initially advertised for districts due to shortage of staff in the provincial office as well as lack of office space in the districts. It was also discovered that the Free State is using the swapping method instead of appointing one supervisor for capturers and another supervisor for verifiers. Although swapping is an innovative strategy to improve the quality of data it could lead to data quality being compromised. The posts for the Statistician and the Programmer have been vacant since 2008. Statisticians are required in the system for data analysis. The gap in staff requirements in the EMIS Free State could result in non- achievement of EMIS objectives.

Training is noted in the National Education Information Policy objectives as critical to ensure sustainability. It was noted in this study that all principals who participated in this study indicated that the training that was provided was inadequate and was sometimes in the form of information sessions which lasted about half an hour only. This means more support is needed at school level. There are not enough trainers available to support schools and this could lead to minimal use of the system by schools. Although the question on basic computer skills was not addressed by the survey tools in this study, the researcher asserts that, based on her considerable experience of working in the department, most principals lack the basic computer skills to manage SA-SAMS. The lack of training of all stakeholders on how to analyse data is another weakness that has been identified. This means stakeholders have to depend on EMIS officials to get analysed data. This practice contradicts the Education Information Policy objectives where it is clearly stated that in an ideal situation EMIS must ensure that data is analysed close to the entry point.

The discussion on systems theory highlighted that a system or a sub-system needs to be constantly evaluated to assess whether it satisfies the needs of its users. The differing contradictory answers provided by the two EMIS managers to the question on how the department evaluates user satisfaction imply that EMIS Free State does not consider the needs of users other than the needs stipulated nationally by the prescribed survey forms. This means that whatever is not catered for in the prescribed survey forms is not collected and analysed to assist the department in its planning and decision making. For example, the survey forms do not provide means to gather data on available Learning and Teaching Support Materials in each school. When information related to available LTSM is needed for planning, such information cannot be accessed through EMIS. The unique circumstances of the Free State Department of Education sometimes compel it to gather and analyse data other to what is determined nationally to assist it in its planning and decision making.

 The study revealed that the School Management and Governance Developers are not aware of data quality standards as well as the National Education Information Policy. The ratings for the questions asked indicated a gap because out of nineteen participants, five strongly disagree and four are neutral on the statement related to awareness of the National Education Information Policy. It was also noted that the ratings for questions related to the data quality standards indicated a gap because out of nineteen participants seven strongly agree whilst five are neutral about the statement. This is an indication of lack of understanding of these National Policies. The principals of schools were also not able to demonstrate an

understanding of the data quality standards. There is a correlation between the answers provided by the principals and those of School Management and Governance Developers because the School Management and Governance Developers are supposed to know the different policies relating to the management of schools and provide training on them. Consequently, if School Management and Governance Developers are unaware of the National Education Information Policy so are the principals and management teams of schools.

It is further noted that EMIS Free State needs to be reviewed to meet the varied needs of its users for informed decision making and planning. For instance, the data fields in the survey forms need to be aligned with the needs of clients. Such information will help during planning and decision making.

The findings also show a huge gap regarding the immediate access to data close to the entry point as the National Education Information Policy prescribes. This means the schools without Internet access will have to wait for the printed reports which are sometimes delayed due to the red tape of government procedures. This means without Internet access schools are unable to access information on EMIS and are consequently unable to analyse it to enhance decision making**.**

5.2   Recommendations

Although the findings have revealed a number of factors that indicate that EMIS is effective, there are gaps that have been identified which could be rectified to make the system even more effective and reliable. EMIS, like any system, requires regular feedback from the users on how the system is performing. This feedback could be in the form of an information session with stakeholders in which relevant questions are asked to assist in developing the Information Systems strategy of the department. EMIS is an information management system that requires the capturing and analysis of all sorts of data that when processed into information will help the department to make valuable decisions. By consulting stakeholders on their needs would mean that Free State EMIS considers the needs of its clients when surveys are administered. The department is expected to report on the performance of learners in Numeracy and Literacy in Grades 3, 6 and 9. EMIS is the only information system that will assist the department to realise this performance measure at the end of 2010 and beyond. This means the stakeholder approach whereby different stakeholders are consulted for information needs must be adopted by the EMIS Sub-directorate.

The success of any project depends on the availability of funds which when used effectively, efficiently and economically achieve the objectives. The funding mechanism for the information system of the department needs to be prioritised. For instance, provinces are expected to upload the SA-SAMS database onto LURITS for full implementation by 2011. This huge project needs adequate funding without which the project implementation will not succeed in meeting its objectives. The budget allocated to Free State EMIS is far below what other provinces are allocated.

The mandatory Performance Measures from the National Treasury are also misleading because the performance measures only refer to "*number of schools with SA-SAMS.*" It is recommended that EMIS officials who participate in the crafting of the Annual Performance Plan for the department should ensure that the performance measures address the objectives of the National Education Information Policy as well as data policy standards. The EMIS officials that participate in submitting inputs for the annual performance plan of the department - which ultimately contributes to the development of the strategic plan - must advise the Strategic Planning Sub-directorate regarding the alignment of performance measures with the goals of the National Education Information Policy as well as the data quality standards. It would be wise for the Free State Department of Education to imitate best practice from EMIS Tanzania whose plan of action is crafted in such a way that it responds to the policy objectives as well as to data standards. EMIS Tanzania evidences the due consideration of relevance, timeliness and reliability, as well as vision, mission and strategies. Tobin[151] also strongly believes that in order to gain direction, the goals detailing what deficits, and what needs to be accomplished must be determined.

Also noted amongst the weaknesses of EMIS Free State is the lack of understanding of the National Education Information Policy objectives and the data quality standards on the part of the principals and the School Management and Governance Developers. There should be advocacy in the form of information sessions at district level on these critical policy frameworks that guide provinces in providing reliable and credible data for planning and decision making by the national and the provincial departments. It has been noted that the objectives of the National Education Information Policy, as well as data quality standards, are not clearly articulated in either the strategic plan or the annual performance plan of the department as well as in the EMIS operational plan. It is recommended that the objectives of

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[151] Tobin, T. 2001. p.5

the National Education Information Policy as well as the elements of data quality standards be used as performance measures in both strategic documents of the department that will be monitored yearly for accountability purposes. It is also recommended that the EMIS Sub-directorate review its operational plan to give direction by crafting comprehensible vision and mission statements as well clear performance measures based on the above policies as well as elements of data quality standards. It is critical that the Free State Department of Education through the Education Management and Information Systems Sub-directorate develop this policy as it will ensure that all stakeholders comply and may be held accountable to provide relevant and accurate data for future use during planning and informed decision making. Learning from best practice is an important ingredient for success. Other than what is being prescribed by the Department of Basic Education, the Free State could learn from other countries about optimal ways of implementing EMIS. For instance, in Zimbabwe the user is the central focus for EMIS. In Zimbabwe it is strongly emphasised that it is critical to understand what users want. In order to determine users' needs, Zimbabwe undertakes an evaluation which takes different forms e.g stakeholder forums and feedback meetings. A comparative study tour, in which beneficial practice toward the implementation of EMIS in both the Free State and Zimbabwe is strongly recommended.. This need not imply that the Free State should abandon the best strategies to improve the gathering and analysis of data for decision making and planning purposes. The purpose of the study could be to establish or undertake a comparative analysis of practices in the Free State with those in Zimbabwe. It is understood that financial implications for the study were not budgeted for during the 2010 /11 financial year. The study could be part of the plans for the next financial year.

Guided by findings of this research it may be concluded that EMIS Free State is effective because it conforms to the data quality standards as well the objectives of the National Education Information Policy. It is has been noted from the analysis of the EMIS survey forms that there is no provision for data fields, spaces for the gathering of data related to the availability of Learning and Teaching Support. This identified gap undermines EMIS's reliability because it is impossible to obtain information related to which schools have relevant Learning and Teaching Support Materials. The absence of this information calls for a review of the EMIS survey tools to include data fields that will respond to this gap. The availability of this information will make it possible for the department to direct its planning to areas where there is a definite need. Another identified information gap involves survey forms which do not make provision to count a teacher once for the language she / he offers

per school. This point is further clarified that when the user wants information from EMIS to provide a breakdown of teachers per language level taught (e.g. Home Language, First Additional or Second Additional) EMIS provides the number of teachers irrespective of the level. This could lead to double counting and is a deficiency that needs to be rectified because it does not provide a true reflection of the number of teachers teaching a particular level of a language offered per school.

The Free State Department of Education must adopt the best practice of a National Advisory Council whereby different stakeholders are part of an EMIS forum to advise on the development, advocacy and budgeting for EMIS as implemented in Zimbabwe. Such an advisory council comprises of different stakeholders that will influence the Accounting Officer as well the political leader on the allocation of budget as well ensuring that the needs of users are taken into account. As noted in chapter two above, the success of information systems depends on the political commitment. This advisory council will play an influential role in advising the Member of the Executive Council on the critical role that the EMIS plays in the planning process of the department. The advisory council could also emphasise that adequate funding must be available to enable the department to achieve its mandate through a strengthened information system. The advisory council must be placed at strategic level to influence the political decisions for the improvement of EMIS. This Advisory Council will also advise on identification of needs for training of different stakeholders to improve the quality of data. The need for training was highlighted by the principals of the schools who participated in this study.

Noted amongst the weaknesses is the huge gap of non-filling of critical vacant EMIS posts of which include the programmer, the statistician the EMIS coordinators and programmers for two districts. The shortage of staff in EMIS Sub-directorate is a huge gap that could lead to low staff morale and lack of motivation. It also hampers service delivery. It is strongly recommended that all EMIS vacant posts must be filled for the department to achieve as expected by the Department of Basic Education.

5.3   Challenges experienced

Getting responses from the participants was not easy although a period of two weeks to respond to the questionnaire was allocated. This kind of obstacle was mostly experienced with officials employed as Office Based Educators (OBE) in the department. Another challenge experienced was that one participant whose contribution was critical to this research was not

willing to participate as he informed the researcher that he had not made any commitment to participate in the study. Knowing that non-participation by this respondent would render the study unsuccessful, the researcher took it upon herself to convince him to participate. After a long discussion, he agreed but then had to complete the survey tool in the researcher's presence because of time constraints. His reluctance to participate in the study casts doubt on the validity of his responses. It is important that readers are aware, however, that the other participants showed willingness to assist in the research.

5.4   Conclusion

EMIS is the hub of the Free State Department of Education. Its reliable and credible data is critical for varied decisions taken at different levels. My informed conclusion is that EMIS Free State is found to have systems in place which ensure that data is reliable and valid. The quality of work that has been done by the Free State Department of Education in providing quality data needs to be strengthened by ensuring that the required personnel are employed without resorting to outsourcing because the EMIS pool of expertise has made a huge investment in providing high-quality data to the province. These experts are intimately familiar with the processes of the department and have established good relationships with the schools. Outsourcing would mean that service providers would first need to learn how the processes of the department work, which would be time-consuming, and, ultimately, counter-productive. Furthermore, the time-lines followed by the Department would be severely compromised. The strengthening of EMIS could take the following into consideration:

EMIS is a system, and therefore its success depends on interaction and interrelationships with other units in the department. This means it is of critical importance that all stakeholders relevant to the EMIS implementation and data gathering are taken on board and are involved in the development of EMIS strategy. A continuous dialogue with EMIS users is critical as it will determine what the educational needs are, and what is achievable in the short and long term. The adoption of a communicative approach, the basic characteristic of a system, will ensure that challenges faced during implementation are addressed before the best practice that EMIS is doing in the province is spoilt. The dialogue will provide an opportunity for open communication on how the system could improve on the benefits which it has generated, as well as how the negative perceptions which stakeholders may have about the system could be transformed.

127

5.5   Future research

The study does not include all the schools in the province. It would be interesting to evaluate the perceptions of other schools that represent the five districts in the province. The survey instruments used in the study could be adapted to include   other aspects of information systems success that could not be included in this study. EMIS's intention is to provide reliable and credible information for decision making and planning, therefore a study targeting the Executive Management as well as the Broad Management of the department could be undertaken in order to gather the views of the planners about how EMIS information assists them during planning as well as in the decision-making process.   In this way the department would be constantly evaluating the system in terms of users' needs, in line with the systems theory approach.

BIBLIOGRAPHY

Aouad, G. et al…(1999) Technology management of IT in construction: a driver or an enabler. *Logistic information management*, 12 (1/2): 130-137.

Axelsson, M and Landelius, H. (2002) An information system as an enabler of knowledge transfer: a case study of the Skanka Knowledge network at Skanka AB. Master's Thesis

Berg, B.L. (2004) *Qualitative research methods for the social sciences*. New York: Pearson.

Bjórn-Anderson, N and Davis, G.B. (eds) (1986) *Information systems assessment: issues and challenges. Proceedings of the IFIP WG 8.2 conference on Information Systems assessment*. Nordwichjkerhout. Netherlands.

Bjørn-Anderson, N. and Davis G.B. (eds) (1986) Incorporating user information systems assessment. In *Information systems assessment: issues and challenges. Proceedings of the IFIP WG 8.2 Conference on information systems assessment*. Netherlands: Elsevier Science Publishers.

Bless, C. and Higson-Smith, C. (2000) *Fundamentals of social research methods: an African perspective*. 3rd ed. Cape Town: Juta.

Bocij, P. et al... (2006) *Business information systems: technology, development and management for e-business*. 3rd ed. England: Pearson Education.

Brown, S.E. and Lerch, D.C. Systems thinking: a tool for municipalities. Available: www.postcarboncities.com [Accessed: on 27 April 2010].

Bulling, P. (2009) ICT in education: education management systems step up gear. *Government IT, 1 (3): 18-20.*

Burkhardt, H.J. and Schindler, S. (1981) Structuring principles of the communication architecture of open systems: a systematic approach. *Computer networks,* 5: (157-166).

Cabrera, D. et al... (2008) Systems thinking. *Evaluation and program planning,* 31: 299-310.

Cassidy, T. (2005) *Education management and information system (EMIS) development in Latin America and Carribean : lessons and challenges.* InfoDev Program at the World Bank.

Charles, C.M. (1995) *Introduction to educational research*. 2nd ed. San Diego: Longman.

Claver, S, et al... (2001) The performance of information systems through organizational culture. *Information technology and people,* 14 (3): 247-260.

configuration. *International journal of quality and reliability management*, 25 (7): 772- 786.

Cronholm, S and Goldkuhl, G. (2003) Six generic types of information systems evaluation. Paper presented at the 10th European Conference on information technology evaluation (ECITE-2003): 25-26 September 2003, Madrid.

DeLone, W.H. and McLean, E.M. (2003) The DeLone and McLean model of information systems success: a ten year update. *Journal of management information systems*, 19 (4) : 9-30.

DeLone, W.H. and McLean, E.M. (1992) Information systems success: the quest for the dependent variable. *Information systems research,* 3 (1): 60-94.

Denning, S. (1998) *What is knowledge management*? : A background document to the World Development Report. World Bank, Washington.

Draft White Paper: Transformation of Public Service. (1995) Cape Town: Ministry of the Public Service and Administration.

Elpez , I. and Fink, D. (2006) Information systems success in the public sector: stakeholders' perspective and emerging alignment model. *Issues in information science and information technology*, 3: 219-231.

Fox, W, Schwella, E and Wissink, H. (1991) *Public management*. South Africa: Juta.

Free State Province. Department of Education. (2005) *Approved macro structure*

Free State Province. Department of Education. (2007) *Annual performance plan, 2007/8-2009/10*.

Free State Province. Department of Education. (2010) *EMIS statistical report*.

Gholafshani, N. (2003) Understanding reliability and validity in quantitative research. *The qualitative report,* 8 (4): 597-607.

Gounaris, S.P., et al... (2007) Measuring the effectiveness of marketing information systems: an empirical validated instrument. *Marketing intelligence and planning*, 25 (6): 612-631.

Gupta, U.G. (2000) *Information systems success in the 21st century*. New Jersey: Prentice-Hall.

Hatting, M.J. (2005) Instrument to evaluate to which extent the Operational Support Information System (OSIS) adds value to the South African Air Force (SAAF). *Masters Thesis*: University of Stellenbosch.

Heard, W. and Badcock-Walters, P. (2006) *Educational planning in a world with AIDS. Version 1: HIV challenges for education information systems*. Paris: International Institute for Educational Planning : UNESCO.

Heeks, R. (1999) *The tyranny of participation in information systems: learning from development projects.* Development Informatics, Working paper 6. Manchester: Institute for Development Policy and Management.

Hussein, R. et al... (2007) The influence of organizational factors on Information Systems success in e-Government agencies in Malaysia. *The electronic journal on information systems in developing countries*, 29 (1) : 1-17.

Ifinedo, P. (2007) Investigating the relationship among ERP systems success dimensions: a structural equation model. *Issues in information systems,* VIII (2) : 399-405.

Introna, L.D. and Whittaker, L. (2001) *The phenomenology of information systems evaluation : overcoming the subject / object dualism*. South Africa.

Jackson, MC. (2005) *Systems thinking: creative holism for managers*. England : Wiley.

Jacobs, M. (2008) Systems thinking: The fifth discipline of learning organizations. Systems In Sync: Guiding organizations toward a shared vision. Available: *www.systemsinsync.com.*[accessed on 2 May 2010].

Jennex, M.E. and Olfman, L. (2004) *Assessing knowledge management success / effectiveness model.* Proceedings of the 37th Hawaii International Conference on Systems Success. (p.2)

Joppe, M. (2000) The research process. Available: www.ryerson.ca/~mjoppe/rp.htm. [accessed 15 February 2008].

Kalbasi, H. (2007) Assessing ERP implementation : critical success factors. Luela University of Technology. *Master's Thesis.*

Katz, J.S. (2006) Indicators for complex innovation systems: a scale independent view. *Research policy,* 35: 893-901.

Kelegai, L. and Middelton, M. (2004) Factors influencing information systems success in Papua New Guinea organisations: a case analysis. *Australian journal of information systems*, 11 (2): 57-69.

Khan Q. (1996) *Managing education for outcomes: the educational management information systems.* Paper presented at a capacity building workshop in Thailand on 21-22 December 1996.

Kok F. (2009a) Chief Education Specialist: EMIS. Personal interview, conducted on 9 March 2009.

Kok, F. (2009b) Free State a stabilizer in implementing school ICT systems. *Government IT,* 1 (3): 1-48.

Krisha H. and Sharma R. (2008) Estimation of reliability characteristics of general systems

Kucza T. (2001) *Knowledge management process model.* Finland: VTT Technical Research Centre of Finland.

Laudon K.C. and Laudon J.P. (2004) *Management information systems: managing a digital firm.* 9th ed. New Jersey: Pearson Education.

Laudon K.C. and Laudon, J.P. (2005) *Essentials of management information systems: managing a digital firm.* 6th ed. New Jersey : Pearson Education.

Lee, S.M. and Hong, S. (2002) An enterprise-wide knowledge management system infrastructure. *Industrial management and data system*, 102(1): 17-25.

Leischow, S. J. et al... (2008) Systems thinking to improve the public's health. *American journal of preventive medicine*, 35 (2S): S196-S203.

Lewis P.J. (1994) *Information systems development: systems thinking in the field of information systems.* Great Britain: Pittman.

Mathi, K. (2004) Key success factors for knowledge management. *Master's Thesis.* Germany: University of Applied Sciences.

Mouton, J. (1996) *Understanding social research.* Pretoria: Van Schaik.

Mugerezi, E. (2002) EMIS implementation in municipalities. Paper presented at the Nairobi City Council GIS workshop application in City Planning and Management, Nairobi, Kenya on 18 February 2002. Unpublished.

Muhlenberg College 1990. The multiple dimensions of information quality. Available: www.muhlenberg.edu/depts./abe/business/miller/mdiqual.html [Accessed on 15 July 2010].

Munshi, J. (1999) A framework for MIS effectiveness research. Available: www.*Munshi.4t.com/papers/swafad91.html* . [Accessed: 19 January 2008].

Nicolaou, A. (2004) ERP systems implementation: drivers of post-implementation success. USA: Bowling Green State University.

Özkan, S. (2006) PB-ISAM: A process –based framework for information systems effectiveness assessment in organizational contexts. Doctor of Philosophy: Thesis. Middle East Technical University.

Patel, F. (2007) *Education Management Information System (EMIS): ensuring quality through education districts*. Minutes of the Portfolio Committee held on 9 November 2007, Pretoria.

Phosa, A. (2009) Deputy Chief Education Specialist. Personal interview conducted on 17 March 2009.

Pitt, L.F.et al... (1995) Service quality: a measure of information systems effectiveness. *MIS Quarterly*: 173-186.

Rai, A. et al... (2002) Assessing the validity of IS success models: an empirical test and theoretical analysis. *Information systems research*, 13 (1): 50-69.

Remenyi, D. et al...(2000) Some ad hoc information system issues in South Africa for the new millennium and suggestions as to how to deal with them. *Information technology for development, (9): 163-174.*

Robles-Flores, J.A. and Kulkarni, U. *Knowledge management systems: a business value model*. Arizona State University.

Rodgers, C. (2006) *Informal coalitions: mastering hidden dynamics of organizational change*. New York: Palgrave Macmillan.

Roldán, J.L. and Leal, A (2003) *A validation test of an adaptation of the DeLone and McLean model in the Spanish EIS field*. Spain, University of Spain : Idea Group.

Rountree, J. H. (1977) Systems thinking: some fundamental aspects. *Agricultural systems*, 2: 247-254.

Saarinen, T. (1996) SOS: an expanded instrument for evaluating information systems success. *Information & management*, 31: 1-118.

Sabherwal, R., Jeyaraj, A. and Chowa, C. (2004) Information systems success: dimensions and determinants. Doctoral Thesis. St Louis: University of Missouri.

School realities. (2008) Available: www.education.gov.za/EMIS [Accessed 20 June 2009].

Schulthesis, R. and Sumner, M. (1995) *Management information systems: the manager's view*. Chicago: Irwin.

Seddon, P.B. (1997) A re-specification and extension of the DeLone and McLean Model of IS success. *Information systems research,* 3 (3): 240-253.

Shapiro, J. (2000) *Monitoring and evaluation: program manager's planning monitoring and evaluation toolkit.* South Africa: CIVICUS: World Alliance for Citizen Participation.

Skyrme, D.J. (1999) *Knowledge networking: creating the collaborative enterprise*. Oxford: Heineman.

South Africa. Department of Basic Education. (2004) *Education information policy*. Pretoria: Department of Education.

South Africa. Department of Basic Education. (2004) *National education information policy: draft data quality standards*. Pretoria: Department of Education

South Africa. Department of Basic Education. (2007) *Annual survey 2007*: *ordinary schools.* Pretoria: Department of Education.

Suurla, R., et al... (2002) *Developing and implementing knowledge management in the Parliament of Finland.*

Thomas, R.D. (2006) An empirical investigation of factors promoting knowledge management system success. *Doctoral Dissertation*, Texas Tech University.

Thong, J.Y.L. and Yap, C. (1996) Information systems effectiveness: a user satisfaction approach. *Information processing and management*, 33 (5): 601-610.

Trucano, M. ed. (2006a) Education management information system: a short case study of Ghana. *InfoDev,* Working paper no.4.

Trucano, M. ed. (2006b) Rethinking education management information systems: lessons learnt from and options for less developed countries. I*nfoDev*, Working paper no 6.

Turare, R. and Kavanamur, D. (1999) Reinvigorating sustainable development in Papua New Guinea : a systems thinking approach. *Development bulletin*, 50: 25-28.

Turban E, et al... (2005) *Introduction to information technology*. 3rd ed. United States of America: John Wiley.

Voights, G.G.F. (1999) *Development of Education Management Information System (EMIS) in Namibia*.

Voights, G.G.F. (2004) Education Management Information System (EMIS) Development Plan. Available: www.moe.gtz/documents/EMIS%20Doc/EMIS%DEV%20PLAN%20. [Accessed on 12 July 2009].

Wako, T.N. (2003) *Education management information systems (EMIS): an overview*. UNESCO. Harare: Zimbabwe.

World Development Report for the World Bank. 1998. *Knowledge for development*. Oxford: Oxford University Press.

Xu, H. (2003) Critical success factors for accounting information systems data quality. *Doctoral Dissertation*, University of Queensland.

Yin, R.K. (2003) *Case study research design and methods*. 3rd ed., California: Sage.

APPENDICES

APPENDIX A   QUESTIONNAIRE FOR PRINCIPALS OF SCHOOLS.

The National Education Information Policy was approved by the Minister of Education in August 2004. This policy outlines the framework which allows for the coordination and development and maintenance of Education Information Systems

No	Questions relating to this policy	YES	NO
1.	Are you aware of this policy?		

2.   If yes to question 2 above, do you know the purposes of the National Education Information Policy?

Can you mention at least 1 of them?

Annually all schools are expected to participate in snap surveys, annual surveys, etc

3.   Do you know the purposes of these surveys? YES / NO

4.   If yes, to the above can you mention ONE purpose?

5.   Was SA-SAMS installed at your school by the department? YES/ NO

6.   If yes, do you use it to capture data: YES / NO

7.   Were you trained on SA-SAMS   YES/ NO

8.   Who completes the surveys at your school?

9.   How do you access learners' details that are expected to be filled in the survey forms?

10.   Is it easy to access the details mentioned in point 7 above in the time allocated by the department to complete the survey forms?

11.   How do you access information regarding learners who are orphans?

12.   You are also expected to fill information in regarding teachers at your school.

How do you access this information?

Do you get this information easily from teachers? YES /NO

13.   After filling in the survey forms, is there a method to check that data included in the survey forms is correct before it is sent to the district office. YES / NO

14. If yes, who checks the correctness of data?

15. When looking at the output of what has been captured, have you noticed mistakes or differences to what was originally captured by your school?

APPENDIX B   SELF-ADMINISTERED QUESTIONNAIRE FOR SCHOOL PRINCIPALS

From the statements provided below, please tick {✓} ONCE, the appropriate column. The columns range from 1-7. Ticking columns 1-3, means that you disagree with the statements listed on your left hand side, ticking column 4 means that you are neutral, and ticking columns 5-7 means you agree with the statements on the left hand side.

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	Disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
1. System quality							
1.1.At school we capture data using SA-SAMS.							
1.2.The department has trained the members of our school in using SA-SAMS.							
1.3.Using SA-SAMS has made data capturing easier.							
1.4.Filling in of survey forms is easy and understandable.							
1.5. The information needed regarding learners' details as required in the survey forms is difficult to access from sources outside the schools' control.							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	Disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
1.6. There is enough time allocated to fill in the detailed data as required by the EMIS survey forms.							
1.7. The data posted on the departmental website is easy to understand and to retrieve.							
2. Information quality							
2.1. Input is verified by the department before capturing into the EMIS database.							
2.2. Feedback on what has been captured in EMIS is distributed to role players for final verification							
2.3. The input is the same as the output.							
2.4. EMIS provides up-to-date and current information.							
2.5. EMIS output is relevant to the needs of the Department							
3. Individual and							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	Disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
organizational impact							
3.1.The output of what has been captured, is disseminated to schools to make decisions							
3.2. The school constantly gets analysed output to make decisions.							
3.3. As a result of EMIS more relevant information is available to make decisions							
3.4. The timeframe allocated to fill in the survey forms is not enough taking into consideration the data needed in the data fields.							
3.5. My school has access to the Internet to access the Provincial EMIS database for decision making.							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	**Disagree**	**Mostly disagree**	**Neutral**	**Mostly agree**	**Agree**	**Strongly agree**
3.6. Other than electronic means of disseminating the analysed data the individual school gets flyers or printed analysed data in handbooks.							

APPENDIX: C SELF-ADMNINSTERED QUESTIONNAIRE FOR SMGDs

SECTION A.

A) In this section, please rate the quality of EMIS data.

A1) Quality data from your EMIS database?

How would you rate the overall data quality in EMIS of the Free State Department of Education?

□ Very poor   □ Neutral   □ Very high

□ Poor   □ High

A2) Accuracy of data: the recorded data conforms to the actual data entered

□ Very Poor   □ Neutral   □ Very High

□ Poor   □ High

A3) Timeliness: The recorded data is not out of date

□ Very Poor   □ Neutral

□ Poor   □ High

□ Very High

A4) Completeness: all values for a certain data field are well presented and easy to find.

□ Very Poor   □ High

□ Poor   □ Very High

□ Neutral

A5 Consistency: the representation of data is always the same as the input all the time

□ Very Poor   □ High

□ Poor   □ Very High

□ Neutral

SECTION B.

In this section please tick {✓} ONCE, the appropriate column. The columns range from 1-7

Ticking columns 1-3, means that you strongly disagree with the statements listed on your left hand side. Ticking column 4 means that you are neutral about the statements on the left hand side. Whilst ticking columns 5-7 means you strongly agree with the statements on the left hand side.

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
1. System quality							
1.1.All the schools I am responsible for are using SA-SAMS to capture data.							
1.2.I have access to the Internet in my office to retrieve analysed data for my schools.							
1.3. EMIS is user friendly and well organised to retrieve analysed data easily.							
1.4. The data posted on the departmental							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
website is easy to understand and facilitate decision making.							
2. Information quality							
2.1. I verify the correctness of data before it is submitted to the district EMIS coordinator.							
2.2. Feedback on what has been captured on EMIS database is distributed to role players for final verification.							
2.3. Input from EMIS databases is the same as the output.							
2.4. I am aware of the National Education Information							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
Policy							
2.5. I am aware of the data quality standards.							
2.6. EMIS output information is accurate.							
2.7. EMIS output is current, precise, relevant, current and up-to-date.							
3. Individual and organizational impact							
3.1. I use analysed data to assist my schools in decision making.							
3.2. EMIS database has increased the quality of decision making in the department							
3.3. Other than electronic media, individual schools and officials of the department							

Dimension	1	2	3	4	5	6	7
	Absolutely disagree	disagree	Mostly disagree	Neutral	Mostly agree	Agree	Strongly agree
receive analysed data through flyers, pamphlets, oral presentations.							
3.4. All the schools I am responsible for understand the objectives of the National Education Information Policy.							
3.5. All the schools I am responsible are aware of the data quality standards.							

APPENDIX D: QUESTIONNAIRE FOR DATA CAPTURERS

The National Education Information Policy was approved by the Minister of Education in August 2004. This policy outlines the framework which allows for the coordination and development and maintenance of Education Information Systems

No	Questions relating to this policy	YES	No
1.	Are you aware of this policy?		

2.   If yes, how did you know about the policy?

Choose ONLY ONE from the options

- The department's information sessions held at district or Provincial Offices.
- Website of either the National Department or Provincial Department.
- Distributed nationally or provincially to districts.
- No idea.

3.   If yes to question 2 above, do you know the purposes of the National Education Information Policy?

Can you mention at least 1 of them?

Annually all schools are expected to participate in snap surveys, annual surveys   etc

4.   In what format (electronic or hard copy) do you receive captured data from schools?

5.   During capturing of data do you detect mistakes that have occurred during data capturing at school level?

6.   What happens when you detect mistakes in data captured at school level?

7.   After finishing capturing data who verifies its correctness?

8.   When completed capturing, in what format do you send the captured data to the Provincial Office?

9.   Does the District get an opportunity to verify the data captured by the Provincial Office before it is stored in the Provincial database? YES / NO

10.   If yes, have you noticed mistakes from the original data captured against what you verify?

11.   What kind of training have you been exposed to in order to do your job efficiently?

APPENDIX E   SELF-ADMINSITERED QUESTIONNAIRE FOR EMIS OFFICIALS : PROVINCIAL EMIS SUPERVISORS

For the following statements you are provided with TWO options. Choose the appropriate ONE.

National Education Information Policy

1.   Are objectives of the above policy articulated in the annual performance plan or strategic plan of the department?

Yes   ☐   No   ☐

2.   Do you have a data policy in the department?

Yes   ☐   No   ☐

3.   If yes, have the objectives of the above policies been communicated to all stakeholders in the department?

Yes   ☐   No   ☐

4.   Was an evaluation conducted in the past five years to determine the effectiveness of EMIS in relation to users' perceptions?

Yes   ☐   No   ☐

5.   Do you supply schools or districts with output reports to verify information before it is published?

Yes   ☐   No   ☐

Please provide an opinion in response to the questions.

6.   You use Statistica as an analysis tool. What was the reason for choosing this tool?

7.   Do you do data mining? If so, what sort of data mining?

8.   Data has to be interpreted before it is disseminated. What sort of questions do you ask during data analysis?

9.   Other than electronic media how do you disseminate analysed information in particular to schools that do not have access to the Internet?