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TITLE

Enhancement of information Management & Systems: Towards business efficiency and productivity Within The Asset Creation Department of Eskom in Kwa-Zulu Natal

Student Name: Nakhokonke Silomo Xulu

Student Number: 200200344

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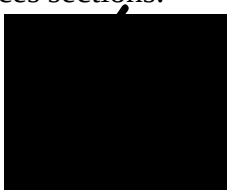
Signed: 

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Abstract

This study articulates the enhancement of Management Information Systems and its role in enabling business efficiency and productivity in Eskom Operating Unit within the Asset Creation department (KwaZulu-Natal). The study aimed to determine how Information Systems could be used to enhance its operations, reporting and business efficiency. The research methodology adopted a mixed method approach utilising both qualitative and qualitative methods. Interviews were used to interact with management for the collection of qualitative data and a questionnaire for quantitative data collection. The study adopted primarily a census approach to population and sampling and therefore targeted the entire department. The findings of the study indicated that there are operations taking place in isolation and that information systems can serve to increase the flow of information across departments. In addition, real time information can promote proactive management decision-making that can influence operations. The research study concluded by proposing a model for best practice which was underpinned by the Delone and Mclean Information Systems model. The research recommends that the organisation must develop programmes to establish the sharing of information and transparency, adopt the proposed model and conduct a study in other operating units. It further recommends that Group Information Technology become visible by conducting technology roadshows and exhibitions and also ensure regular engagements with the executive on their operational meetings.

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Abbreviations and Acronyms

KZN OU	KwaZulu-Natal Operating Unit
MW	Megawatts
EXCO	Executive committee
NED	Network Engineering & Design
BIPM	Business Integration and Performance Management
Dx	Distribution
MIS	Management Information Systems
IS	Information System
ERP	Enterprise Resource Planning
DSS	Decision Support System
ISO	International standards Organization

Chapter 1

Introduction

1.1. Introduction

Information sharing is pivotal for organisational success when it comes to transparency in operations, processes and performance. This study examined the barriers to information sharing at a prominent energy-related organisation in KwaZulu-Natal with the intention of examining the role of Management Information Systems to address and promote more information sharing. This chapter introduces the study, and defines the research problem. This there informs the research questions and objectives of the study thereof. An outline of the methodology will be presented as well as the significance of the study.

1.2. Contextual Background

Eskom is a utility which operates as a monopoly in the generation, transmission and distribution of electricity in South Africa and neighbouring countries. Eskom Holdings is made up of 4 divisions. These are:

- Generation: sole responsibility is to generate electricity
- Transmission: sole responsibility of transmitting electricity from generation to distribution
- Distribution: Responsible for distributing electricity to its customers.
- Customer Services: ensures that customer needs are catered for. Eskom customers are categorized as follows :

- Industrial
- Municipalities for redistribution
- Mining
- Commercial
- Agricultural and
- Residential

Currently, Eskom owns and operates 27 power stations in South Africa with a total nominal capacity of 41 995 Megawatts (MW). Eskom's generating capacity comprises of 35 726 MW from coal-fired power stations, 1 860 MW from nuclear power, 2 409 MW from gas-fired power fuelled by diesel, 2 000 MW from hydro and pumped storage stations as well as 3 MW from a wind farm at Klipheuwel (EXCO , 2014).

The Distribution division, consists of 9 Operating Units (OU) located in the 9 provinces within South Africa, and focus is primarily on the KZN operating unit which has an energy demand of 6105 MW of 36970 MW national energy demand which totals 16.5% of national demand. EThekwini municipality consumes 31% of KZN's total demand. There is a total of 56 610km of line. There are 22 Transmission substations and 386 Distribution substations. There are approximately 730 000 active agreements in KZN (BIPM, 2015). This includes 729 973 residential customers, 55 municipalities and the balance being industrial, Mining, commercial and agricultural customers. KZN contributes to R13.6 billion in revenue. Municipal customers account for 46% of this, industrial 34%, residential 8%, commercial 5%, Mining 1% and others total 6%. Eskom challenges in KZN include the backlog with the Electrification of

households; the islands of un-electrified households; constrained networks; and the high incidence of illegal connections, theft and vandalism (BIPM, 2015). The focus of the study will be on the asset creation department within the KZN OU.

The KwaZulu-Natal operating unit (KZN OU) is made up of the following core departments and these are known as the 'wires business', namely because these departments deal with the engineering components of the business. These include Asset Creation, Maintenance and operation, Safe, Health and Environmental Quality, and Business Integration and Performance Management.

The focus of this study will be on Asset Creation within the KwaZulu-Natal operating unit. As defined above, Asset Creation department's primary focus is on the development and construction of assets. Operations are conducted on a daily basis. Asset Creation is an ongoing programme. This programme includes the involvement of the following departments:

Department	Expected output.
Network planning	Lead in the identification of constrained networks, and put together a plan to reduce these constrains, develop network master plans and Network development plans and support Electrification Planning by producing network planning reports
Electrification Planning	Aligns Eskom plan with the Independent development plan (IDP) as issued by the Department of Energy and Municipalities. EP also liaises with governmental structures and provides input to the district reports. The department plays a public relations role when there are community meetings and community unrest.

Network engineering and Design	Network Engineering and Design (NED) is accountable for the design and technical quality assurance of the distribution and sub-transmission network of both power and control plant according to national standards and specification.
Land development	The Land Development and Environment Department is accountable for acquiring environmentally approved routes and sites for Eskom's capital programme, the surveying of lines and substation sites, and the recording of the geographical locations into Eskom's GIS in accordance with Eskom standards and specifications
Project Execution Core	Project Execution Core plays a vital role in building, refurbishing and strengthening of Eskom Infrastructures to enable the electrification connections taking place, while constructing sub stations to transmit electrical power to that suitable for supply to consumers.
Project Execution Electrification	Electrification plays a vital role in ensuring service deliveries as per the DOE Plan and as per the government mandate. Electrification of households, infills schools and the normalization of illegal connections are executed in the programme.

Table 1.1. Asset Creation departments and output.

1.3. Statement of the Problem

There is a dire need for the KZN OU business to have up-to-date real live information at its fingertips at all times. The timeline taken for the production of reporting is too lengthy and by the time the information is presented, that information has changed drastically (Eskom, 2017). There is a lack of information sharing and this has resulted

in operational inefficiencies and the creation of silos.

1.4. Background to the problem

Information is a critical element in any business or organization (Granados, Gupta and Kauffman, 2009). We are currently living in an information age where information keeps the world in operation and serves as the fuel in global communication (Blyth, 2015). Today information is available at any time and it can be freely accessed on almost any technological device as long as one has access to the internet (Qadir & Quadri , 2016).

Information sharing in any organization is also very important and has a positive impact on the economic growth on the organization (Sundararajan, 2014). Wenjing (2011) defines it as the sharing of available information resources collectively between teams, departments and within an organization. Mohammed et al., (2015), state that the process of sharing involves the exchange of information to allow for efficient decision making and productivity. There are challenges to information sharing which lead to the silo formations taking place within departments and organization (Nakai et al., 2017), Information security is another critical factor when it comes to the sharing of information. Organizations fear that delicate information can jeopardize their existence, damage customer perception and the stock value of the organization (Hulme, 2017). Lack of information sharing leads to operational inefficiencies (Almazán, Tovar and Quintero, 2017). With the lack of real time information organizations struggle to make strategic decisions and proactively manage the business through tools such as proactive analysis (Dukić, Bara and Dukić, 2016). Real-time data allows users the ability to capture data as close as possible to the occurrence, reduce recall in the manufacturing industries, establish of precedence for casual inferences (Jones et al., 2012).

1.5. Objectives

Based on the problem statement above, the objectives of this study are:

- To establish the processes and operations that is conducted in isolation (silos) per department.
- To determine if operational efficiency can be achievable through sharing and transfer of real-time information between departments.
- To determine how updated and real-time information can inform management and operational decisions
- To establish a conceptual system that can be implemented to enable the achievement of real-time information for management.

1.6. Research Questions

The Research questions formulated address the key problems of the department by asking:

- What are the key operations that are occurring in isolation (Silos) per department?
- How can operational efficiency be enhanced through the use of Information System/s for the effective management, transfer and dissemination of information?
- How can real-time information promote proactive management decisions and actions as opposed to reactive?
- What type of Information System can promote effective information management, sharing and reporting for the Department?

1.7. Significance

In light of the research problem and questions, the study attempted to:

- Provide insight to the processes and operations that may be occurring in isolation
- Examine operational efficiency through the possibility of Information Systems
- Conceptualise an Information Systems Model that is applicable to Asset Creation
- Generate research-based knowledge towards the adoption of IS in relation to Processes and operations
- Use the results from the study to inform future strategies and plans.

1.8. Research Method

1.8.1. Mixed Method

A mixed method approach was selected for the study targeted towards the Kwa-Zulu Natal operating unit, Asset creation department because of the wide scope of participants within the department. Interviews were held for the structure as displayed in the organogram, while middle managers, specialists and officers reporting to these managers were provided with a quantitative questionnaire.

1.9. Research Site

This study was conducted in the Eskom Distribution division, particularly in the Kwa-Zulu Natal operating unit.

1.10. Target population

The study will be conducted in the following business units within Asset creation department, which comprises of 414 employees this includes 31 managers and specialists.

1.11. Sampling technique

For quantitative data, a census sampling technique was used from a total census population of 408, in Asset creation division which excluded the participants of the qualitative data collection. A survey was sent to all employees' middle managers and specialists in the census population. Responses submitted constituted the sample size.

Qualitative data was collected from the 6 portfolio managers reporting directly to the Asset creation senior manager.

1.12. Research instruments

The questionnaire was developed around the research questions and constructs of the theoretical model. It primarily took a Likert scaling approach to eliminate redundant data. Similarly, the qualitative method adopted a structured interview schedule which prevented information overload. The questionnaire was delivered electronically to the census population whilst the interviews were done face-to-face.

1.13. Ethical considerations of the Study

The following were applied to ensure ethical compliance of the study:

- Voluntary participation: Employees were not forced into participating in study.
- Interviews were recorded and are safely and anonymously stored for safe keeping

- Confidentiality and informed consent: All employees were informed of the details of the study and signed a consent form before participating in the study. All findings are treated as confidential.
- Risk of harm: All participants were protected as a result of their participation.

- Principle of anonymity: was used in protecting participants taking part in the study.
- Plagiarism: The study was conducted under the supervision of qualified research supervisor allocated by the University of KwaZulu-Natal. The research topic has undergone a screening process by the Research Ethics Committee to ensure ethical compliance at all stages of the project.

1.14. Data Analysis

Data Analysis For data collection using the Quantitative method the below analysis tools were used:

- Reliability analysis
- Frequency analysis,
- Chi-squared and
- Correlations

For Qualitative method the below three analysis tools will form key themes for the study:

- Word Clouds
- Cluster analysis
- Tree Mapping

1.15. Model of study

This study was underpinned by Delone and Mclean IS model of success which was found to be applicable to a study of this nature.

1.16. Summary

This chapter introduced the study and delivered the research problem and back ground to the problem. It brought forward the research questions and objectives of the study. It further gave a basic outline of the methodology and design. A brief overview of data analysis techniques were shown as well as the theoretical model that underpins the study. The next chapter details the critical literature review that shapes the study.

Chapter 2

Literature Review

2.1 Introduction

This chapter interrogates and presents key literature that is related to the study. It defines the key terms and brings together related literature from a global and local perspective. It emphasises the phenomena of strategic information and its role in organisations, whilst exploring the possibilities and importance of information sharing. The focus is on the research questions for this study and the applicability of an information system framework which is a model of success when applied to an organisation.

2.2 Information

The Business Dictionary (2017) defines information as data which is accurate, organised, contextual and relevant, which in turn leads to a detailed understanding of a certain object or phenomenon. Information is therefore critical as it affects the decisions or outcomes of specific tasks. Information is often confused with data, however, the data information, knowledge and wisdom (DIKW) pyramid is a perfect structure or framework to assist with distinguishing the one concept to the other. Zins (2007) displayed that information is a set of significant components that have the ability to create knowledge. The components of data, information and knowledge are interrelated but have various meanings. The DIKW pyramid is seen as a conversion process. A study conducted by Duan et al. (2017) displayed the DIKW pyramid in a conversion process from data to wisdom as per figure number 2.2.1 below.

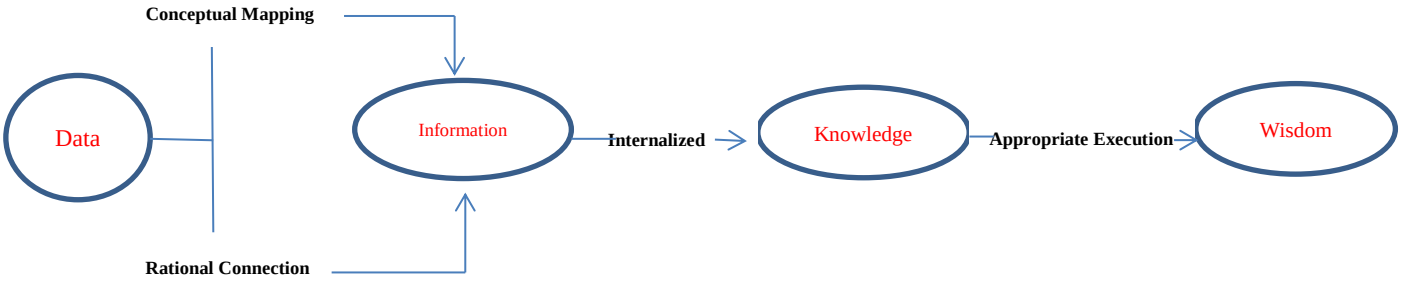


Figure 2.2.1 Conversion process from data to wisdom (Duan et al, 2017)

For raw data to be converted into information, conceptual mapping has to take place. The information is then internalised and results in knowledge. Appropriate execution of the knowledge gained results in wisdom (Duan et al, 2017). There are various interpretations of the DIKW model from various scholars however they all seem to be in agreement of the components leading up to wisdom and that information represents the second component (Sharma, 2008).

Information is a critical factor when it comes to communication and can be further classified as an essential resource or commodity (Madden, 2000). We are currently living in an information age where information keeps the world in operation and serves as the fuel in global communication (Blyth, 2015). Today information is available at any time and it can be freely accessed on almost any technological device as long as one has access to the internet (Qadir & Quadri , 2016).

2.3 Information in business/organisations

The value of information to businesses and organisations according to Porter and Miller (1985) is the key to competitive advantage. Information is a critical resource for an organisation's success. Heerwagen et al., (2016) found that organisations today have evolved in the manner in which they operate. This is due to two critical driving factors that being the pressure of being an agile and a competitive organisation and the breakthrough in information technologies and communication. These driving forces are achieved when the sharing of information and the implementation of tools are evident (Oliveira and Martins, 2011).

This subsection will look at how organisations operating in different industries have embraced information and the benefits of information sharing to achieve operational efficiency and productivity.

2.3.1. Information management in the agriculture industry

The farming or agriculture industry was identified as an area where critical information is a necessity for effective operations to take place. Critical information is required for operational efficiency in the agricultural industry. This included information for decision making describing how much of livestock and crops are on hand as well as sales forecasting for the agricultural products (Harsh, 2012). Risk-based analysis is becoming a growing sensation especially in such an industry. Farmers need to know when and where to anticipate certain risks and devise a plan to mitigate these risks while preventing re-occurrence (Kahan, 2013). Risk-based agriculture has therefore created new opportunities and threats for production and for potential investors by providing information for decision making (Gerasymenko and Zhmoyda, 2009).

2.3.2. Information management in health industries

Information in the health industries and organisations is critical. This industry is under pressure to improve patient safety, reduce medical errors, provide secure medical information, cost control, protect patient information, comply with legal guidelines and operate efficiently (Helms and Moore, 2008). Information is critical for both the public and private health facilities and should be a matter of priority to ensure efficient and good quality service to patients. The availability and management of such information is of pivotal importance in both the public and private sectors and therefore proper management of this information ensures customer/patient experience (Young, 2016). The mismanagement of information in the health care industry results in corruption which leads to a negative impact in economic growth and development (Rispel, Jagar and Fonn, 2016).

2.3.3. The value of Information for decision making in the South African energy industry

The value of information is a concept which cannot be universally described (Thakur, 2014). Hence, the value of information is based on the relevance information has to the decision-maker. Information which is not ambiguous creates positive value to decision-

makers (Snow, 2010). When the National Energy Regulator of South Africa, (NERSA) approved Eskom a tariff increase for the 2018 financial year, this decision was made taking into account various inputs. These being linked to the financial position of the organisation and output factors being the customers and the impact this increase will have on them (Paton, 2018). The information supplied by Eskom when requesting a decision by the regulator includes the organisation's financial report, the organisation's performance or score carding and the organization's strategy (Oberholzer, 2018).

2.4 Information management and sharing

One of the pressures of business productivity is the assumption that managers are able to positively influence business operations and productivity. However the element of uncertainty exists which is largely influenced by the lack of information (Wanyama and Zheng, 2010). The management of information then becomes a crucial facet in reducing elements of uncertainty. Information management is the process of managing the information gathered through the collection of data and disseminating it where it will add value (Martinson and Westwood, 1997). In order for managers to be successful in running an organisation or business, not only must they cope with fluctuating conditions but they must also be aware of developing technologies (Oliveira and Martins, 2011).

Information sharing is also one of the critical elements for ensuring operational efficiency and productivity. Wenjing (2011), defines it as the sharing of available information resources collectively between teams, departments and within an organization. Similarly, Mohammed et al., (2015), assert that the process of sharing involves the exchange of information to allow for efficient decision making and productivity. This can be achieved through the following factors:

- Social network: allows people with similar interests to collaborate (Rouse, 2013)
- Information stewardship: information quality management and information security measures are in compliance with privacy and disclosure guidelines (Marks, 2006)

- information quality: the quality of information that is produced by a system (Delone and Mclean, 1992)
- Trust: confidence in the honesty or integrity of someone or a system (Aljazzaf, Capretz and Perry, 2010)
- Privacy: the right to have some form of control over information gathered and its use (IAPP, 2016)
- Reciprocity: mutual exchange of commercial or other privileges (Webster, 2008)
- Complexity: interrelationships of the individuals, their effect on the organization, and the organisation's interrelationships with its external environment (Anon., 2008)
- Risks: threats to business data, business processes and critical skills (Townley, 2017)

Other scholars are in agreement with some of these factors particularly information quality in various areas in order to support decision making and increase productivity this was sited in (Nowduri, 2010; Marinagi et al., 2014).

2.5 Challenges to information sharing in organisations

As any consistent phenomena, information sharing is faced with a number of challenges with the biggest challenge being the human resource element. People build and leverage information sharing (Goldfarb, 2014). This leads to the following challenges.

2.5.1. The creation and maintenance of the silo culture

In organisations, people have created a silos culture where they share information amongst a specific team or department (Egmon, 2012). Silos are invisible barriers which exist in the mind of individuals, creating a mentality of “them” and “us” making boundary crossing difficult while causing anxiety in employees. These barriers become a treat to the performance of the organisation (Cillierts and Greyvenstein, 2012).

Silo culture has a negative impact on the organisation particularly in four critical areas which are; innovation, customers, teams and departments. When employees fail to share

information based on skills, knowledge and expertise, this has a ripple effect on customers creating a discrepancy on information (Mohapeloa, 2017).

2.5.2. Information security

Many organisations fear information sharing because they fear that delicate information can jeopardise the existence of that organisation, damage customer perception and the stock value of the organisation (Hulme, 2017). Data protection and legislatures surrounding information security are a challenge and as a result many governmental organisations utilise information systems for sharing very sparingly (Oliveira, 2016).

2.5.4 Information parameters and stale Information

Information and data when collected within various departments in the same organisation may differ in terms of parameters. The individual collecting may define their parameters differently than that of the user of information (Longo and Drazen, 2016). When decisions are taken and are based on stale information, this leads to non-efficient operations and prevents proactive management (Bharosa, Lee and Janssen, 2010).

2.6 Information systems

Organisations make use of various tools to achieve information management and sharing. One such tool is the management information system also known as the MIS. Management Information Systems have gone through radical changes over the years influenced by business and organisational operating models and new ICT technologies which have challenged managers in dealing with the business anxieties and complexities (Urquhart, Lehmann and Myers, 2010).

A good MIS that is designed to achieve business objectives consists of a series of software packages that enable management to make effective decisions. Each decision made is generally specific to an individual, a task being performed and the presentation of that specific decision (Lugmayr, 2013). Information systems are defined as a set of entities and activities relating to computer systems, mainly hardware and applications. Many

organisations make use of information systems to increase productivity and competitive advantage while growing the economy and sustaining its own goals and objectives (Cresswell and Sheikh, 2012). With the influence of an ever changing environment, organisations and businesses are forced to ensure that their information systems and technologies meet the customer demands at all times and therefore ensure that systems are developed to meet these demands (Venkatesh et al. , 2003).

2.6.1. The evolution of Information systems

Information systems have evolved over time and the driving forces to this evolution have been studied over the years. Liang and Chen (2003) identify the main driving forces as artificial intelligence, and the human interface.

Similarly, Gomez, Serna and Badenes (2010) found that there have been new advances that have been incorporated in the commercial business requirements and these are identified as business intelligence systems and knowledge management.

2.6.2. Change in business and business requirements

Business has evolved over the years because of the shift in the market dynamics (Haigh and Hoffman, 2012). Looking at how business activities have evolved through the implementation of Information systems will give a clear understanding of the important role that information systems play in the process of decision making and operational efficiency. Al-Zhurani (2010) mentioned that the process of decision making in any business is imperative for the organisation and individuals within the organisation and MIS has been an essential tool used to institutionalise this process. Some of the dynamics that have emerged with this change in business dynamics were as a result of legislation which triggered a change in the business model (Casadesus, Masanell and Ricart, 2009).

2.6.3. Different systems that facilitate information sharing within organisations

This section will focus on information systems that have evolved and have been implemented due to the changes in business and business models. The section will cover

the enterprise resource planning, strategic information systems, and the decision support system

2.6.3.1. Enterprise Resource Planning system

The enterprise resource planning system emerged in the late 1990s and targeted only large complex business organizations (Rashid, Hossain and Patrick, 2002). Management effectiveness is now measured through the design and development of operating models whilst improving strategies to ensure operational effectiveness. This led to the development of the enterprise resource planning system (ERP). An ERP system is used in an organisation to integrate functional business processes, which have been implemented as scattered systems (Doom and Barczak, 2009). Enterprise resource planning systems provide a platform of information sharing to promote operational efficiency and enable decision-making (Trabelsi and Abid, 2013). One of the main advantages provided by the ERP is the allocation of information in a central repository which can be used by any functional department as input data for their operations improving information quality, system quality as well as service quality (Qutaishat et al., 2012).

2.6.3.2. Strategic Information Systems (SIS)

In 1990s the emergence of the strategic information system was seen in business organisations (Handerson and Venkatraman, 1999). Curry et al. (2012) found that organisational success increasingly depends on the organisations' ability to fuse potential power into its business processes and networks. Continuous growth of information systems requires organisations to integrate information systems decisions, general planning and the decision-making processes at all levels of the organisation (Curry and Kirwin, 2014). According to (Hemmatfar et al, 2010) strategic information systems (SIS) enable organisations to gain competitive advantage through customer management, cost reduction and increase in sales (Altaf, 2016). The application of the strategic information system results in what researchers call information systems strategy (Peppard and Ward, 2002. Information systems strategy helps to determine the organisation's capabilities, addressing

how it can support business goals and objectives (Issa-salwe and Aloufi, 2011), and focuses on driving that strategy in its operations (Schaltegger, Ludeke-Freund and Hasen, 2012).

2.6.3.3. Decision support system (DSS)

Information sharing facilitates the process of decision making in any business which is imperative for the organisation. Management information systems have been an essential tool used to institutionalise the process of decision making (Al-Zhurani, 2010). Management information system (MIS) enabled managers to make effective and efficient decisions in their organisations therefore the development and implementation of the Decision support system (DSS) became critical (Fanti et al., 2015). The DSS is a computer based system which has the capacity to analyse organizational data, and presents it in a manner that enables managers and stakeholders to make informed decisions (Nowduri, 2010).

Information systems have been developed and put in place within organisations. Some organisations have embedded information systems to achieve operational efficiency and productivity while others have failed to do so.

2.7. Effective implementation of Information systems by South African Governmental departments

South Africa as a developing country is not far behind in terms of implementing management information systems in the South African parastatals and the various government departments. Alter and Vardigan (2015) found that even though Information systems have challenges specifically related to the digital divide in South Africa and in other developing countries; there is a visible change towards moving to a technology advancements.

These initiatives display that government is aligning their business strategies to information systems as a means to integrate their processes. Pouris and Inglesi (2011) found that information systems have contributed directly to the national GDP by acting as an enabler; information systems have improved market competitiveness of the nation's products and services.

2.8. Information management in Eskom Holdings Pty Ltd

In 2003 the South African government was requested by the National Electricity Regulator of South Africa (NERSA) to oversee the commercialisation of the electricity utility which was owned by the Department of Minerals and Energy (National Electricity Regulator of South Africa, 2017). Group information systems (2010) reported that Eskom Holdings had various systems in place to perform various activities however these systems were not integrated therefore Eskom looked at implementing and integrating the enterprise resource planning system.

As stated by the business integration and performance management report of 2012, Eskom then implemented an ERP system from system application and product data processing and SAP. This resulted in a lot of challenges mainly for the human resources in the organisation. The ERP was implemented by the leadership of then Chief Financial Officer, Paul Auflaty and previous Chief Executive Officer, Brian Dames. The implementation team did not have a consistent change management plan and the system was designed specifically for human resources and financial departments (BIPM, 2012 - 2017). In Distribution alone, this resulted in a dysfunctional supply chain process. In the KwaZulu-Natal Operating unit, the commercial department was not coping with the pressure. Many employees resigned, while others were exposed to consistent hospitalisation due to stress (BIPM, 2012).

The deployment of information systems in other case studies mentioned above was successful while in others it could have been successful if the implementation was not seen

in isolation to various departments. The development of information systems should be an inclusive process.

2.9. Information systems and future developments

Many organisations and businesses contemplate between building their own in-house systems and making use of an industry standard systems (Nitman,2010). Some scholars have agreed that an in-house developed information system provides specific needs while others feel that industry developed systems are flexible and can fit and fulfil the needs of any organization (Reeves, 2016).

Businesses today require more robust information technologies and infrastructure. This therefore led to the introduction of business intelligence systems (Skyrius, Kazakeviciene and Bujauskas, 2013). Business intelligence (BI) is a concept that has taken the business world by storm. The emergence of BI was realised from 2009 when there was a business demand for making prompt and informed decisions. These decisions required data analysis, reporting and query tools to achieve this objective (Chee et al., 2009). Business intelligence is centred on having to consistently deliver effective strategies and high performance while delivering greater economies of scale (Nedelcu, 2013). Various components that make up the business intelligence systems are discussed below.

2.9.1 Databases

Databases are defined as electronic databases for the collection of data or information which can be organised for retrieval by any computer. A database is structured to facilitate storage, retrieval, modification and deletion of data (Britannica, 2018). A database management system is a tool utilised to manage databases. Some industry common databases include SQL, Oracle, and SERVER (Technopedia, 2018). There are many advantages in having a database that have been realised, these enable operational efficiency, reduce redundancy is, reduction of updating errors, while increasing

consistency. Employees experience greater data integrity meaning that they can rely on the information stored on the database while ensuring information sharing (Thakur, 2017).

2.9.2. Data-mining

Data-mining is the ability or process of sorting large data sets to identify patterns and align certain relationships to solve a specific problem (Rouse, 2018). According to Stats-graphics (2018), data mining is the process by which patterns are extracted from data and can be used to improve business decisions. The data mining tool groups the data in four segments namely clustering, classification, association and prediction (Hall et al., 2009). This has proven to be a tool that enables operational efficiency in the health care industry as reported in a study conducted by Jothi et al. (2015), to ascertain how data mining can improve health care operations. The study also found that data mining plays a crucial role in this industry especially with predicting various diseases.

2.9.3. Dashboards

Dashboards are information management tools used for the monitoring of the business health index. It is an efficient way to track multiple data sources while providing a central view of the businesses' key performance indicators (Klipfolio, 2016). Dashboards make use of visualisation, which has proven to be one of the successful manners in which big data can be disseminated and grouped according to specific requirements of the individual or group making the decision. Visualisation supports better detection, analysis, understanding and evaluation of real time information (Franklin et al, 2017). Although visualisation is evident through dashboards it is imperative for the decision maker to understand the information in order to make decisions. In many cases dashboards are used to make strategic decisions (Franklin et al, 2017) .

2.9.4. Score carding and Performance Evaluations

Today many organisations use score-carding to effectively score a business in order to evaluate its effectiveness. A research group initiated at Nolan Norton institute further developed a framework for business planning and the measurement of business performance through development of the balanced scorecard. The balanced scorecard monitors and reports on performance using Key Performance Indicators (KPI's) and the setting up of the organisation's targets (Zsido and Fenyves, 2015).

Scorecarding is defined as a collection of performance metrics designed to reflect the organization's strategic direction. The information on the balance score card identifies how well the organisation is progressing towards or regressing from the business objectives. This is also displayed with the use of visualisation as indicators (IBM, 2016).

2.9.5 Predictive analytics

Predictive analysis is another form of a business intelligence and information system tool. Predictive analytics is used to make predictions about future unknown events by making use of data mining techniques and artificial intelligence (Pat, 2017). Although predictive analytics have been around for decades, it is only gaining momentum now as more and more businesses are utilising it for operational efficiency and to gain competitive advantage (SAS, 2016). Predictive analytics study trends and are able to predict where each department and organization will end off in terms of its performance. Predictive analysis is predictive and proactive, enabling management and staff to be proactive in the organisations operations and decision-making (Halper, 2014).

2.9.6. Central data repository/ies

Central data repositories are portals where data can be stored, shared (eliminating silos), updated, analysed and secured by anyone within that organisation. Storing information in central repositories improves decision making, enhances data quality, saves time and costs, while increasing operational efficiency and reducing risks (Questudio, 2014). According to

research a study conducted in Germany, in the bioinformatics environment. Bioinformatics and proteomics data was well managed through central data repositories which proved to improve accuracy, reproducibility, and comparability (Thiele et al, 2008).

2.9.7. Effective reporting interfaces

In order to understand this concept, many writers have broken it down to interface management and effective reporting. Interface management are activities to define control and communicate information enabling the co-functioning of unrelated objects being systems, services and products as well as human resources (SEG, 2009). According to (Strubbe, 2012), interface management is the process of facilitating agreements with stakeholders regarding roles responsibilities, timing and identification of crucial interfaces in the early stages of a project. The overall goal is early identification and proactive management (Caglar et al, 2007). Effective reporting is defined as results obtained in reviewing the reported data and making changes to improve performance (Sherrill, 2011).

2.9.8 Web 2.0

The founders of web 2.0 had distinguished what this phenomenon is and included the changes in their guide. Some examples of these changes are the modification to the utilisation of Google AdSense from the "double click", Wikipedia from Britannica online, blogging form personal websites to participation from publishing through social networking sites (OReilly, 2005). Constatinides and Fountain (2008) defines Web 2.0 as a collection of open source, interactive user controlled online applications. Lipika (2016) defines Web 2.0 as an internet application which allows sharing and collaboration of opportunities. She further elaborated that the advantages of Web 2.0 are availability, media variety, ease of usage, and user friendliness. A survey conducted by (McKinsey, 2018) and found that the benefits of utilising web 2.0 included innovative products and services, effective marketing, better access to knowledge and reduction of costs, better access to both the organisations customer and its suppliers. IMB uses Web 2.0 to foster innovation

and responsiveness to customer requirements and market trends (Ephraim and Anderson, 2007).

2.9.9. Cloud computing

Cloud computing is an application where a service is delivered through the internet where both hardware and system software are applicable in the delivery of the service. This is also termed the datacentre (Armbrust et al., 2009). Cloud computing is characterised by the following:

- On demand self-service: users can provision computing capabilities without the assistance of super users.
- Broad network access: network capabilities being accessible and available on multiple platforms, for example mobile and computer tablets.
- Resource Pooling: enables one to serve multiple customers using the multi-tenant model
- Rapid elasticity: capabilities can be elastically provided and released at any given time.
- Measured service: the usage can be measured monitored controlled and reported (Mell and Grance, 2001).

With all the developments taking place in Information Systems, it is important for organizations to prioritise aligning business models to make business decisions that will enhance operational efficiency and productivity. The section below covers the benefits of having a good management information system designed for operational efficiency and productivity.

2.10 The benefits of a good management information system

As previously mentioned one of the key elements of a good management information system is that it enhances information sharing in an organisation thus helping it to achieve operational efficiency and decision making. An organisation is bound to stabilise its operations, gain competitive advantage, be in a position to proactively manage its productivity and make timeous decisions when the management and sharing of information

is done efficiently (Lausa, 2016). Information systems are changing the way companies do business (Zaini et al, 2014).

2.10.1 Management Information systems enable organisations to bridge the silo culture

Departmental silos are seen as a growing pain for many organisations, regardless of size (Rozo, 2013).Scholars of silo culture and silo mentality agree that the key element in bridging or putting an end to the silo culture is through collaboration. Tamm and Luyet (2005) assert that collaboration starts with an individual while recent scholars are of the opinion that to successfully break down silos an interactive approach or strategy should be driven from top management to the employees (Serrat, 2010). Watson, Boudrean and Chen (2010) found that information systems can be used to drive operational efficiency and competitive advantage by making management and employees trust in the integrity of the systems in place. The evolution and development of information systems has led to the improvement of in such that communicate with each other enforcing integration within an organisation. No system should work in isolation as all information is interrelated and need to be used by another department as input data into their operations (Hobbs et al., 2008).

According to (Briody and Erickson, 2014), collaboration in various organisations have also proven to be a successful feature with the implementation of system wide innovations. Sekgweleo, Billawer and Hamunyela (2016) argue that information systems, when designed to meet the unique requirements of an organization, can promote integration and collaboration which in turn breaks the silo culture within an organisation.

Although systems need to be designed in an effort of breaking down the silo culture, it is also important that it is designed in order to achieve operational efficiency.

2.10.2. Operational efficiency can be enhanced through the use of Information Systems

Operational efficiency is defined as a ratio between outputs gained from business activities and the input of running the business operations. When looking at improving operational

efficiency this would be the study and improvement input ratios (Lausa, 2016). Operational efficiency is also described by other scholars as the minimising of waste while maximizing resource capabilities for the delivery of good quality products (Rasaouli, 2011).

(Braglia and Frosolini, 2014) studied how an integrated approach in a project management environment can yield benefits by ensuring that skill transfer of information systems form a basis with the introduction of project management information system .
Operational efficiency impacts specifically on operational performance. For an organisation to realise the efficiency of its operations, the results are dependent on the organisation's performance. A positive trend will yield as a result of operational efficiency (Mahmood, 2008). Manufacturing industries have continually increased their revenue and expanded their productivity while reducing waste with the implementation of information systems (Herterich, Ubernickel and Brenner, 2015). In addition, operational efficiency to the weaponry industry means the control of information for the initiation of modern wars. Today's weapons are so sophisticated that without information systems, these would not have been possible to create (Jun ,Hongmei, & Jie, 2011).

Information systems have proven to produce operational efficiency even in institutions of education where there has been an improvement in performance in material monitoring and evaluation, administration support facilitated with human resources capabilities and cost savings that are realised in the daily running of the operation as sited in (Lausa, 2016). A study conducted in the supply chain industry also yielded positive results when the researcher wanted to examine whether information systems had a positive influence on supply chain processes. Supply chain activities were seen to benefit from real-time information enabling demand forecasting, inventory management and ordering (Qrunfleh & Tarafdar, 2012).

Furthermore, Almazan, Tovar and Quintero (2017) found that information quality is the most important precedent for user satisfaction for department and teams and organisational contentment. The key fundamentals for this finding were availability and accuracy of information which lead to operational efficiency and productivity.

The cases presented above are proof that operational efficiency can indeed be enhanced by proper management of information through information systems and its future ongoing development. Operational efficiency is also enhanced through real-time information which has the ability to enable proactive management and decision making.

2.10.3. Real-time information and its role in proactive management decisions and actions

Organisations as well as businesses are always faced with a challenge of making strategic decisions. Some decisions are taken by individual managers whilst others are taken in groups. Problems are evident when making decisions as individual preferences and opinions come into play (Cabrerizoa et al., 2015). With the continuous changes in the environment, management is faced with not just making decisions, but making timeous decisions (Wen, Qiang and Gloor, 2018).

Management information systems are enabled with the capability to give real-time updates of occurrence in the organisation when captured on the system. These immediate updates enable management to take necessary actions when they are most applicable (Lingham, 2009). The generation of real-time data is purely at the discretion of the business itself. For some operations, this is every five minutes while for others it is weekly this must be defined in the business process (Dukic, Bara and Dukic, 2016).

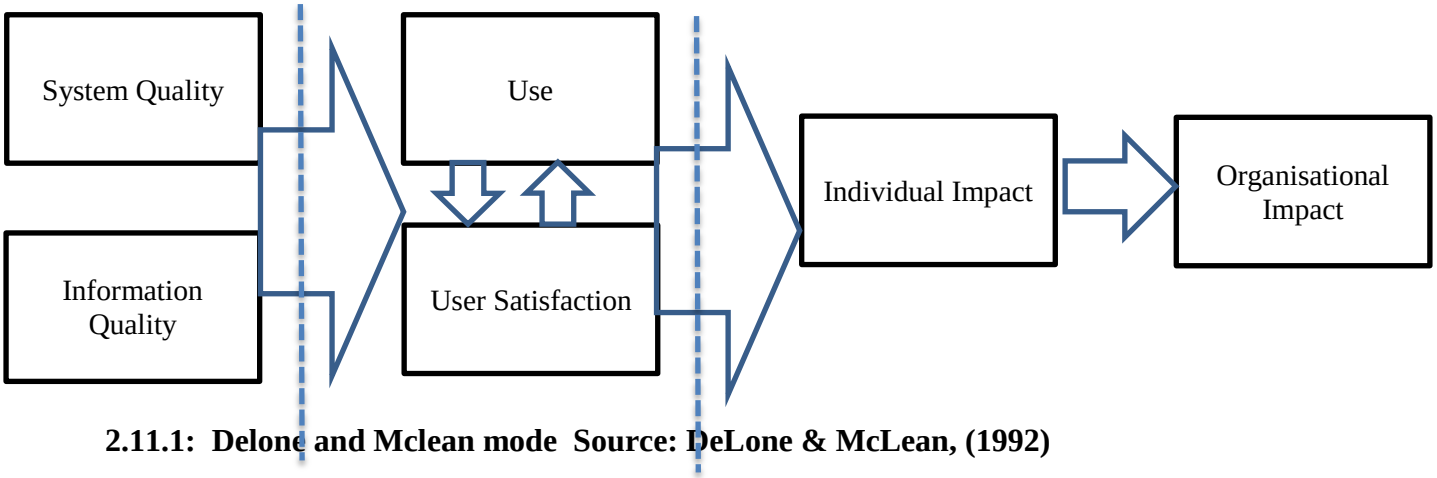
The benefits of real-time data are a positive shift in satisfaction and this was revealed in a research study conducted in the transportation industry where transit satisfaction, safety perception and ridership frequency were a result of real time data (Gooze, Edison and Boring, 2013). Real-time data allows users the ability to capture data as close as possible to the occurrence, reduce recall in the manufacturing industries, establish of precedence for casual inferences (Jones et al., 2012).

2.11 Applicable Theoretical Framework underpinning the study

This study utilised a respective IS theory that was one of the most applicable to the study. The choice of such a model was based on its alignment to promote effective information management, sharing and reporting. The model must drive towards user satisfaction and ultimately the organisational net benefits which are reflected in organisational performance. The Delone and McLean model is one such model which has elements that fulfil the requirements which this research is most interested in. Over 10 years ago, William Delone, associate professor and chair of the Information Technology Department in the University of Washington and Ephraim R. McLean professor and chair in the State University of Atlanta came together to develop and present the Delone and McLean Information Systems Success Model framework which measures the complex dependent variable in information system research (Delone and Mclean, 2003).

The model reviews the success of Information systems and classifies the management system into six categories and therefore has created a multi-dimensional measurement with interdependencies between success categories (Delone and Mclean, 1992).

Motivated by Delone and Mclean's (2003) call for further development and validation of their model, many researchers have attempted to extend or rectify the original model. Ten years after the publication of their first model and based on the evaluation of the many contributions to it, Delone and Mclean proposed an updated IS success model (Delone & Mclean, 2003).



2.11.1: Delone and Mclean mode Source: DeLone & McLean, (1992)

The Delone and Mclean model as displayed as figure 2.10.1 above consists of six interrelated dimensions of IS success:

- System Quality- this is measured by the functionality associated with the system. This takes into account the ease of use meaning how easy it is for a non-technical person to understand the use of the system. It also includes the reliability and flexibility of the system, whether the system is properly integrated with the requirements of the organisation, while also looking at the value of the systems data quality (Delone and Mclean, 1992). System quality focuses on the performance characteristics of the system under study by looking at resource and investment application, dependability of devices or products, employee response times, ease of use, human factors, design controls and system accuracy (Rohlin, 2017).
- Information quality- this is measured by the accuracy of data, system timeline, completeness, consistency and the relevance of the system (Delone and Mclean, 1992). Other dimensions which have been cited in current studies relating to information quality are believability, interpretability, reputation, values added, objectivity, security, price variability (Marinagi, Trivellad and Reklitis, 2015).
- Use of the system- measures the amount of time the system is used and the relationship between system usage and the realisation of probable outcomes are synchronised (Delone and Mclean, 2003). One would question the usability of a system if it did not meet the expected outcomes and as such a management decision may be taken to discontinue the use of a particular system when it is not driving towards the intended objective (Meehan et al., 2016).
- User satisfaction – this measured by the use of the system. When the use of a system meets the desired outcome, this leads to user satisfaction, this informs the researcher that the system has met the desired outcome for the end-user (Azainil et al., 2017).
- Individual impact- is measured by the quality of work as experienced by the user, if the system meets the user specific environment, the impact it has on the user's job performance and the effectiveness of the decisions made based on information available on the management information system (Hou, 2012).

- Organisational impact- this can be differentiated into three components, strategic, informational and transactional benefits (Golar, Sommers and Wong, 2010). Strategic impact is measured on whether the organisation has met or exceeds its competitive advantage, the organisation's alignment with the environment, politics, technology and legal requirements as well as its customer relations to continually improve its competitive advantage (Sharma and Djiaw, 2011). Information impact or benefit includes the extent to the access of information, information quality, information dimensions and flexibility (Gao, 2012). Transactional impact looks at the efficiencies in areas of communication, system development and business efficiency sub dimensions. In order for an organisation to meet organisational impact all three components must have been met (Delone and Mclean, 1992).

2.11.2. The revised Delone and Mclean model of 2003

The Delone and Mclean model then evolved and added a new dimension to it as displayed below.

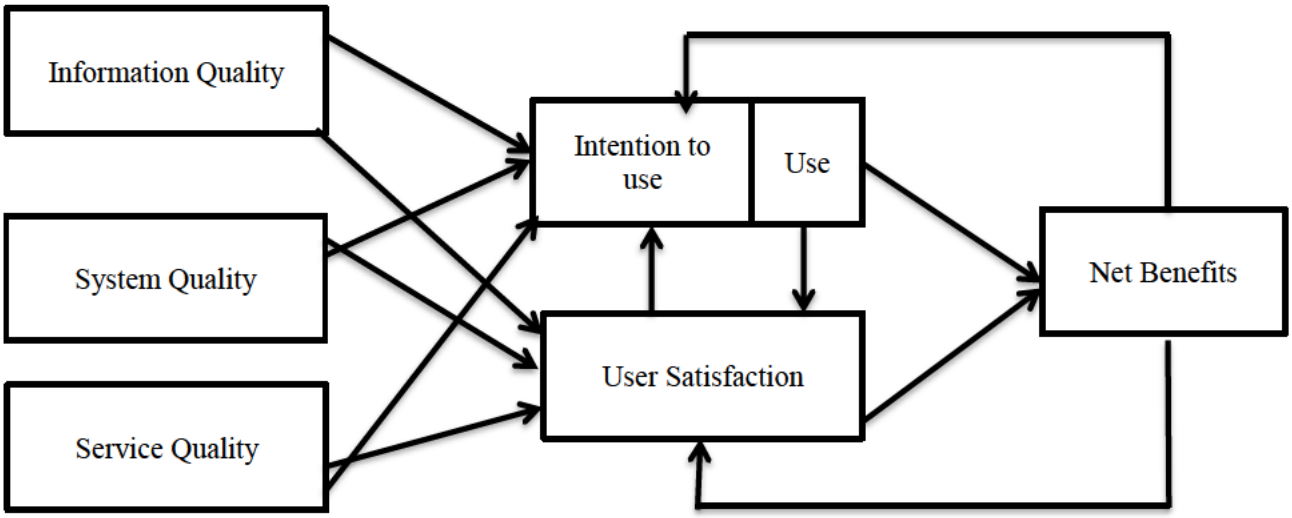


Figure 2.11.2 The Delone and Mclean model updated 2003. Source: (Delone and Mclean, 2003)

In the revised model, Delone and Mclean (2003) included service quality. This measures the subsequent use or intention to use as well as the result of using the system in order to

achieve certain benefits. Service quality is associated with the type of service offering as well as the benefit derived from the quality of service which ultimately gains the organisation competitive advantage (Delone and Mclean, 2003).

The revised model includes Net benefits as opposed to organisational impact. The net benefits have not been defined by the researchers; this was not because of an oversight, but felt that the level of detail in defining the net benefit would then enclose net benefits for various organizations and for Microsoft. The net benefits will either positively or negatively influence user satisfaction and the further use of the information system (Delone and Mclean models, 2003).

2.11.3. Application of the Delone and Mclean Model in other studies

Having discussed the theory behind the Delone and Mclean (2003) model it was then imperative to see research studies that have successfully applied this model.

In the banking sector of Omen in India, the model was applied in the assessment of the bank's decision support system. The research concluded that the constructs were supported, such as system quality, information quality and service quality which were directly associated with user satisfaction (Manchanda and Mukherjee, 2014). The same outcome was apparent when the model was applied in a research study conducted in the private sector organisations (Almutairi and Subramanian, 2016). Another study conducted on the private sectors in Mexico also resulted in the same components of the model associated with user satisfaction. Furthermore the users considered accessibility and availability vital to the elements of a successful system. What was interesting about this study is that the users not only focused on the user satisfaction element but also looked at the overall organisational results which displayed the ultimate satisfaction (Almazan, Tovar and Quintero, 2017).

A number of scholars that have applied the Delone and Mclean model have come up with successful results in the sectors or areas of research. It is interesting to see that this model still yields positive results when applied. In an organisation such as Eskom Distribution,

the aim is to show how this model can be applied and if it will yield positive results as it has done so with other organisations.

2.12. Summary

This literature review chapter has unpacked what information is and how it is effectively managed through information systems. One has also seen how the Information management paradigm has evolved with the intention of making information readily available through real time information so that organisations can operate efficiently and also make operational decisions that promote productivity and operational efficiency. Information sharing is also an integral part of the study hence one has looked at how information sharing is currently challenged and how the identified challenge can be mitigated. The chapter further looked at the Delone and Mclean model including how it was developed and how it has been applied over the years in various organisations and institutions. The model itself has proven to be a model of success and therefore chosen to be applied in this study. Then next chapter details the methods employed to fulfil the study.

Chapter 3

Research Methodology

3.1. Introduction

This chapter will outline the research methods employed to fulfil the objective of the study. It will show the data collection, sampling strategies. The participant's operational outcomes will be unpacked to show the relevance of these to the study. The importance of location and the geographical area in which the study was conducted will be evident. The methodology adopted for the study, known as the mixed method which comprises of both the quantitative and qualitative data collection techniques. The instrument design and development will be discussed along with the respective administration of the instruments. Furthermore, the relevant data analysis techniques will be outlined.

3.2. Aim of the study

For recap purposes, the aim for this study is to determine if an integrated management information system can indeed enhance efficient and effective management of the Asset creation business unit enabling management to make proactive decisions and enhancing performance.

3.3. Research Approach

|This study adopted a mixed-method approach. This methodology uses both the qualitative and quantitative research methods and enables a dual form of research to satisfy the study (Creswell, 2009). Popularly known as triangulation, this phenomena increases the study capability of the research subject (Hussein, 2009). The combinations of both disciplines are meant to complement and strengthen each other (Curry et al 2009). Qualitative methods should be used when the aim is to investigate a

complex phenomenon which is usually difficult to measure quantitatively, to be able to generate data for the all-inclusive understanding of the research problem. (Bradly, et al 2014). This study hence adopted a mixed method approach. With organisations constantly facing new challenges and developments on a daily basis due to the advancement of technology, it becomes crucial for information systems and management researchers to keep ahead (Pinsonneault and Kraemer, 2012). The use of mixed methods has provided the study of this nature with added value in terms of exploratory and conformity research which enables a combination of the descriptive and correlational research components (Venkatesh et al 2013).

3.4. Census and Sample

A census method was adopted. This method involved the complete enumeration of a universe (which is a group of people in a specific locality) where one has collected data (Kumar, 2011).

The census population for this study was made up of all staff members of the Asset Creation department, and this was a total of 414 employees. The quantitative leg of the study was made up of 408 employees, while the qualitative consisted of 6 managers.

3.5. Participants and Location of the study

Participants to the study were segregated into two groups, quantitative and qualitative.

Qualitative data was collected through series of personal interviews. The participants for the interviews were the Asset creation senior management.

The participants to the qualitative data collection are represented in the organogram below.

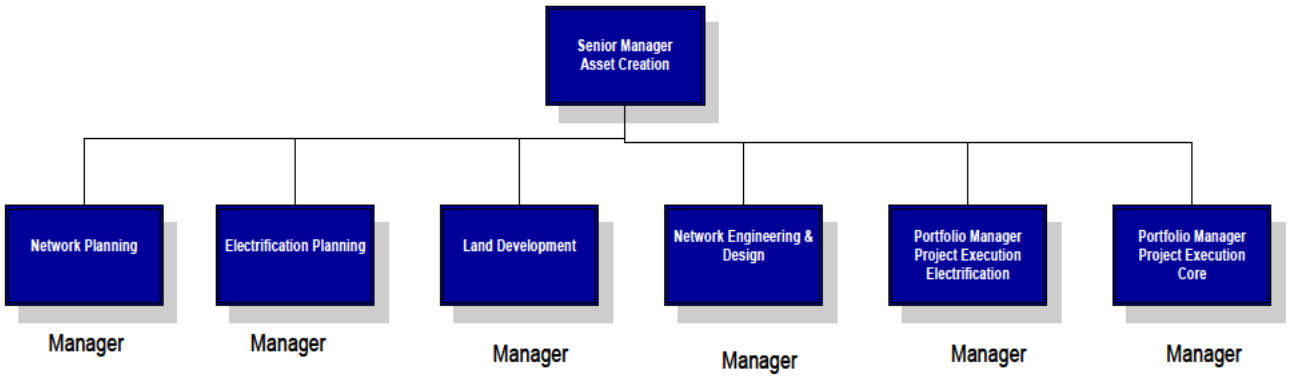


Figure 3.1. Asset creation management organogram.

Participants to the quantitative data collection included all asset creation departmental staff.

The location for the study was the KwaZulu-Natal (KZN) operating unit (OU), specifically in the Asset creation business unit which compromises of six departments namely:

Department	**Deliverables**
Project Execution: Core	Construction of capital projects to meet future demands. Production of rolling plan 6 and 3 year plan, Top priority projects execution and the completion of direct minor connections within 90 days.
Project Execution Electrification	Assists the South African Government in providing all South Africans with electricity regardless of their economic position by ensuring year end connections are met, and the development of infrastructure and rollover projects.
Network Planning	National Development Plan construction and implementation, development of master plans, distributive generation, constrained networks and initiate project release.

Electrification Planning	Districts Master Plan implementation DoE household projects and Infills (electrification of islands), Eskom funded Infills and Islands, Ensuring alignment between Eskom, KZN municipalities and the needs of South Africans.
Network Engineering and Design.	Ensure that all designs have been submitted and are according to Eskom Standards enabling Electrification and Core projects to commence with execution.
Land Development	Ensures all land negotiation, Survey Designs, List of future and current projects, Strategic projects, completed according to all regulatory requirements.

Table 3.1 Departmental deliverables.

These departments have employees seated in various parts of the province. For ease of classification the operating unit has been broken down to three zones,

- Empangeni zone - which is the northern parts of KZN,
- Newcastle zone - which is mainly the inland areas and,
- Pietermaritzburg zone - which also consists of southern coastal parts of KZN.

Participants taking part in the study were situated in these areas as well as the Durban area.

3.6. Recruitment of study participants

In light of the above, a census method was followed and all employees from the Kwa-Zulu Natal Operating unit within the Asset creation business unit made up the census population. The questionnaire was sent to all Asset creation departmental employees and those that responded became the sample to the study. Participants to the interviews were pre-selected these were the managers who reported directly to the Asset creation senior Manager. This method was preferred due to the nature of the business within which the study is taking place.

3.7.Data collection Strategies

Data collection consisted of 20% qualitative data. This was obtained through personal interviews with the 6 management staff. Specific details to the participants of the interview have been outlaid in detail in the participants and location section above.

Quantitative data was obtained through an online questionnaire. The survey was sent out to participants (which made up 100% of the entire population in Asset creation), 70% or, 286 respondents replied to the survey.

3.6. Research Design and Methods

The study investigated if the application of a Management Information System will enable proper information sharing and management for the operating unit thereby empowering management to make the relevant decisions using real-time data rather than assumptions (Venkatesh et al. 2013). The mixed method is one of the most appropriate research methods for a researcher when conducting Information Systems and management research. It provides the researcher with an in-depth perspective encompassing descriptive, correlational and explanatory research components in a single study (Kumar, 2011).

3.7. Construction of the instrument

The design of the survey and the interview revolved around the research questions and objectives of the study. A copy of the interview and survey questionnaire has been attached in appendix 1 and 2.

Interview

Table 3.6 below displays the construction of the questions and how they link to each research question. This section will be divided into two sections, the interview and the

survey questions.

Interview

Section	Objective	Question number
1	Establish the processes and operations that are conducted in isolation (silos) per department.	1,7
	Determine if operational efficiency can be achievable through sharing and transfer of real-time information between departments.	2
	Determine how updated and real-time information can inform management and operational decisions	3,6
	Establish a conceptual system that can be implemented to enable the achievement of real-time information for management.	4,5

Table no 3.2. Construction of interview questionnaire

Questionnaire

The questionnaire comprises of two sections section A which provides the researcher with knowledge of the participant and the section B which seeks to extract information about the research topic:

Questionnaire

Section	Objective	Question number
A	Demographic details	1,2,3,4
	Establish the processes and operations that are conducted in isolation (silos) per department.	1,2,3
	Determine if operational efficiency can be achievable through sharing and transfer of real-time information	4,5,12,13, 14, 17,

	between departments.	
B	Determine how updated and real-time information can inform management and operational decisions	6, 7, 8, 10,
	Establish a conceptual system that can be implemented to enable the achievement of real-time information for management.	9, 11, 15, 16

Table number 3.3 Construction of Survey questionnaire

3.8 Pretesting and validation

- **Questionnaire**

The questionnaire was validated by ensuring that:

- All questions revolved around research questions
- Questions were built around the constructs of the model
- Likert scaling was primarily used to ensure stringent responses to questions
- Dichotomous variables were used to ascertain mutually exclusive categories
- Close-ended questions were applied.
- Questionnaires were developed from IS theories mainly using the Delone and Mclean IS success model (2003).

- **Interview**

- The Interview schedule was validated by ensuring that:
- All questions revolved around research questions
- Open ended questions were developed to obtain maximum information from participants.
- Secondary questions asked to ensure reliability
- All interviews will be recorded and kept in a safe location

3.9. Administration of Questionnaire and Interviews

3.9.1 Ethical considerations

Any study must be underpinned by ethical considerations. This study ensured that all ethical principles were adhered to. This included:

- Gatekeepers letter from ESKOM were obtained
- Informed Consent letters were given to each participant
- Full ethical clearance was obtained from the researcher's institution which is the University of KwaZulu-Natal.
- Data obtained was treated confidentially and integrally

3.10. Analysis of Data

3.10.1. Quantitative

Data analysis for quantitative method followed four types of measurement of scales, these were namely: normal scale which allowed the researcher to assign subjects to certain categories, ordinal scale denoted the difference between different variables, interval scale enabled mathematic or statistical calculations for data gathered and ratio scaling measured the difference between two points (Creswell 2009).

The following analysis techniques were used:

- Reliabilities: Computed by taking several measurements on the same subjects. (Kothari, 2004)
- Frequencies: The number of times an event occurred in a study (Kumar, 2011)
- Factor analysis: Describes the variability among observers and correlated variables (Kline, 2017).
- Chi-Squared Hypothesis testing: Is intended to test how likely it is that an observed distribution is due to chance. It is also called a "goodness of fit" statistic (Turner, 2014).

- Correlations: A process of establishing a relationship or connection between two or more variables (Schonbrodt et al, 2013).

3.10.2. Qualitative

Word clouds specialised visuals of texts where the more frequently used words are highlighted. Word cloud is used to produce an analysis of spoken or written responses to interviews mostly during a research study (McNaught and Lam, 2010). This study utilised word clouds to assist in theme formulation of qualitative data.

3.11. Summary

This chapter discussed the applicable research methodology that was used to fulfill the study. A census method was used to obtain participants. The participants of the study were discussed and the relevance of the recruitment process. The participant's operational outcomes were unpacked so as to show the relevance of these participants to the study. The importance of location was stated as well as the geographical area in which the study was conducted was in the KwaZulu-Natal operating unit. The study adopted a mixed-method approach which entailed both quantitative and qualitative data collection techniques. The instrument design and development was discussed along with the respective administration of the instruments. Furthermore, the relevant data analysis techniques were also outlined. The next chapter details the data analysis and discussion of the research.

Chapter 4

Quantitative Analysis and Discussion

4.1. Introduction

This chapter details the quantitative analysis and discussion and draws on all qualitative data collected from the study. To commence with the quantitative analysis, reliability analysis determines how reliable the data was followed by descriptive statistics, that being the frequency analysis. Thereafter, the more detailed inferential statistics are revealed which consists of factor analysis, chi-square hypothesis testing and correlation. A discussion of each relevant result is also presented with discussion and reference to theory.

Section A:

4.2. Reliability Statistics

This study utilised the Cronbach's Alpha technique for reliability testing. The table below reflects the Cronbach's alpha score for all the items that constituted the questionnaire. A reliability coefficient of 0.70 or higher is considered as "acceptable" (David et al., 1999).

Question	Section	Number of Items	Cronbach's Alpha
8	Operations/activities happening in isolation	21	0.869
11	Operations can be improved via the implementation of a proper management information system	8	0.971
12	A good quality Management Information System should be	8	0.947
14	Highly quality information should be	7	0.823
20	Real time information can positively impact your departmental outputs by promoting	4	0.944

23	Information management system assist with proper management of the department	9	0.944
24	Benefits that are effective MIS can bring to Asset Creation	7	0.943

Table 4.1: Reliability Coefficient

The reliability scores for all sections exceed the recommended Cronbach's alpha value. This indicates a degree of acceptable, consistent scoring for these sections of the research.

Section B: Descriptive analysis

The descriptive analysis follows in the form of the frequency graphs and tables. This provides the preliminary analysis in the form of agreement levels to the questions of the quantitative instrument. The first sub-section will be the biographical analysis followed by the actual questionnaire variables.

4.3. Biographical analysis

The biographical analysis is a method that has been has proven to be an excellent way of making theoretical sense of social phenomena. Biographical analysis, offers a way of capturing the diversity, complexity, and transformational character of a sample population in a research study (Apitzsch et al, 2007).

4.3.1. Age Group

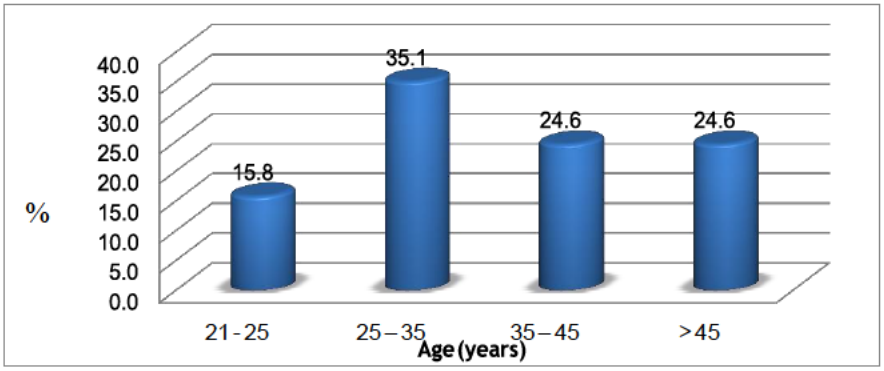


Figure 4.1. Age of participants

The majority of the samples taking part in the survey which responded were of a mature age. Almost 50% were above the age of 35; this indicates maturity of age in the sample selected.

4.3.2. Number of years of working experience

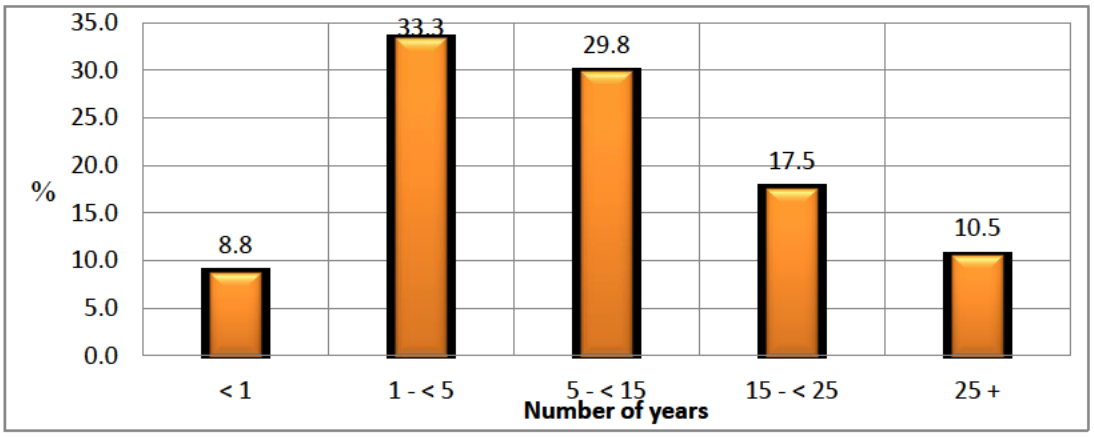


Figure 4.2. Number of years of working experience

Respondents work experience in their current positions, at the time when the data was collected, indicated that over 80% of the sample has experience between 1 to 25 years in KZN Operating unit.

4.3.3. Demographics of participants

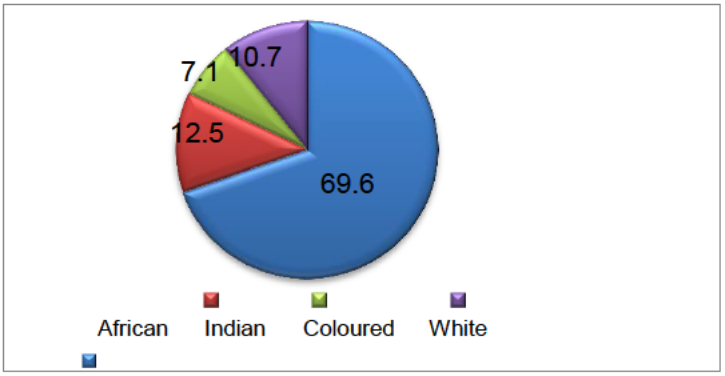


Figure 4.3 demographics of participants

Of the entire sample Seventy percent (70%) were of the African race, and the remaining 31% being the other races. Eskom is a state owned enterprise in South Africa. One of the requirements not only for state owned but for all companies which seek BBBEE compliance is to ensure growth in its strategy, targeting the South African economy's weakest point, that being inequality. The BBBEE strategy stresses the process associated with growth, development, and not merely the redistribution of existing wealth as required by the broad based black economic empowerment act (Act no 40 of2003).

4.3.4. Participants current job title

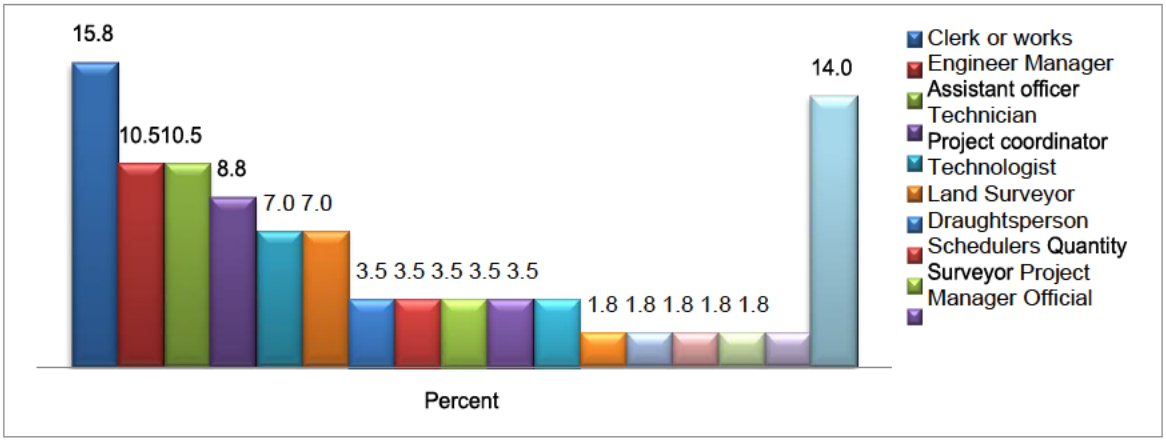


Figure 4.4 Title description of the sample size

In an effort of understanding the sample better, each respondent was required to select their current title. A total response of 86 % of the participants were from the Asset creation environment, and 14% being from supporting disciplines, as indicated by 'other' in figure 4.4 above. The respondents that are labelled as 'other' are those that have been working in the Asset Creation through secondments and have not been appointed in the departments. Majority of these respondents have been seconded only for the current financial year as to assist with the required output for the department.

4.4. Frequency Analysis of Questionnaire variables

4.4.1. Operations taking place in silos

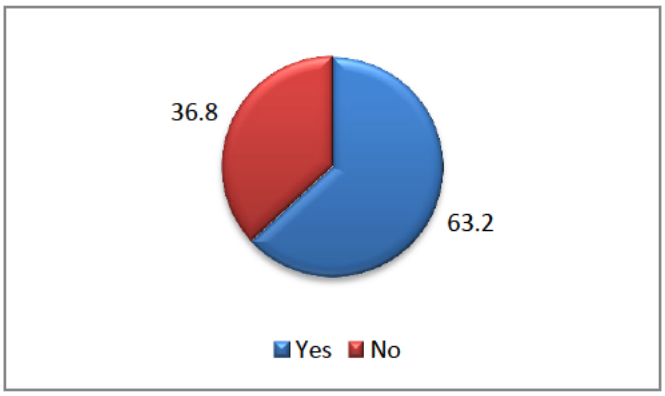


Figure 4.5. Operations taking place in silos

A response of 63% of the respondents agreed that operations were taking place in silos at the ESKOM Asset Creation department.

4.4.2. Type of Operations taking place in Silos

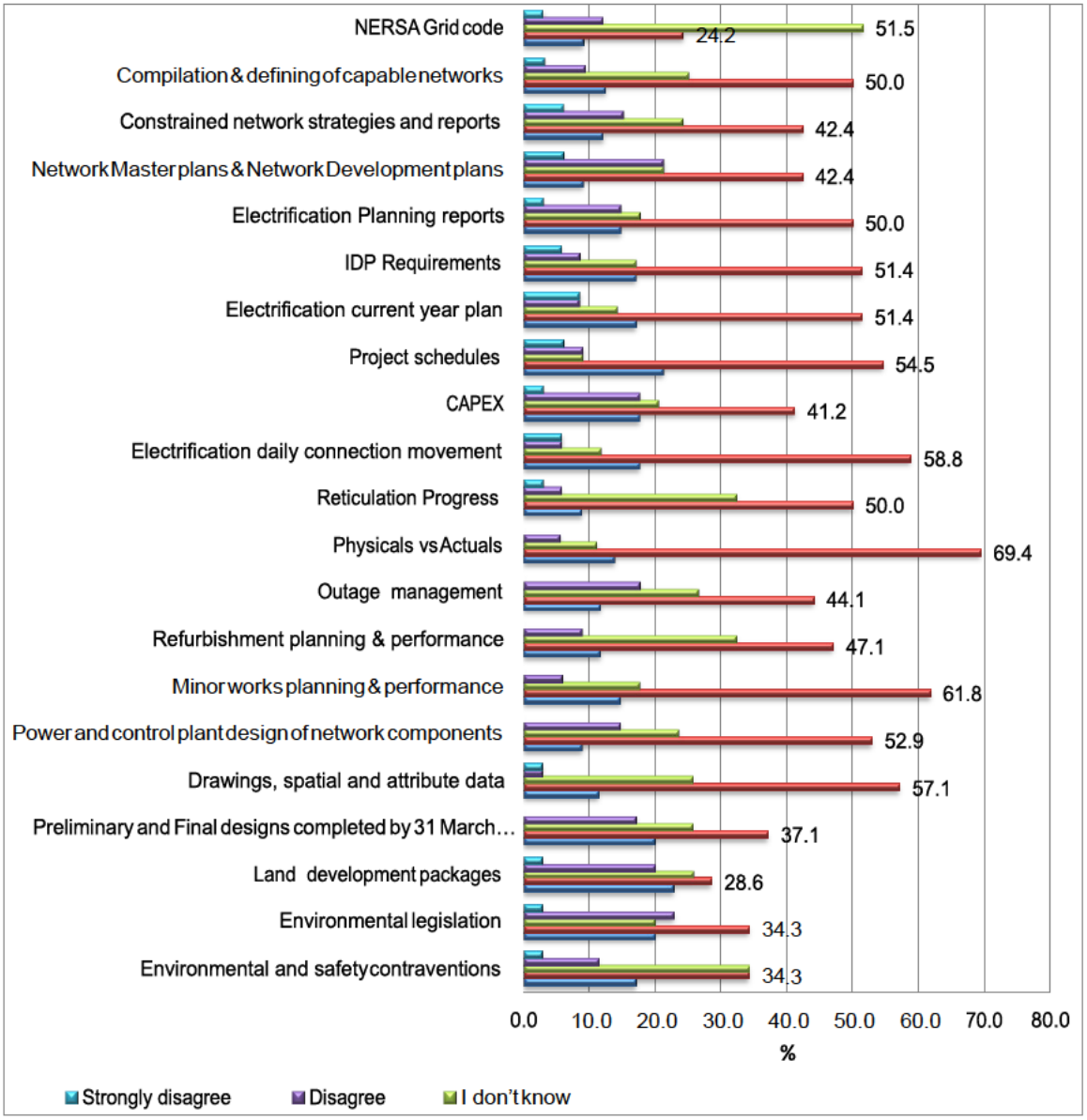


Figure 4.6: Identification of operations happening in silos

Of the 63% that agreed that operations were taking place is silos, looking at all the various operations which areas were mostly susceptible to silo operations. The

responses are indicated by the graph 4.6 above.

Almost all of the operations as shown in the figure 4.6 seem to be operating in silos. However, some of the highest ranked operations were:

- Physicals verses actuals (69 %) - This report measures the physicals which represent the actual construction of infrastructure, being mainly the Major Voltage (MV) and Low Voltage (LV) lines that have been built against the actuals. These are defined as the live connections and are the MV and LV lines that have been commissioned for supplying live electricity. This report enables the managers to forecast for the week ahead. For example if this week the project manager reports on 40 Physicals this is an indication should all conditions remain the same, 40 actual connections are expected the following week.

- Minor works planning and performance was rated at 62% - The second highest rating. This process is triggered by another process from customer services department. When a customer requires electricity, they call or come to Eskom's walk in centres and apply for electricity. The customer is given a quotation and once accepted a request is placed through from online program called CC&B which is linked to another program called ACNAC to the minor works department as a plan. The execution and reporting of this function seems to be operating in silos as not all employees have access to the systems used as these are access controlled. The performance reports are not shared except when viewed in the KZN dashboard which is compiled once a quarter.

- Electrification daily connection movement report rated at 60%, gives an indication of how the electrification Programme is progressing on a daily basis. This report is very important as the Electrification Programme is a highly influenced by South African Politics. The Government will give a mandate through Department of Energy, mandating them to electrify a certain number of South Africans. The DOE then mandates Eskom and the municipalities. Eskom breaks these numbers down to

provinces based on a needs assessment. Each province is then required to meet its objective for the program. In 2016/17, the KZN Operating unit was required to connect 47000 customers through this Programme, 2017/18 43000 connections were required from the KZN Operating unit. The daily connection report enables management to foresee how many connections are achieved per day and per week and are then able to forecast how many connections will be achieved in the months to come. This report also provides as an indicator to determine whether management should pull through more resources to fast track the Programme or not. This report is vital as the success of this Programme indicates the success of the operating unit.

- Project schedules are seen to be operating in silos and were rated at 44 %. Project schedules are tools used in the project environment to plan and execute projects. Project schedules work as a map or guide not only to Project managers and executors but also to the Asset Creation management team. Schedules enables the team to have a view of projects that should be fast tracked to meet more connection numbers and which projects need to be cancelled in some instances. The view of schedules enables proper planning for all departments within Asset creation environment to facilitate smooth operations for each project.

Indicated in the above figure 4.6, page 58 more than 98 % of all operations within the Asset Creation environment are indicated as operating in silos. This therefore means there is lack of communication and collaboration between these departments. It further indicates the alienating of top management from the actual working force and this implies that information which is provided to top management may be distorted and hence good quality information for decision-making is compromised (Krachenberg, Henke and Lyons, 1993). This lead to extremely high stress levels not only on the organisations management but also on the working staff. (Leka, Griffiths and Cox, 2005). In Eskom this has resulted in extremely high stress levels, poor forecasting leading to making inappropriate or uninformed decisions which also have had negative cost implications to Eskom.

4.4.3. The impact of Silo mentality in an Organisation

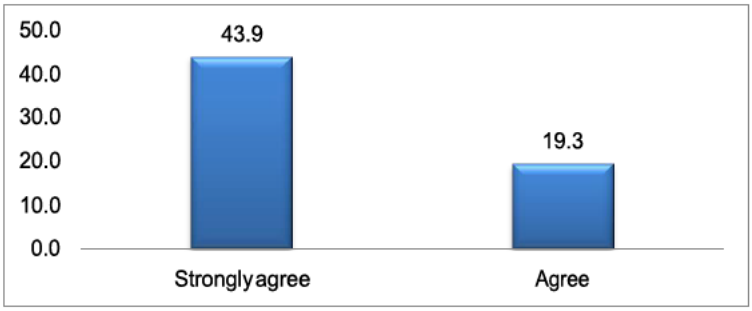


Figure 4.7: Impact of silo mentality in an organization

When the respondents were asked whether the operations functioning in isolation have an impact on Asset creation, a total of 63% agreed (with 44 % strongly agreeing) that there is indeed a negative impact on Asset Creations operations when operating in isolation.

In a study conducted by the Department of industrial and organisational psychology it was found that the silo mentality is not physical but rather a state of mind where individuals with the same level of thinking or intellectual capacity groups themselves isolating those that are not like them. This mind-set creates barriers within departments and inter-departmental barriers are also apparent. (Cilliers and Greyvenstein, 2012)

Serrat (2010) states that silos within an organization lead to misaligned goals, each department starts focusing on their own objectives, they dilute the roles and responsibilities within the organization leading to ambiguous authority and misalignment in the allocation of resources, silos cultivate a culture where performance is only focused on the departments outputs and lose focus on the holistic picture.

4.4.4.Management information system to focus on information sharing to enhance the operations across each department

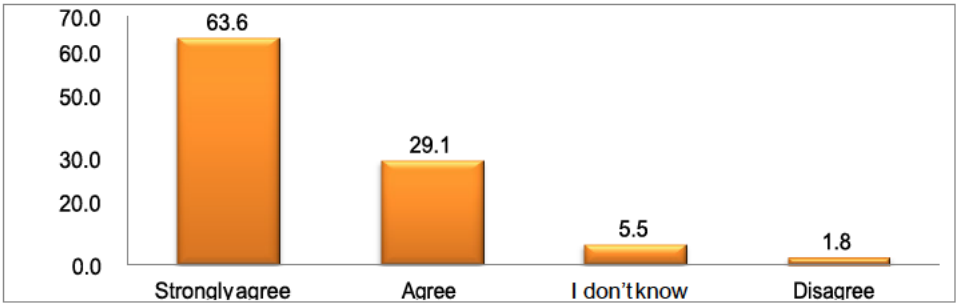


Figure 4.8: Management information system to focus on information sharing to enhance the operations across each department

It is evident in figure 4.8 that information sharing is very important within the department. 94% of the respondents indicated that an appropriate MIS must definitely focus on of information sharing for the enhancement of operations. This is seen as a positive finding in relation to implementation of an MIS.

4.4.5. Improvement of operations through an effective information management system.

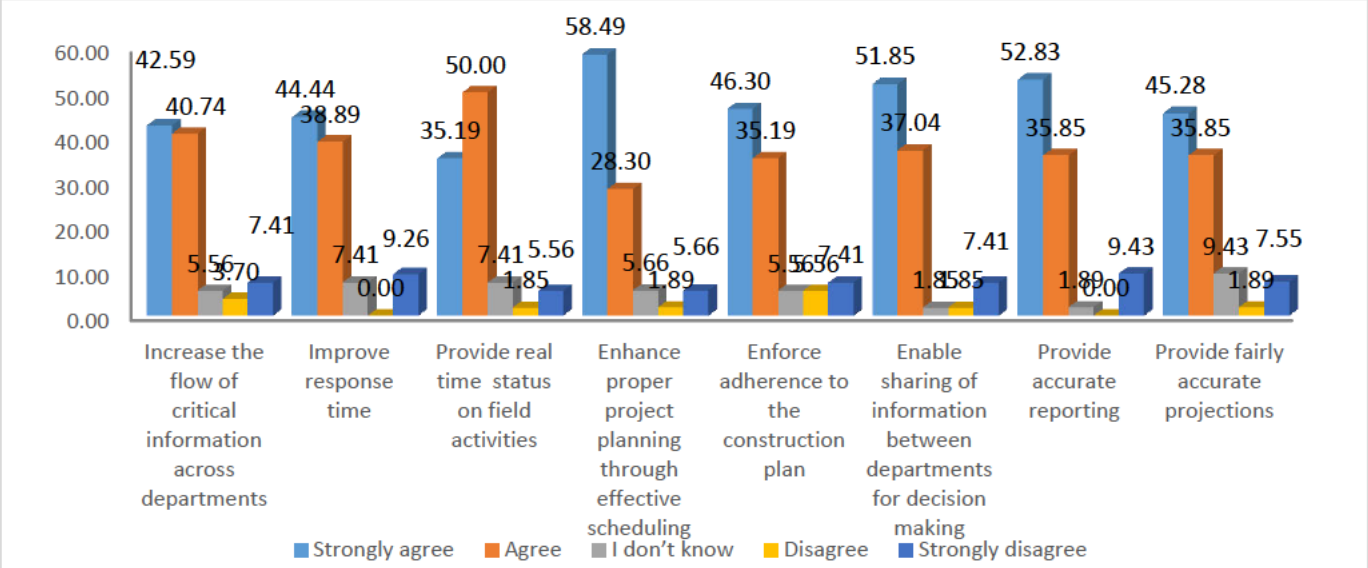


Figure 4.9. Improvement of operations through Information management system implementation

Figure 4.9 above displays the result respondents that believed an effective MIS could

improve operations at Asset Creation. As shown, 84% indicated that the information system must increase the flow of critical information across all departments, enabling transparency in operations and proper decision making. Another 83% indicated that information systems can improve response time. This is the time taken in the decision making process which currently appears to be longer due to the lack of or the time taken to collect information for decision making, causing delays in the performance indicators of the OU. A further 84% felt that operations could improve should the information system provide real time status on field activities. This means that as and when an asset is commissioned or energised, the MIS should also update data. It should also enhance project planning through effective scheduling (87%)

As a common law in project management, it is vital for all contractors and project managers to adhere to the construction plans which are usually used to develop a project schedule. Hence, 81% of the sample population felt that an effective information management system can enforce adherence to the construction plan and as a result minimal delays and timeous execution can take place. In addition, 89% of the sample population agreed that a proper or effective management information system (MIS) should enable information sharing between departments for proper decision-making, and must have the ability to provide accurate reporting with minimal human manipulation. Lastly, 81% felt that an effective MIS should provide fairly accurate projections providing management with a view of their performance based on their current input variables. According to (Nowduri, 2010), MIS is an integral part of any business. An MIS enables an organisation to firmly lay a foundation of concrete decisions making use of systematic tools, real time information policies and procedures governing an organisation.

4.4.5. Operation efficiency enhanced through good quality information

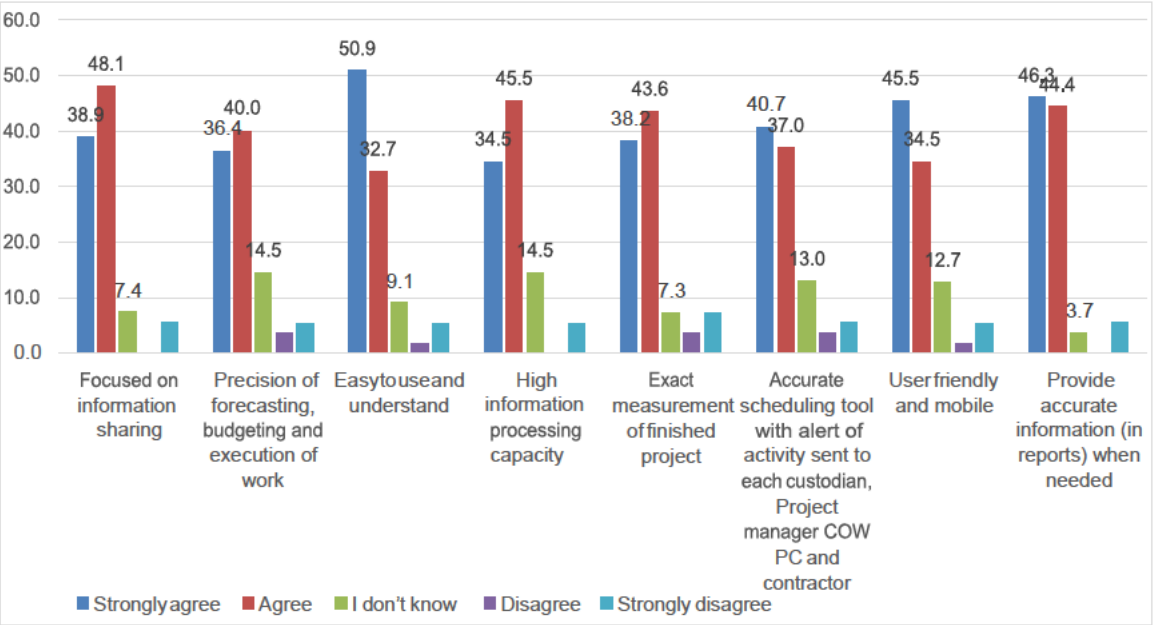


Figure 4.10.: Operation efficiency enhanced through good quality information.

When it came to perception on how a good quality MIS can enhance operational efficiency, the respondents ranked the various factors very highly as displayed in the figure 4.10.Respondents believed that a good quality MIS that can enhance operation efficiency should be one that is/has:

- Focused on information sharing (88%)
- Precision of forecasting, budgeting and execution of work (76%)
- Easy to use and understand (84%)
- High information processing capacity (81%)
- Exact measurement of finished project (82%)
- Accurate scheduling tool with alert of activity sent to each custodian, Project manager COW PC and contractor (78%)
- User friendly and mobile (81%)
- Provide accurate information (in reports) when needed (91%)

This is supported by studies such as the study by (Asemi et al.,2011) indicated that

operational efficiency can be enhanced with the use of a good quality management system It is a system that is used for effective communication throughout the organisation from management and to all employees. A good quality management information system enables the employees to ask what and why they are performing certain tasks and also how they can improve on what is currently being done (HIRTC, 2013). Management information systems must focus on information sharing, eliminating the silo mentality which is currently existing.

4.4.6. The importance of quality information and whether an effective MIS can provide quality of information.

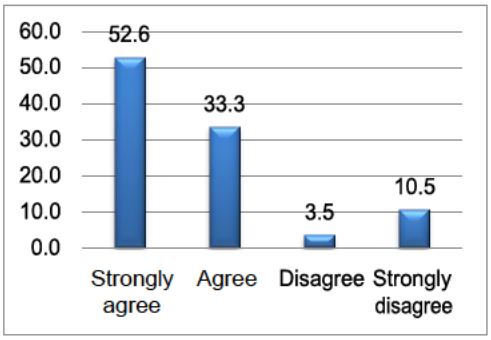


Figure 4.11.: The importance of Quality information

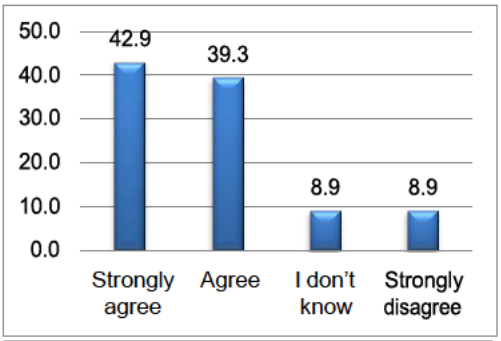


Figure 4.12.: Effective MIS providing high quality

As revealed in Figure 4.11, 86 % agreed that Information quality was important for their department. Complementing this is figure 4.12 which displays that 82 % of participants indicated that an effective MIS should provide high quality information to the department. As indicated by (Nowduri, 2010) that a good quality management system is that which allows for proper decision making.

4.4.7. Components of high quality information

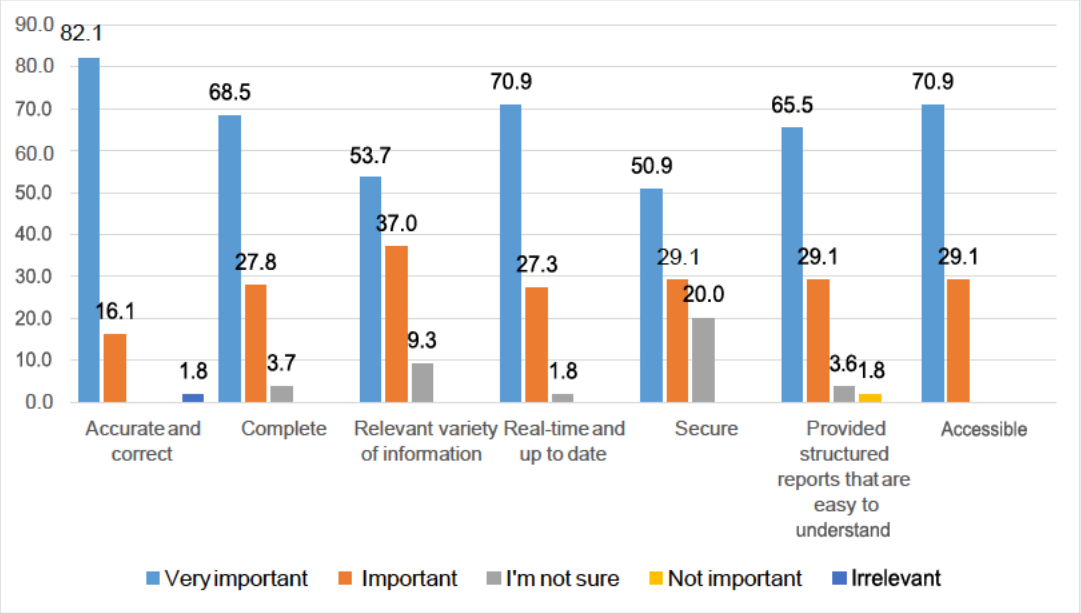


Figure 4.13 Components of high quality information.

Majority of the respondents agreed (strongly agreed + agreed) that high quality information should be

- Accurate and correct (98%)
- Complete (96%)
- Relevant variety of information (91%)
- Real-time and up to date (98%)
- Secure (80%)
- Provided in structured reports that is easy to understand (95%)
- Accessible (100%)

This concurs with studies as sited in (Allentown, 2014) and through an information quality guide collaborated on by a number of delegates around the American state in the information quality guide of the Unites states Justice Department (Anon., 2010).

4.4.8. Real time information can promote proactive management

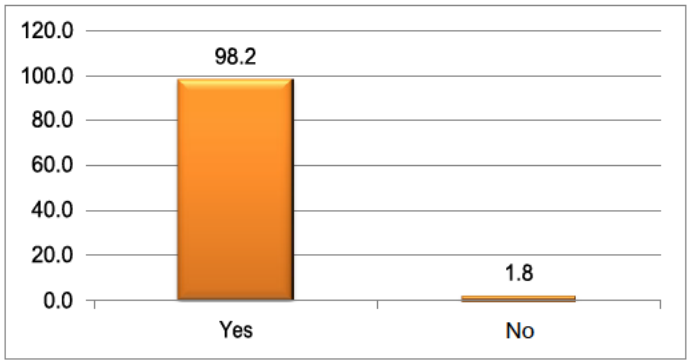


Figure 4.14: real time information can promote proactive management

A further enquiry was made if the respondents felt that real time information can promote proactive management for the departments within Asset Creation. An astounding 98.2 % agreed. This concurs with an online study (Thomas, 2017) and a study by (Bousdekis et al.,2015).

4.4.9. Real time information can have a positive impact in the Asset creation environment

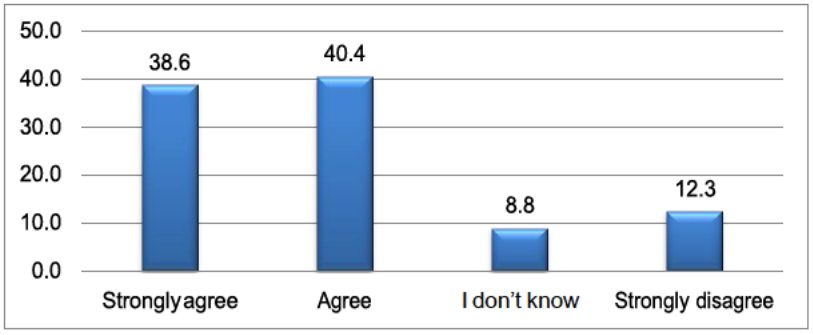


Figure 4.15: Real time information can have a positive impact in the Asset creation environment

Results displayed in the graph above indicate that 79 % felt that real time information can promote proactive management with 39 % strongly agreeing to this.

This finding concurs with (Mckinsey, 2012) and (Eckerson, 2009).

4.4.11. Components of an information management system that can implement proper management.

An enquiry was made to the sample population whether an information management system with specific components can in actuality assist with proper management of the department. The results to this were as displayed below:

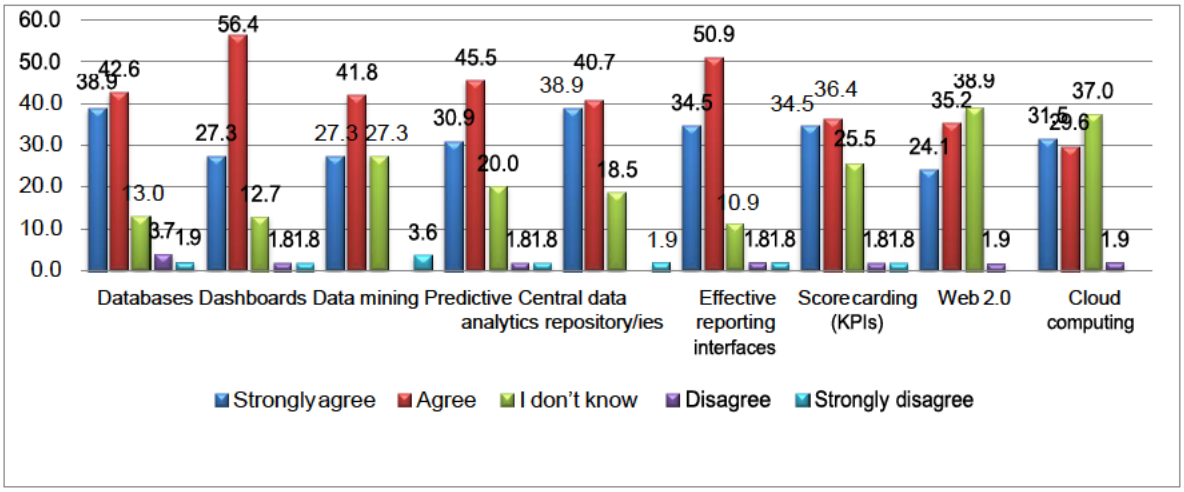


Figure 4.16: Are these components able to assist with the proper management of asset creation

- Databases A built in database component in an information system can assist with proper departmental management 83 % of the respondents share this sentiment. This finding concurs with (Mongo, 2013).
- Dashboards: a large number of respondents, 83% felt that dashboard were great in proper management of the department. A similar finding was sighted on (Kuo, 2004)
- Data Mining: Datamining was seen as an important component by 69 % of the respondents, while 27% of the respondents did not know what data mining is. One may say there is a correlation between the 27 % who do not know what data mining is to that of the 24 % of respondents who are aged above 44 years.

- Predictive analytics: up to 77% of the respondents agreed that predictive analytic was important in an MIS that would assist with the management of the Asset creation department.
- Central Data repositories: an large percentage of respondents, 80 % felt that all information regarding Asset creation and the sub departments within Asset creation must be kept in a central data repository, where applicable access is given based on the individuals input to the entire system.
- Effective reporting interface: respondents up to 86 % felt that this was most vital component of management information system for the Asset Creation department. The MIS must have the ability of drawing real time reports as and when required to enable proper and effective decision-making by management.
- Score carding (KPI): this received 71 % agreement as this component will also enable the department to conduct quarterly performance appraisals based on actual performance as real time data will be captured on the MIS.
- Web 2.0- (49 %) and Cloud computing (62 %) received some of the lowest ratings in terms of the participant agreeing with them forming part of an effective component of the MIS for Asset creation. This may also correlate to the 24 % of the sample size being above the age of 44, and these concepts may not be known to them.

4.4.12. Benefits that can be realised from the implementation of an effective MIS

The final question posed to the respondents was whether the below benefits were feasible and could be realised should an effective MIS be put in place in Asset creation.

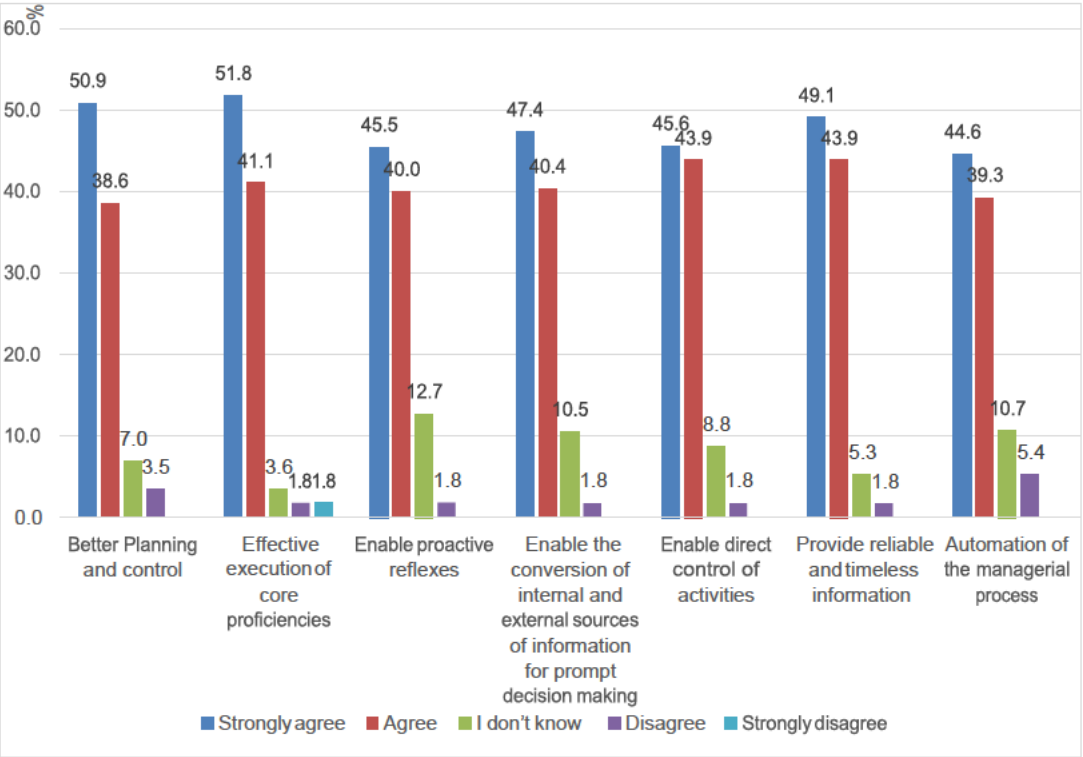


Figure 4.17: Benefits derived from an effective MIS

It was shown at all of the variables ranked highly in terms of benefits that an effective MIS could provide.

An effective MIS would enable better planning as indicated by 89% 0f the respondents, and put in place effective controls where they seem to be lacking in the current situation. Effective execution of core proficiencies received 93 % agreement from the audience. This component or benefit seemed to have the majority's strong agreement. This, to Asset creation, means that there will be a seamless execution of all

major activities within the process resulting in positive performance.

A large number (86 %) of the respondents felt that an effective MIS would enable proactive reflexes eliminating the current scenario where all decisions are based on current or historical data. This will also enable a conversation of internal and external resources for prompt decision making. An effective MIS will spark the conversation enabling prompt decisions to take place, of which 87 % felt this was one of the most important benefits.

Section C

4.5 Factor Analysis

Factor analysis is a statistical technique where the main goal is data reduction. A typical use of factor analysis is in survey research, where a researcher wishes to represent a number of questions with a small number of hypothetical factors (Yong and Pearce, 2013). Factor analysis can be used to establish whether the three measures do, in fact, measure the same thing. If so, they can then be combined to create a new variable, a factor score variable that contains a score for each respondent on the factor. (Vandenberg and Lance , 2000)

Factor analysis is done only for the Likert scale items. Certain components divided into finer components. This is explained below in the rotated component matrix. The initial requirement for factor analysis is that Kaiser-Meyer-Olkin Measure of Sampling Adequacy should be greater than 0.40 and Bartlett's Test of Sphericity less than 0.04. The KMO for this study is shown in table 4.2.

		Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
Question	**Section**		Approx. Chi-Square	df	Sig.
8	Operations/activities happening in isolation	0.377	464.484	210	0.000
11	Operations can be improved via the implementation of a proper management information system	0.893	443.618	28	0.000

12	A good quality Management Information System should be	0.864	387.183	28	0.000
14	Highly quality information should be	0.768	129.118	21	0.000
20	Real time information can positively impact your departmental outputs by promoting	0.844	299.744	10	0.000
23	Information management system assist with proper management of the department	0.783	447.217	36	0.000
24	Benefits that are effective MIS can bring to Asset Creation	0.888	343.704	21	0.000

Table: 4.2: KMO and Bartlett's Test

All of the conditions are satisfied for factor analysis except that of question 8. This could be because of insistent scoring patterns by respondents. That is, the Kaiser-Meyer-Olkin measure of sampling adequacy value should be greater than 0.400 and the Bartlett's Test of Sphericity sig. value should be less than 0.04.

The study further shows the findings of the factor analysis and these are represented below:

Q11: Operations can be improved via the implementation of a proper management information system	Component 1
Increase the flow of critical information across departments	0.892
Improve response time	0.920
Provide real time status on field activities	0.916
Enhance proper project planning through effective scheduling	0.919
Enforce adherence to the construction plan	0.882
Enable sharing of information between departments for decision making	0.939
Provide accurate reporting	0.948
Provide fairly accurate projections	0.887

Table 4.3 Operations can be improved via the implementation of a proper management information system

Question 11 in the questionnaire looked at how operations can be improved with the implementation of an information management system. All components loaded perfectly into component 1. This showed that the variables set out to measure what they intended to measure. Respondents viewed these variables as similar and inter-related when it came to measuring the improvement of operations via a proper MIS.

Q12: A good quality Management Information System should be	Component 1
Focused on information sharing	0.848
Precision of forecasting, budgeting and execution of work	0.808
Easy to use and understand	0.810
High information processing capacity	0.839
Exact measurement of finished project	0.848
Accurate scheduling tool with alert of activity sent to each custodian, Project manager COW PC and contractor	0.887
User friendly and mobile	0.893
Provide accurate information (in reports) when needed	0.918

Table 4.4. A good quality Management Information System should be

Similarly, factor analysis was run against the components that can actually make up a good quality management information system, the respondents felt that all the components were related to each other as displayed in table 4.4 above. These measures hence measured the quality of a good MIS perfectly.

Q14: High quality information should be	Component 1	2
Accurate and correct	0.041	0.868
Complete	0.382	0.743
Relevant variety of information	0.788	0.147
Real-time and up to date	0.834	0.182
Secure	0.668	0.227
Provided structured reports that are easy to understand	0.383	0.664
Accessible	0.731	0.298

Table 4.5. High quality information

This specific analysis on the determinants of high quality information loaded under two components. This showed that respondents may have viewed some of the variables differently. The first component identified consisted of 'relevant variety of information, real time and up to date, secure and accessible'. This component can be considered as one factor and can be termed as "Information access and availability" as all the selected refer specifically to the availability of information as and when it is required. The second factor as seen in table 4.3 page 77 can be termed as "Comprehensive" this includes the accuracy and correctness of information, the completeness and whether the MIS can provide structured reports which are easy to understand. High quality information resulted in two factors namely availability and comprehensive, these two make up the main component for high quality information.

Q20: Real time information can positively impact your departmental outputs by promoting	Component 1
Proactive information about completeness of tasks and activities	0.891
Proactive review of risk management through real-time information	0.944
Ensure all departmental KPI targets are known and met.	0.797
Informed decision making at departmental level	0.948
Informed strategic action	0.942

Table: 4.6. Real time information can positively impact your departmental outputs by promoting

All components for the impact of real time information on departmental outputs were found to be inter-related in the view of the participants. Hence, all results loaded perfectly on one component as represented by table 4.6 above.

Q23: Information management system with the below components can assist with proper management of the department	Component 1
Databases	0.732
Dashboards	0.889
Data mining	0.884
Predictive analytics	0.902
Central data repository/ies	0.862
Effective reporting interfaces	0.893
Score carding (KPIs)	0.797
Web 2.0	0.792
Cloud computing	0.769

Table: 4.7. Information management system with the below components can assist with proper management of the department

Question 23 examined at the components needed within an information management system to assist with proper management of the entire Asset Creation department. When the factor analysis was run is revealed that all components loaded perfectly into one factor, meaning that the there is clearly a relationship, in the eyes of the respondents, between all the components. This is seen as a key result that can inform the conceptual model.

Q24: Benefits that are effective MIS can bring to Asset Creation	Component 1
Better Planning and control	0.880
Effective execution of core proficiencies	0.893
Enable proactive reflexes	0.923
Enable the conversion of internal and external sources of information for prompt decision making	0.864
Enable direct control of activities	0.901
Provide reliable and timeless information	0.893
Automation of the managerial process	0.719

Table 4.8. Benefits that are effective MIS can bring to Asset Creation

Lastly, the benefits that can be offered when an organisation implements an effective

management information system was examined via factor analysis. As with the previous questions, it indicates that the components loaded perfectly into one factor indicating similarity and relation between the variables.

Section D

4.6. Chi-Square Hypothesis Testing

The Chi-square test is intended to test how likely it is that an observed distribution is due to chance. It is also called a "goodness of fit" statistic, because it measures how well the observed distribution of data fits with the distribution that is expected if the variables are independent. (Turner, 2014). Hence, the chi square test looks at the interdependency between variables within your sample size.

Provide accurate information (in reports) when needed	Chi-square	6.470	11.428	13.487	67.924
	df	9	12	9	44
	Sig.	0.692	0.493	0.142	.014*

Table 4.9. Interdependence between 'having a management information system that will provide accurate information and the current job title

The results of the chi-square test in the study revealed that there is interdependence between 'having a management information system that will provide accurate information in a form of structured reports when required' and 'current job title. Respondents of the sample size are directly involved in the activities and processes that make up the entire Asset creation value chain 84% require an information management system that will enable collaboration within the various departments on a per project or process basis. It has been cited that an effective information management system syncronised with proper knowledge management can provide synergy within an organisation (Schultze and Leidner, 2002).

Secure	Chi-square	4.621	16.628
	df	6	8
	Sig.	0.467	.034*

Table 4.10. Interdependence between having a secure information management system' and the number of years

There is also an apparent interdependence between having a 'secure information management system' and the 'number of years' in which the respondents have been employed in the operating unit, and more specifically in the Asset creation environment. An amount of 63 % of respondents indicated that they have been in the Asset creation environment for 1 to 14 years, this implies that a younger generation who are more conscious of new technologies and is therefore concerned about the level of information security than the older generation which rated 37%. This finding concurs with a finding sited on (Ikenwe et al., 2016) who reiterated the importance of information security in this digital age not only to demographics but also in developing countries. Demographics are also vital in the shift towards information security (Sinclair, 2014).

Databases	Chi-square	21.426
	df	12
	Sig.	.044*

Table 4.11. Interdependence between information management system consisting of databases and age.

There is an apparent interdependency between information management system consisting of 'databases' to assist with proper management of the department 'age'. Looking at the frequency a majority of the respondents range from ages 24 – 44, resulting in 60 % of the sample size being of that age. This age group believes that a proper management system must include databases that are up to date with real time information. This concurs with (Lehtinen, 2014). It is also evident in the Eskom Employee records that at this age range is usually in specialist or management position and therefore require databases to conduct further analysis in their line of work (Jones, 2015).

Section E

4.7. Correlations

Correlations are a process of establishing a relationship or connection between two or more things. The results indicate the following patterns. Positive values indicate a directly proportional relationship between the variables and a negative value indicates an inverse relationship (Schönbrodt et al, 2013).

4.7.1. Improvement of operations via a proper MIS and high quality information.

Operations can be improved via the implementation of a proper management information system *-Increase the flow of critical information across departments* - *Improve response time* - *Provide real time status on field activities* - *Enhance proper project planning through effective scheduling* - *Enforce adherence to the construction plan* - *Enable sharing of information between departments for decision making* - *Provide accurate reporting* - *Provide fairly accurate projections*	.381 (P<0.01)
High Quality Information - *Accurate and correct* - *Complete* - *Relevant variety of information* - *Real-time and up to date* - *Secure* - *Provided structured reports that are easy to understand* - *Accessible*	

Table 4.12. Improvement of operations via a proper MIS and high quality information.

There is a direct proportional relationship between section 'Operations can be improved via the implementation of a proper management information system' and 'High Quality Information.' This implies that an increase in one can mean and increase in the other. Hence, this correlation can be interpreted as the increase in the

implementation of an MIS to improve operation in Asset Creation can mean an increase in high quality information received and produced in the department. The frequency results reflected that 80 – 84 % of the same population felt that a proper information system can improve operations whilst 98 – 100 % of the sample population felt that the components of high quality information must be met in order for one to obtain a high quality system. 'The results clearly indicate the directly proportional relationship.

An Oracle white paper published in 2014 looked at how customer experience can improve with the implementation of high quality information. Oracle realised that in order to improve customer satisfaction or experience via improving their operations, they needed to ensure that there is a process and culture change within the organisation. To achieve this, emphasis was made on data and information quality whereby the correct and relevant data needed to be put in place (Scheuber, 2014). Operational efficiency in the weaponry industry means the control of information for the initiation of modern wars. Today's weapons are so sophisticated that without information system these would not have been possible to create. This implies that Information system in this context is critical. (Jun, Hongmei and Jie, 2011). Today even the manufacturing industries have moved toward the implementation of information systems for proper management transfer and dissemination of information. They have continually increased their revenue and have expanded their productivity in an effort of reducing waste (Herterich, Uebernickel and Brenner, 2015).

4.7.2. Improvement of Operations via implementation of MIS and Components of a good quality MIS

Operations can be improved via the implementation of a proper management information system - *Increase the flow of critical information across departments* - *Improve response time* - *Provide real time status on field activities* - *Enhance proper project planning through effective*	

scheduling - *Enforce adherence to the construction plan* - *Enable sharing of information between departments for decision making* - *Provide accurate reporting* - *Provide fairly accurate projections*	.380 (P<0.01)
A good quality Management Information System should be - Focused on information sharing - Precision of forecasting, budgeting and execution of work - Easy to use and understand - High information processing capacity - Exact measurement of finished project - Accurate scheduling tool with alert of activity sent to each custodian, Project manager COW PC and contractor - User friendly and mobile - Provide accurate information (in reports) when needed	

Table 4.13. Improvement of Operations via implementation of MIS and Components of a good quality MIS

A positive directly proportional relationship is apparent between 'Operations improving via the implementation of a proper management information system' and 'the components of a good quality Management Information System'. This implies that an increase a good quality MIS and its components can promote an increase in the improvement of operations.

A large number of respondents between 80 – 84 % felt that a good quality system with these components would definitely improve operations within the asset creation environment should a proper information system be implemented. As ascertained in Section B Frequency analysis of the questionnaire figure 4.10. page 69.

Noted and discovered by the National learning consortium, when looking at improving the state of the American health care system, they came up with an initiative they called continuous quality improvement (CQI). This to them meant creating a culture

for CQI, by having a structured planning approach, and evaluations at every mile stone of the project. This also involved evaluation of processes, production tools meaning the current Management information system to verify if they can actually achieve their objective with their current systems or did they require something more advanced (HIRTC, 2013)

4.7.3. Positive impact of Real time information on the organisation and high quality information

Real time information can positively impact your departmental outputs by promoting - Proactive information about completeness of tasks and activities - Proactive review of risk management through real-time information - Ensure all departmental KPI targets are known and met. - Informed decision making at departmental level - Informed strategic action	.466 (P<0.01)
High quality information should be - Accurate and correct - Complete - Relevant variety of information - real-time and up to date - Secure - provided structured reports that are easy to understand - Accessible	

Table 4.14. Positive impact of Real time information on the organisation and high quality information

A positive direct proportional relationship is apparent between Real time information positively impacting ones departmental outputs components of high quality information. The correlation exists between the components of high quality information and the impact of real time information on the organisation. This implies that the higher the quality of real-time information, the more positively it will impact on the organisation. Respondents felt that if one has real-time information, the level and quality of information will be very high and departmental outputs can improve. Mechalek (2012) acknowledges that in the current century, that managing a company

is almost unthinkable without a system.

4.7.4. Information management system with the following components can assist proper management of departments and improvement of operations

Management Information system with the following components can assist with proper management of the department - Databases - Dashboards - Data mining - Predictive analytics - Central data repository/ies - Effective reporting interfaces - Score carding (KPIs) - Web 2.0 - Cloud computing	.377 (P<0.01)
Operations can be improved via the implementation of a proper management information system - Increase the flow of critical information across departments - Improve response time - Provide real time status on field activities - Enhance proper project planning through effective scheduling - Enforce adherence to the construction plan - Enable sharing of information between departments for decision making - Provide accurate reporting - Provide fairly accurate projections	

Table 4.15. Information management system with the following components can assist proper management of departments and improvement of operations

There is a positive proportional relationship between management Information system with the following components can assist with proper management of the department and Operations can be improved via the implementation of a proper management information system. This can imply that the more an MIS is built around the powerful technological components such as databases, dashboards, datamining, predictive analytics and the rest that are listed in table 4.14, the more it will improve operations at Asset Creation. Approximately 90 % of the sample size agreed to the components of a

Management information system as displayed in figure 4.16 page 73 above as being important or critical in the management of the department. This positively relates to operations improving with the implementation of a proper management system and how response time will be enhanced, information sharing will take place as well as accurate reporting.

There seems to be a holistic view about how information management should actually benefit an organisation and improve operations. The system should provide a basis to analyse warning signals originating either internally or externally of the organisation, be able to automate routine operations without the need for human intervention, and enable management to make proper decisions regarding the organisation. Some of the elements as described are related to datamining as discussed and cited in (Alexander, 2016) with predictive analysis being evident through advanced analytics as sited on a white paper by (Bartley, 2016) and a proper performance management tool though balance scoring which concurs with (Murbby and Gould, 2005) The system must also have the capacity to provide information to make non-routine decisions and serve as a strategic weapon for competitive advantage. Information systems are seen as the blood line in a business organisation and has this been displayed in the picture below:

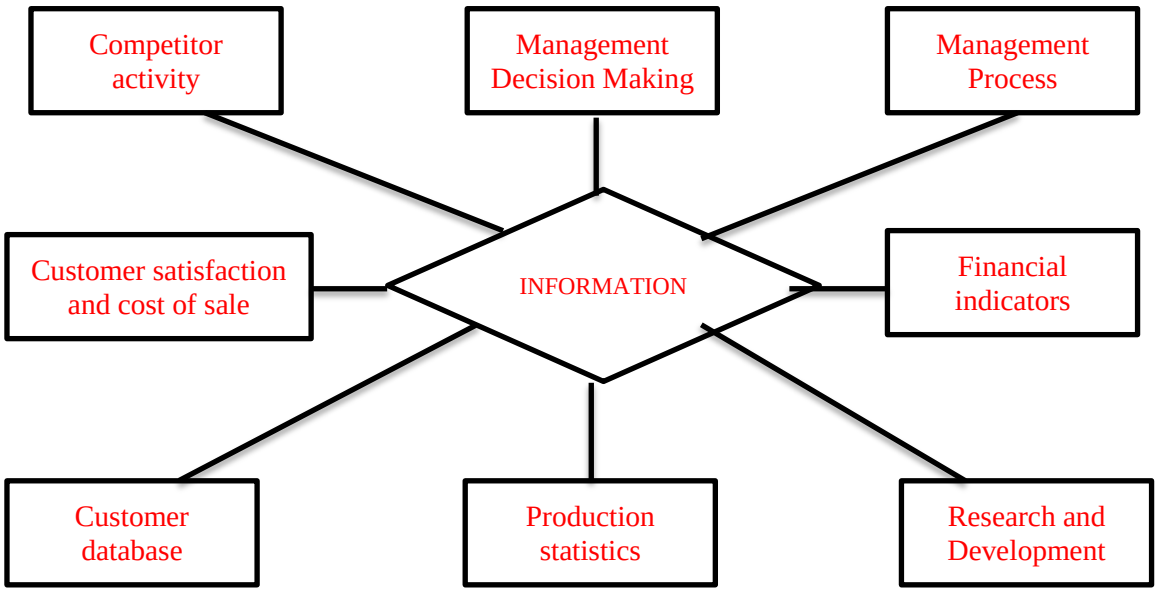


Figure 4.18. Information displayed as the bloodline of all operations (Reddy et al,2009)

From the diagram above one can see that all operational activities require information which is displayed at the centre of the diagram as a life line or blood line to all other components on the organization (Reddy et al., 2009).

4.7.5. Management Information system with the following components can assist with proper management of the department and the focus of a good quality Management Information

Management Information system with the following components can assist with proper management of the department - Databases - Dashboards - Data mining - Predictive analytics - Central data repository/ies - Effective reporting interfaces - Score carding (KPIs) - Web 2.0 - Cloud computing -	.448 (P<0.01)
A good quality Management Information System should be - Focused on information sharing - Precision of forecasting, budgeting and execution of work - Easy to use and understand - High information processing capacity - Exact measurement of finished project - Accurate scheduling tool with alert of activity sent to each custodian, Project manager COW PC and contractor - User friendly and mobile - Provide accurate information (in reports) when needed	

Table 4.16. Information management system with the following components can assist with proper management of the department and the focus of a good quality Management Information

The correlations also show a relationship which is logical as it implies that an increase

in listed technological components of an MIS as shown above will promote a good quality MIS. Hence MIS should be built around these components to promote information- sharing and all other attributes a shown in table 4.16 above. The elements or component of a management information system that can enable proper management of the department, is proportionally related to the quality components of a good management system. This means that if a proper management system is implemented, then the quality of the information will be accurate and allow for positive business performance and proactive decision making.

Data quality is defined as data that is fit for use, in its intended operations and decision making. Data quality is very important to a business or any organisation; this is in concurrence with (Scheuren and Winkler, 2008).

4.8 Summary

This chapter detailed the quantitative analysis and discussion. Various analytical techniques were used namely reliability analysis, frequency analysis, factor analysis, chi-square hypothesis testing and correlations. This provided more depth into the analysis to satisfy the requirements of the study and the data collected. Overall, the quantitative analysis concluded that a Management Information System is required for Asset Creation and can break the silo operations and promote information sharing that can improve operational efficiency and productivity. As previously mentioned, the methodology of the data collection is that of a mixed method. The following chapter will be analysing and discussing the qualitative data.

Chapter 5

Qualitative analysis and discussion

5.1. Introduction

This chapter involves critical analysis of the qualitative data that was collected. The data was analysed to determine alignment with the research questions and the aim of the study. Word-clouding was the tool used to enable the analysis of the data collected, coupled with the researcher's own examination of the data which was then used to formulate relevant themes.

5.2. Qualitative results

The Qualitative results generated the following key themes

- Working in Silos
- Information system and operations
- Real time information effectiveness
- Benefits
- Information and system quality and features

Each theme will be discussed with supporting word-clouds and participant response. The next section discusses the themes

5.3. Working in Silos

Figure: 5.1 Working in Silos

There was a strong degree of agreement from participants that operations within asset creation are happening in silos and/or isolation as indicated in chapter 4 figure 4.5 Page 57.

Respondent 1 replied saying "*Every manager has their own version of the "truth"……* "
Respondent 2: "*Yes. Still a tendency of each department to have its own spreadsheets and project sheets that it focuses on……*"
Respondent 3" *Yes. Although most of them are happening in Silos, …..*"
Respondent 5 "Y*es. there are certain people who have no interest in seeing the success of the electrification program and hold things back purposefully or propose solutions that won't take the program forward……"*
Respondent 5" *we make decisions in our environment not considering the impact it will have on others……."*

This showed a definite affirmation of the silo culture. It was also shown that this occurs at Managerial level . Silo formation is often created by an undesirable barrier of communication between business divisions or functions causing these divisions to work in isolation and disregard the integration between them (Briogy, 2014).

One of the key functions as identified by the participants is that these Silo type operations are mainly taking place in the project environment, relating predominantly to the Electrification Programme. The importance of the value chain and activities which are hypothetically intertwined as per process development rules and regulations within business architecture are in reality ignored as employees cut corners, shortening and concealing information in an effort of meeting their required target for the programme (Chow and Doh, 2013).

Respondent 5: " ….. *But where we look at the whole value chain and we have a summary of the whole value chain and we see how things influence each other, I don't think we are doing that. "*
Respondent 5: "…. *Not everyone is pulling their weight in the value chain of asset creation…. decision makers in the program, there is a feeling that when they make decisions on the program, they don't seem to either understand the value chain process or ignore it and focus on the end result……"*

Respondent 1: ***"….*** *Although all activities eventually link together, there is no Asset creation wide view of data….."*

Respondent 2 spoke about the 'rolling plan' which is a cluster of projects that have been planned by the organisation. It starts from the 20 year plan, 5 year plan, 3 year plan and then the current plan. The rolling plan is too high level and non-provision of finer details can lead to employees interpreting the plan in their own way, thereby setting up their own priorities instead of the priorities of management.

Respondent 2:***"****... There is still a gap in project services in terms of having one project schedule with dates and times that everyone I adhering to. The rolling plan is too high a level…."*

Respondent 3 mentioned an example whereby if the value chain was utilised and adhered to properly, it would result in proper integration making communication with stakeholders most effective.

Respondent 3:"…… *one example will be network planning and Core when they want to embargo or disconnect a major line, if these two had been working as a unit an effective analysis would have been conducted on the line this would have saved Eskom billions."*

This was an important finding that reflects how Eskom could have saved substantial amounts of money if Eskom has the resources or tools for proper analysis and forecasting. Knowledge management is applicable in all spheres of the business and not just as a strategic tool. Should a proper MIS system be in place which consists of the components of knowledge management, Eskom management would be able to make decisions that would be informed by key performance indicators of the entire system (Bourgeois, 2014) . Performance will no longer be about a specific department but will be based on a collective of all departments.

Eskom has a Eskom High Performance Utility Model (eHPUM). This model is a consolidated view of all value chains within Eskom as a whole. This includes Generation, Transmission, Distribution and Customer service. When one visits this model, one gets a

view of how each value chain links to the next and how each activity links to the next (GIT, 2014). The respondents have indicated agreement regarding the value chain and how all activities are connected, however each individual does not seem to want to have a look at the bigger picture, and they are only concerned about the activities that are directly involving their participation. Some respondents have gone on record to say that this view does not exist; this creates an argument whether this is due to the lack of resources and tools or culture which evidently leads to the silo mentality in and around Asset creation.

Respondent 1: "*there is no Asset creation wide view of data. Although all activities eventually link together, there is no Asset creation wide view of data."*
Respondent 3: *"….. If these two had been working as a unit an effective analysis would have been conducted"*
Respondent 5: "*Who have no interest in seeing the success of the electrification program and hold things back purposefully or propose solutions that won't take the program forward. Some won't say anything and will only do things for the sake of doing them. There is no drive to make the program happen…"*
Respondent 5: *"But where we look at the whole value chain and we have a summary of the whole value chain and we see how things influence each other, I don't think we are doing that. And it does have a negative influence because we make decisions in our environment not considering the impact it will have on others"*

Silo mentality within an organization is a silent killer. It is the unconscious state of mind and mentality which take on a life of its own (Cilliers and Greyvenstein, 2012). Collaboration in a business environment where the silo culture is alive and well generally yields unfavourable results (Audra, 2008). Certain components that exist and come from the employee mind set are:

- "It can't be done"
- "It's not part of my job"
- "That's the way we've always done it." (Lugtu, 2016).

The component or mind set which says it cannot be done is clearly indicated by respondent 3 who states "*if these two had been working as a unit an effective analysis would have been conducted on the line this would have saved Eskom billions."*

In Eskom's response to the component which states "Its not part of my Job" is proven during the interviews when respondent 5 stated "*Not everyone is pulling their weight in the value chain of asset creation…"* when enquired about the value chain and the activities within the processes.

The last component being supported is "That's the way we've always done it."this is also confirmed to be evident when respondent 1 and 2 stated "*Every manager has their own version of the "truth"…….* Respondent 2: "*Yes. Still a tendency of each department to have its own spreadsheets and project sheets that it focuses on……..* " when enquired if indeed operations are taking place in isolation within the department.

5.4. Information system and operations

Systems (Information Systems) became a key theme as shown in the word cloud below. This tied into data, performance, decisions and business and culture.

Figure: 5.2. Information systems and Operations

A majority of respondents asserted that a strong and effective and integrated Information System can improve operations within the Asset creation department this was indicated in chapter 4 figure 4.9 Page 67 . This integrated system would also improve business performance and effective decision making as indicated in table 4.12 Page 83 and table 4.3 Page 77.

Respondent 1: *"Yes. Note that obtaining such a system is difficult to attain and to roll out."*

Respondent 2:" *Absolutely essential"*

Respondent 3: *"Yes business is moving towards business intelligence, BI Is about trying to provide live data to enable decision making."*
Respondent 5: *"Yes. This is way to go for asset creation. The sooner you can come up with that the better it is for the business…"*

Another findings is that majority of the respondents asserted that Asset Creation does have information systems in place, however these systems are not integrated.

Respondent 1: *"Eskom has a system called ACNAC, this system successfully manages the work flow of projects within AC, this system was put in place by a single individual who rolled out the system and work shopped it, invading the culture of AC to adopt the system."*
Respondent 5: *"It is similar to ACNAC and it will show the whole picture of the VC. The systems will solve 80% of the problems within AC."*

One system that has the entire workflow structured in its composition is called ACNAC (Acquire Customer Network Asset Creation). This system was designed to integrate two value chains. The first being the Acquires customer chain which composes of the entire process when the customer initially applies for electricity supply. The second is the Network asset creation value chain, which commences once the customer has paid for the supply to when the customer receives their supply of electricity. In this value chain you see the actual construction and commissioning of the physical asset.

The system was working efficiently according to the respondents before it was taken away from the project environment to only cater for minor projects. The impact of this decision has resulted in the segregation within the department leading to the creation of silos where each manager's department is primarily looking at what is within their scope, ignoring the overall impact in totality. The system ACNAC also provided timelines and target dates as a way of automating the management process. This system has been revoked and all projects are now managed from an excel spreadsheet or PowerPoint presentation.

All respondents seemed to be in agreement that business performance can be enhanced by an effective system that enables managers to make prompt decisions. A single interface can be made available, which will source from various data repositories and collate the data.

Respondent 1: *"If data was readily available this would be an effective tool for decision making. The issue with this a centralized system is that it would expose certain managers in a bad light*."

Respondent 2: *"Give the framework within which all resources can work but more importantly it sets clear common goals towards which everyone can work. To quote one of our other managers it is essential to have one version of the truth."*

Respondent 3: *"Operating systems should give us accurate information at all times, must provide accurate data, assist with decision making, with planning, forecasting moving forward….."*

Respondent 5: *"Decisions can be made immediately. As the system will focus on the entire value chain."*

Respondent 5: *"If we can improve on the communication and change the behaviour then the system can enhance performance and also encourage the guys to utilize the systems for them to see value of it because sometimes the systems are there but our guys see them as hindrances rather than enablers that enhance their performance. It would be nice if the systems are integrated throughout the value chain with a click of a button."*

Business process management is a critical factor which emerges from the above discussion. The of business process management leads to operational inefficiencies (Bazhenova, Taratukhin and Becker, nd).

Again it is emphasised that an integrated system would be beneficial however culture is the key focus for positive change rather than a system (Leidner and Kayworth, 2006).

Respondent 1: "*Hence each manager prefers to own their data and manipulate it such that it makes them look good."*

Respondent 2: *" …… more importantly it sets clear common goals towards which everyone can work. To quote one of our other managers it is essential to have one version of the truth.*

Respondent 3: *"Operating systems should give us accurate information at all times, must provide accurate data, and assist with decision making, with planning, forecasting moving forward"*

Respondent 5: *"As it is pointless to put blame on the project manager for non-delivery because one has to see where the issues commenced and assessing the quality of the*

project."

Respondent 5: *"…… we first have to change people……. If we start by first building the culture then the system can follow….."*

It is shown that the current culture in Asset creation is not cultivating positive business performance as each manager is only concerned about their own individual output.

5.5. Real time information effectiveness

This was another key theme that was generated. This theme focuses on the effectiveness and impact of real-time information that was intended to be a derivative from an integrated Information System.

Figure 5.3 Real time information effectiveness

Decision-making is an integral part of the success of any business function (Cabrerizo et al., 2015). The same applies to the Asset Creation department. The respondents to the interview are each in agreement that the real-time information can prompt effective decision-making and pro-active action to the activities of the business function when it is at their disposal (Wen, Qiang and Gloor, 2017) .

Respondent 1: *"Real time information for decision making and strategic actions is independent on an up to date system…."*

Respondent 2: *"Yes it will certainly make it more productive. We are coming out of the climate of being reactive because of our previous GM's management style. Feels that currently moving towards pro-activeness rather than being reactive….. And can sound*

early warnings if there's a risk of delay particularly for the activities that are on the critical path."

Respondent 3: *"Operating systems should give us accurate information at all times, must provide accurate data, and assist with decision making, with planning, forecasting moving forward…."*

Respondent 5: *"Decisions can be made immediately delivery of the program is heavily relying on the time……..... Definitely more proactive, time to take decisions and implement will be improved…."*

Respondent 5: *"It would assist managers to hold people accountable because sometimes we actually do rely on someone triggering to say a certain thing was not delivered so I'm not able to execute a project because a package was not delivered….."*

It is apparent that real time information can empower activity based decisions. In a project environment decisions should not have a top-down approach as activities should be guiding the type of decisions made by management and activity role-players where each role player knows exactly what is taking place as well as being able to forecast events that are to follow and provide realistic deadlines when required (Braglia and Frosolini, 2014).

Respondent 1: *"We also need a culture where management decisions are devolved downwards and no decisions are enforced by top management……"*

Respondent 2: *"When all the key activities necessary to complete a project are clearly identified with target dates that are visible to all then it provides the emptiest to the resource who then know by when their targets have to be met, I think more importantly it provides that information to managers, to the project managers and the functional managers so that they can ensure that the resources are working towards those targets…."*

Respondent 3: *"Real time information helps me to know the health of the business now, the status quo so then it assists in making proactive decision. It give me the direction of where we are heading, it allows me to make adjustments, in terms of mitigating risks of where we are heading, enhance performance moving forward in the next hour, next day next month."*

Respondent 5: *" If one looks at yesterday's information you can make decisions immediately improving on the programmes delivery, instead of waiting for information that was put together two weeks ago, you then have to wait for another 2 weeks before delivering."*

Respondent 5: *"So if we are able to see and we flags that would indicate the things that*

need to be done this week and those that are responsible and perhaps show the status, then the system would really assist and people would have to be trained and it could address issues of staff moral as well."

Real time information is impeditive to any organisation, as highlighted by the responses above it enables it enables Management decision making, but also empowers and activities resources required to ensure the program succeeds. The concept of culture also influences the decision making process through real time information as data cannot work in isolation (Furda and Vlacic, 2010).

Respondent 1: *"……. is also dependent on good culture. A culture that reflects on good and bad performance and accepts looking at the same source of data."*
Respondent 2: *"……all the key activities necessary to complete a project are clearly identified with target dates that are visible….."*
Respondent 3: *".....One waits for monthly reports which talk about has happened, they don't tell about what is happening now….."*
Respondent 5: *". In the current situation you now find yourself running activities in parallel because you are trying to make up for lost time….."*

It is apparent that the culture at the current moment has resulted in delays in the execution of projects thus the Project Manager is forced to execute projects parallel to each other. The current environment does not enable the managers to forecast, foresee risks and implement mitigating factors before they arise. Risks are handled as and when they arise and therefore, Asset Creation is reactive and not proactive in their day to day operations.

Respondent 5: *"Currently we relying on the guys doing what they are supposed to do and we report on that. You are not able to see when there will be trouble, or when the issue has not been escalated to you or your guy have not given you feedback or if there has been a challenge here and there, so we are really relying on the guys rather than us seeing that ok there is going to be a problem and we need to probe."*

Real time information can also stimulate good business behaviour and etiquette. When information is current and is up to date, this allows resources to work ethically, adhering to Eskom's value chain or processes. This can eliminate a lot of disciplinary action that has

taken place within the department, where human resources were disciplined and later fired because they were making decisions based on the current environment and not on real time information. With real time information available to all resources in the value chain, management instructions remain standard. All resources know what activities need to take place as well as their targets

Respondent 1: *"Systems should not enforce behaviour. Systems are enablers….."*
Respondent 2: *"We have been operating under for the last couple of years which was simply reacting to management instruction and ever changing priorities."*
Respondent 3: *"So live data will help us to know now and we can predict where we are heading and we can also predict the cause of now by looking at the past information."*
Respondent 5: *"The quality of CRAs will be improved, and our stakeholders will be continually updated on the projects."*
Respondent 5: *"Managers as we are juggling a lot of balls. They would be able to follow up and see. Currently we relying on the guys doing what they are supposed to do, and we report on that…."*
All respondents were in agreement regarding the importance and the benefits of having real time information in the department. They all ascertain that real time information will enable proactive management, precise decision making, and allow resources to plan their activities properly not rushing from one activity to the next (Franklin et al.,2017) .
The respondents also were in agreement that real time information can function as shield of protection as all decisions taken for execution are supported by real time information which is available and up to date at all times (Qrunfleh and Tarafdar, 2012).

5.6. Benefits of an effective information management system.

Michalek (2010) displays the benefits of Information system as:

- Comprehensive, quick, anytime available reporting
- Reduction of routine work, unblocking staff capabilities for creative activities
- Properly structured information
- Faster planning capability and modelling impacts on the markets.

For this study, the respondents concurred that key benefits would be derived if an effective Information system was implemented.

Figure 5.4. Benefits of an effective Management information system

All respondents seemed to agree that the data quality is critical in the Asset Creation department. Data quality refers to the condition where that specific data is fit for a specific objective. Data is considered high quality if it represents the actual scenario in the real world (Marinagi, Trivellas and Reklitis, 2014). Data quality and system quality go hand-in-hand whereby system downtime should not affect data quality. Quality data also means data that is uncorrupted (Almazán, Tovar & Quintero, 2017).

Respondent 1: *"when there is an error that error must be fixed immediately to ensure that data and system quality."*
Respondent 5: *"AC is mostly dependent of the quality data. And our data is not up to standard, we are currently not even at 80% quality when it comes to data. Any system that will help improve the quality of our data will improve the unit's performance. The quality of data determines the quality of your project."*

One of the additional main benefits which seemed to be common amongst all the respondents is data synchronisation. This means being able to make decisions and function optimally based on the data that is readily available and is reliable (Reddy et al., 2009).

Respondent 1: *"secure data source will enable collective decision making which is holistic and updated."*
Respondent 2: *"I think the key benefit is alignment. Everyone working towards an agreed common goal and set of projects and that can only benefit AC."*
Respondent 3: *"If we go to the problem at the top of Silos, if AC as a business unit are all*

viewing the same data at the same time and live data, it will give everyone a view of the state of our assets and will assist us in learning and prioritising the AC practice in order to improve network performance, the health of our network and mitigating any other pitfall that we would suffer moving forward."

Respondent 5: *"I think it will. If we had an effective system a lot work goes to and fro. There's a lot of double handling in terms of work, I think we can save a lot of time, money and also it will allow us as managers to analyse what is happening so that we can make different decisions and make changes and it will assist our guys also in terms of managing their own work, the will be able to see what is happening."*

The majority of the respondents felt that the most important benefit of having an effective management information system is data quality. The quality of data in MIS regardless of the down times and other risk factors that come into play. Bhanot,(2015) states the benefits of data quality can benefit the organization by increasing revenue, reduce cost, decrease the time taken in reconciling data, analytical systems in the organization provide greater confidence and data quality increases customer satisfaction.

5.7. Information and system quality features

The aspects of features and quality are important for any effective information system (Ahn, Ryu and Han,2005)). When asked about the features and functions of a system as well as the components of system quality, all respondents seemed to light up as though given an opportunity to design the system according to their own specification. They utilise the word verb "must" in an effort to capture the importance of a specific function.

Respondent 1: *"The system must be one global secure data volume which can be accessed through a series of systems, e.g. Tips, ACNAC."*

Respondent 2: *"It must to be a centralized system visible to all resources, like k2/ACNAC which is admirable but only dealing with one portion on AC activities…"*

Respondent 3: *"Data is often dynamic and changes rapidly. As much as it changes because of time we must be able to lock data to a report at a particular time….."*

Respondent 5: *"There must be triggers or flags when the data is not correct. The system must not accept rubbish data. We must be able to upload customers from site, remotely, and all the data must go directly into CC&B. and when the information goes into the R18 report. The data must be authenticated."*

Respondent 5: *"Must be user friendly, easy to use, be able to provide high level information and be able to provide detail if required must have login, revision control so that you can have a document and track changes while someone else has it open, must be useful and helpful to the business and good user interfaces will help."*

The system must be able to manipulate data entered in through currently existing systems to a single interface and manipulate that data according to the requirements of the user whether the user wants to provide input to the data or extract output of the data. This function may be achieved with the implementation of a database management system. Stated in (Techspirit, 2018) report, the benefits of having a database management system are:

- Prevention of data redundancy: there is an integration in the data which is received from various applications, the database management system conducts a check to eliminate redundancy in the data sets.
- Enables data sharing: the database management system enables the sharing of information to various departments.
- Upholds data consistency: the database management system keeps record of a single set of data no matter how many times it has been manipulated as output by various users.
- Maintains data integrity: ensuring that the data is accurate and consistent
- Provides security: ensure only authorise access is given according the users requirements and output.
- Automatic backup and restoration: the database management system has a back and recovery features built in.
- Data abstractions: the database management system allows abstract view of data.
- Ease of application development: the database management system is easy to develop for various developers.

Respondent 1: *"when entering the data volume, this data can be seen by different role players in which ever format they have requested it…."*

Respondent 2: *"….it models the process and drives what people do…"*

Respondent 3: *"look at different views or perspective of the data make information more meaningful depending on the decision that needs to be made. We should be able to run reports, should be able to look at different views."*

Respondent 5: *"We must be able to upload customers from site, remotely, and all the data must go directly into CC&B. and when the information goes into the R18 report. The data must be authenticated"*

Respondent 5: "*…. be able to provide high level information and be able to provide detail if required must have login, revision control so that you can have a document and track changes while someone else has it open, must be useful and helpful to the business and good user interfaces will help. Tracking changes will assist as you are able to see what changes were made, by whom and when. It must be secure as confidential and private information is there, access control as well."*

Access to the system and system security was also deemed critical by all respondents as it protects the data quality of the system (Singh, 2015) .

Respondent 1: *"Bad data = bad decisions. The system must also enhance service quality and an organizational culture where discussion takes place before decisions are made."*

Respondent 2: *"It must to be a centralized system visible to all resources…."*

Respondent 3: *"security is critical we should have access control that will give different people different profile from the same data source, data sharing should be in there."*

Respondent 5: "The system must not accept rubbish data."

Respondent 5: *"It must be secure as confidential and private information is there, access control as well."*

This shows that information and system quality are seen as critical by all respondents in their environments.

Respondent 1: *"Very important. System quality and information quality enhance service quality leading to meeting Key performance indicators and enhancing performance."*

Respondent 2: *"Systems have to work, and have to be bug free otherwise there is confusion, and they have to be reliable certainly there needs to be a backup for when things go wrong they get fixed immediately but what is most crucial is data accuracy. The information they contain has to be correct. There must be one version of the truth."*

Respondent 3: *"Critical. Quality of information = quality of decision, you cannot make the correct decision with corrupt data. Without accurate data wrong assumptions and wrong business decisions will be made."*

Respondent 5: *"For us when we plan whatever we use is based on the quality of data we*

use. We make use of tools like GIS, Electech, all these require top quality information.. If the quality of our information is good, there will be no need to go to site."

Respondent 5: *"Critical. We make decisions based on information we have. If the information is not correct it means it will have time and cost implications for our projects. In terms of systems they must be reliable and robust so we need good quality systems so they must work and do the things they are supposed to do."*

All respondents agreed that a good quality system which provides good quality information will definitely enhance service delivery in not only their environment but within distribution as a whole. This concurred with table 4.13 Page 79, and agreed by (Gorla, Sommers and Wong, 2010) who state that an increase in the dependence of information system quality ensure good quality information which reflects on the management decisions and the organizational performance. This also correlates with table 4.12 Page 77.

Respondent 1: *"Most definitely."*

Respondent 2: *"Yes cause I think that will bring us into closer alignment with our sister departments."*

Respondent 3: *"Yes. For example: If the customer wants to know his consumption now, why can't I tell him? And sometimes because of the lack of quality of information and data I might just give the wrong information which then destroys the department or the businesses reputation, so it will enhance performance and other avenues that have to do with the department."*

Respondent 5: *"Definitely. It will improve on the quality of our work; it will cut the time spent verifying data. If data is top notch and easy to verify it will make life so much easier it will cut into a lot of our time which I feel is wasted when people are trying to find information, & confirm information."*

5.8. System features and aspects

The features which have been mentioned by the respondents when enquired about system features and aspects are :

- Global secure data volume
- Centralized system visible to all resources (Pavlo et al, 2017)
- Able to lock data to a report at a particular time (Govrdhan, Srinivas and Kavihta Rani, 2010)

- Access Control,
- Closer alignment with sister departments.
- Triggers or flags when the data is not correct: Data integrity is the maintaining and assurance of data accuracy and consistency (Snee, 2015)
- Upload customers from site, remotely,
- All the data must go directly into CC&B.(Integrated to all Eskom system)
- User friendly, easy to use,
- Make information more meaningful depending on the decision
- Provide high level information and be able to provide detail (Ghasemaghaei, Ebahimi and Hassanein, 2017)
- Revision control
- Must model internal processes
- Tracking changes
- Enhance service quality (Lim et al, 2018)
- System quality and information quality (Scheuber,2014)
- Reliable (Shiloach, 2010)

The features and aspects of a good system as mentioned by the respondents are listed above and although the respondents are not experts in the information system field have articulated the features which are in agreement with various researchers. The respondents felt that the system must consist of global secure data volume, be a centralized system visible to all resources, have the ability to lock data to a report at a particular time, with specifically required access control, and ensure that a closer alignment with related departments. This view concurs with (Thakur, nd) who when describing the features of a database management system states that the database management systems has secure data and data volumes, centralized repositories, access control, has the ability to make information relevant for a specific use, tracks changes and provide a single data set which is accurate eliminating redundancies.

Snee (2015) describes data integrity as the maintaining and assurance of data accuracy and consistency, this view concurs with the views of the respondents when they described that the system must be able to triggers or flag the users when the data is not correct.

Markgart (2016) states that a good information system must be relevant to the users and be easy to understand. This coincides with the view that says the system must be model

Gaccording to internal processes, be user friendly and easy to use, while making information more meaningful depending on the decisions.

According to (Manchanda & Mukherjee, 2014) system quality is measured by the functionality associated with the system. This takes into account the ease of use meaning how easy it is for a non-technical person to understand how to use the system, how reliable and flexibles the system is, is the system probable, is it properly integrated with the requirements of an organization or institution, and further more looks at the value of the systems data quality .System quality, information quality and service quality were directly associated with user satisfaction.

Despite the difficulties associated with defining and identifying knowledge, knowledge has become a primary resource in organisations. Organisations are implementing knowledge management practices and technologies on the promise of increasing their effectiveness, efficiency, and competitiveness (Schultze and Leidner, 2002). It is evident that for the organisations to keep abreast with the ever changing demands, they need to have a structured form of knowledge management making use of modern technologies to make this a reality. In Eskom there seems to be a lack in an integrated information management system which will enable all departments to reach their objectives while sharing real time quality information.

5.9. Summary

This chapter interrogated the qualitative data analysis. The responses were analysed according to five factors. These factors include working in silos, information system and operations, real time information effectiveness, benefits and information and system quality and features. The researcher examined the data and cross referenced to other scholar who have studied similar subjects in the information management environment. The researcher concluded the chapter by formulating features and aspects of the data collected.

Chapter 6

Key findings and the Theoretical model

6.1. Introduction

This chapter brings together the keys finding of the study taking into consideration the analysis and results of the previous two chapters. Chapter 4 presented the quantitative analysis whilst chapter 5 drew on the qualitative analysis. The results will be brought together to inform the findings in relation to the research questions, in order to verify if a management information system can promote information sharing. Furthermore, the theoretical model will be applied via the results of the study and this informs the conceptual model.

6.2. Key findings in relation to research questions

6.2.1 What are the key operations that are occurring in isolation (Silos) per department?

There was a strong degree of agreement from participants that operations within asset creation department are happening in silos and/or isolation. In the quantitative analysis 63 percent of the respondents agreed that operations are indeed occurring in isolation, (see figure 4.5, Page 62). When further probed it was discovered that a large majority of operations were in fact taking place in silos within the various operations. This was also evident in the qualitative analysis where all interviewees were in agreement that they are only exposed to facts that are in their own environment and that there was no clear connection in the operations conducted in the various departments yet they all make up a single value chain. This confirms that currently the key operations at ESKOM Asset Creation department are currently occurring in silos.

6.2.2 How can operational efficiency be enhanced through the use of Information System/s for the effective management, transfer and dissemination of information?

Operational efficiency was seen to be achievable should an effective and integrated MIS be put in place. Ninety four percent (94%) of the respondents agreed that an appropriate

management information system should focus on transfer and dissemination of information (See figure 4.8, page 67). The study further revealed that there is a direct correlation between operational efficiency and information systems (see Table 4.3 on page 77. and Table 4.12, Page 83. The qualitative analysis revealed that an effective and efficient information system would indeed improve business performance and proactive decision making through proper and timeous dissemination of information.

6.2.3. How can real-time information promote proactive management decisions and actions as opposed to reactive?

The concept of real time information came out very strongly in both the quantitative and qualitative analysis. In Figure 4.14, page 72 indicates 98% of the respondents agreed that real time information can promote proactive management and there is a direct proportional relationship between positive impact of real-time information on the organisation and high quality information as seen in table 4.13 (page 71). What also seemed apparent was that real time information can also stimulate good business behaviour and etiquette. In both areas of the research, it was agreed that decision-making is an integral part of the success of any business function as stipulated in discussion section 5.5 from page 90 and as such, real time information can prompt effective decision-making and proactive management of decisions and actions. When information is current and is up to date, this allows resources to work ethically by doing what is right while adhering to Eskom's value chain or processes.

6.2.4. What type of Information System can promote effective information management, sharing and reporting for the Department?

When all the findings were taken into consideration, a proposal of a management information system was put together based on the application of the Delone and Mclean model (2003). This proposal takes in to consideration all the applicable results in both the quantitative and qualitative analysis. Correlations were taken into account as well as descriptive variables based on agreements levels. Furthermore, results are validated through the qualitative perceptions of respondents. As depicted, the system must be easy to use, access controlled and secure. Further to that the system should encompass databases, dashboards for reporting, predictive analysis tools to enable forecasting, an effective reporting interface and score cards for all KPIs, in an effort to manage and drive

information transfer and sharing (see figure 4.6. page 63). There is a strong correlation between the above mentioned components and the proper management and operational efficiency in (Table 4.14, page86). The qualitative analysis also supports a strong agreement to Information and system quality and features to the above mentioned features (See the discussion at section 5.6, page 94).

6.3. Application of the Delone and Mclean (2003) Model in the Eskom Distribution KZN Operating Unit.

Based on the findings of the study, the conceptual model is hereby proposed and is underpinned by the Delone and Mclean (2003) model of Information Systems. This is presented in figure 6.3 pages 113 below.

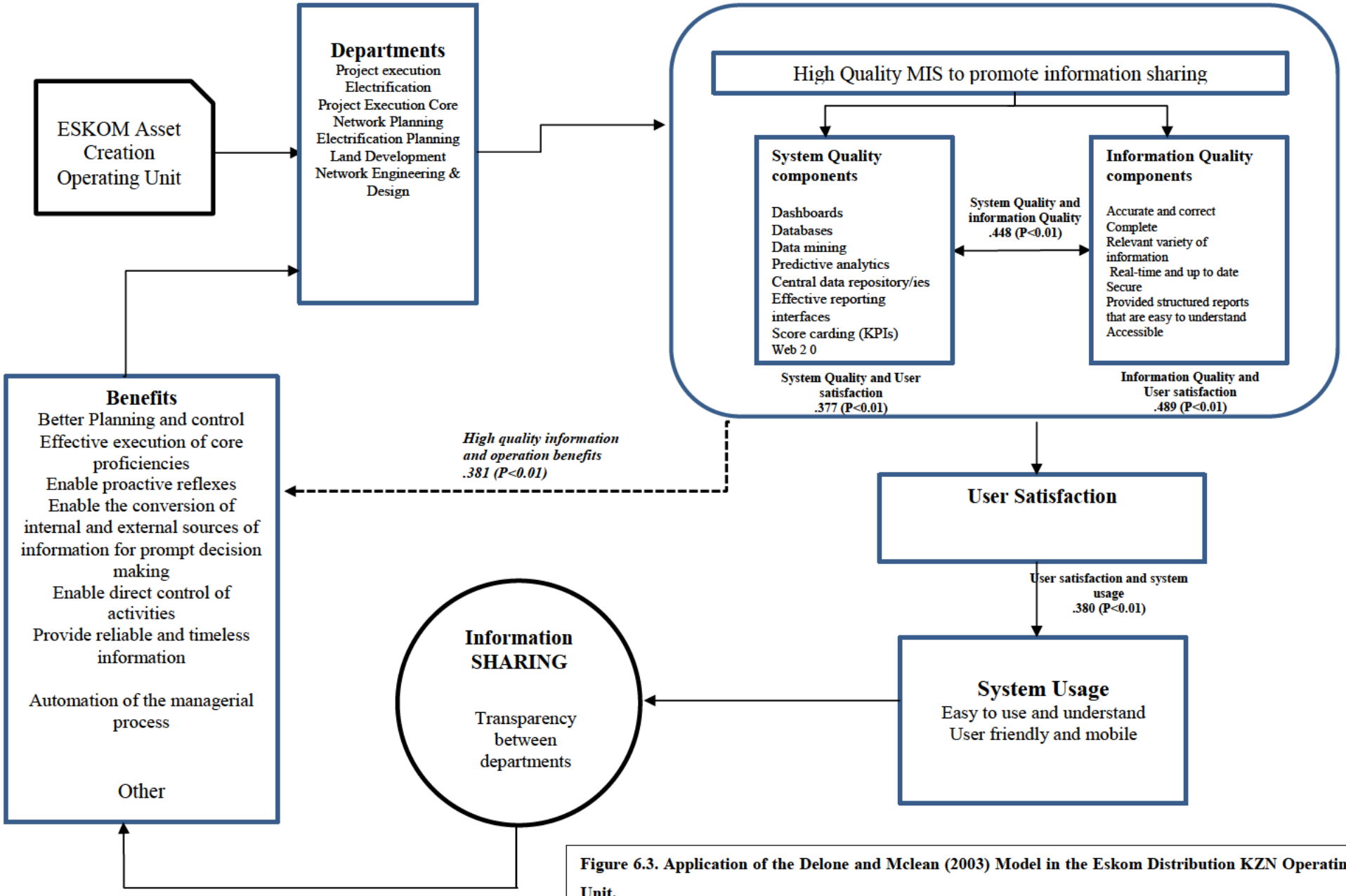


Figure 6.3. Application of the Delone and Mclean (2003) Model in the Eskom Distribution KZN Operating Unit.

The model as displayed in Figure 6.3 above is a recommendation for Eskom Distribution KZN Operating Unit to promote information sharing.

In order to achieve a high quality MIS to promote information sharing, system quality components must be centralised and include database, dashboards, data mining, predictive analytics, central data repository/ies, effective reporting interfaces and Score-carding for performance management. This must be complemented by information quality components which include accuracy and completeness, relevance of information, real time up-to-date information which is secure and has the ability to provide structured reports which are easy to understand and accessibility. These components were shown to have a positive correlation in table 4.6. page 63. When all these components are integrated into a single system, then it can be implied that user satisfaction through system usage (easy to understand and use/ user friendly) can be achieved. This can in turn lead to information sharing across the department and promote operational efficiency, proactive management and ensure that management are taking informed decisions in their various departments.

6.4. Summary

This chapter looked at the findings of the study in relation to the research questions. It triangulated the quantitative and qualitative results to support the findings. The conceptual model was also proposed which was underpinned by the Delone and Mclean (2003) model and supported by the findings of the study. This proposed model can be seen to promote information sharing and yield benefits associated with operational efficiency, proactive management of operations and proper decision making for management and operational employees.

CHAPTER 7

Conclusion and Recommendations

7.1 Introduction

This chapter is the final chapter of this dissertation. It concludes the research and draws the study to a close. The chapter recaps on the problem statement research questions and objectives and determines if the study fulfilled its intended purpose. Recommendations are made in relation to the study phenomena as well as direction for future researchers. Limitations of the study will also be presented.

7.2 Problem Statement overview

There is currently a problem that exists within the Eskom Asset creation department which relates to information sharing. Currently, departments are operating in silos and are unaware of what the other is doing. This presents a plethora of operational problems such as duplication of services, increase in costs, delays in the completion of electrification and infrastructure projects, inconsistencies in procurement processes and most importantly the delay of providing customers with electricity. This study therefore investigated the current problem with the intention of proposing a conceptual model of a Management Information System to alleviate this problem and improve operations at Eskom Asset Creation environment.

7.3. Research Questions

The research problem presented the following key research questions to be answered:

- What are the key operations that are occurring in isolation (Silos) per department?

- How can operational efficiency be enhanced through the use of Information System/s for the effective management, transfer and dissemination of information?
- How can real-time information promote proactive management decisions and actions as opposed to reactive?
- What type of Information System can promote effective information management, sharing and reporting for the Department?

7.4. Objectives

The objectives of the study were hence:

- To establish the processes and operations that is conducted in isolation (silos) per department.
- To determine if operational efficiency can be achievable through sharing and transfer of real-time information between departments.
- To determine how updated and real-time information can inform management and operational decisions
- To establish a conceptual system that can be implemented to enable the achievement of real-time information for management

7.5. Have the Research Questions been answered?

7.5.1 Research question 1: What are the key operations that are occurring in isolation (Silos) per department?

Findings show that operations are occurring in silos. These key operations are: NERSA Grid code, Compilation and defining of capable networks, Constrained network strategies and reports, Network Master plans and Network Development plans, Electrification Planning reports, IDP Requirements and, Electrification current year plan among others (figure 4.6 page 63).

7.5.2. Research Question Q2: How can operational efficiency be enhanced through the use of Information System/s for the effective management, transfer and dissemination of information?

Results show that operational efficiency can be improved through an effective Information System. Results indicate that an information system can serve to increase the flow of critical information across departments, improve response time, provide real- time status on field activities, enhance proper project planning through effective scheduling, enforce adherence to the construction plan and provide accurate reporting and provide fairly accurate projections. Furthermore, sharing of information can be facilitated between departments to improve decision making,

7.5.3 Research question 3: How can real-time information promote proactive management decisions and actions as opposed to reactive?

Results (figure 4.15 page 72) and supported by discussion section 5.5 from page 90 in the qualitative analysis indicate that proactive management decisions can be possible through real-time information that is generated from a Management Information System.

7.5.4. Research question4: What type of Information System can promote effective information management, sharing and reporting for the Department?

A conceptual model was developed and was proposed based on the application of the Delone and Mclean (2003) model (Chapter 6, section 6.3 page 113). Building on the model, key components such as dashboards, web-based interfaces, databases, data mining, predictive analytics, central data repository/ies, effective reporting interfaces and score carding (KPIs) are important features of the model and can serve to alleviate the current information silo culture within departments by promoting information sharing and operation efficiency.

7.6. Have the objectives of the study been fulfilled.

7.6.1. Objective 1: To establish the processes and operations that is conducted in isolation (silos) per department.

This was established and it was found that key departments did operate in silos.

7.6.2. Objective 2: To determine if operational efficiency can be achievable through sharing and transfer of real-time information between departments.

This objective was fulfilled, and the study found that the department can operate more efficiently should the department achieve information sharing and transfer of real-time information between departments.

7.6.3. Objective 3. To determine how updated and real-time information can inform management and operational decisions

This was fulfilled and the study finds that up-to-date and real time information can proactively inform management and operational decisions.

7.6.4. Objective 4. To establish a conceptual system that can be implemented to enable the achievement of real-time information for management

An MIS model was conceptualised and presented to enable unity of purpose getting rid of silos and enable operational efficiency and proactive management through the existence of real time information.

7.7. Recommendations made by this study

7.7.1. Recommendation 1: The organisation must establish an organisational culture that not only focusses on the processes but also on information sharing and transparency through skills and development training programme .

7.7.2. Recommendation 2: The adoption, testing and implementation of the model as

displayed on chapter 6 figure 6.3 page 113. This model encompasses all the concerns that have been raised during the interaction with the employees and adoption of it can result in the breaking of information sharing barriers. The model would have to undergo rigorous testing.

7.7.3. Recommendation 3: This study should be rolled out throughout Distribution units in all provinces with South Africa and perhaps because of the geographic locations and the difference in variables more information can be gathered to enlighten the burden of the employees in the Asset Creation departments.

7.7.4 Recommendation 4 : Technology and systems need to be placed on the executive management agenda and be filtered to all levels below.

7.7.5 Recommendation 5: Group IT should commence with Technology roadshows and the compilation of newsletters, indabas and technology expos that can include all new technology that is available in the industry as well as those that Eskom has adopted.

7.8. Limitations experienced during the study

7.8.1. Limited sample size

The sample size was less than the anticipated sample population

7.8.2. Participant behavioural limitation

The research is subject to human emotions and feelings which can compromise data collected.

7.8.3. Geographical location limitation

The study was only conducted in the KZN operating unit whereas the Eskom Distribution

division is made up of 9 provinces and each province has its own Operating unit. Other locations may generate different results.

7.9. Direction for future researchers

7.9.1. A study can be conducted across South Africa in Eskom Distribution division to include researching all provincial operating units in relation to information sharing.

7.9.2. A comparative study can also be conducted between the three divisions that make up Eskom Holdings, such as Generation, Transmission and Distribution to ascertain if there are similar challenges and should one division be operating optimally a benchmarking exercise can be conducted to ensure alignment throughout Eskom Holdings.

7.9.3. A study can be conducted in energy developments organisations in African countries.

7.9.4. A comparative study may be conducted to look at how international energy utilities operate in comparison to the African energy utilities

7.9.5. A study can be conducted in order to develop information systems that are able to mitigate risks and issues such as corruption that lead to financial and reputational damages for an organisation such as Eskom Holdings.

7.10. Conclusion

The study aimed to establish if challenges to information sharing existed within the ESKOM Asset Creation department as departments operating in silos have led to multiple organisational damages which included operational inefficiencies and ineffective decision-making by key role players. In light of this, it was important to establish if an effective Management Information System could be seen as a strategy to alleviate the problem. The sample size for the study were employees within the Asset

creation department. The entire team consisted of 31 managers and specialists and a total of 414 employees. A mixed method approach was utilised to conduct the study. For the quantitative analysis, a survey questionnaire was used and semi-structured interviews for the senior managers as part of the qualitative arm of the study. The findings of the study revealed that there were operations taking place in isolation within the departments. It further revealed that a department can operate more efficiently should information sharing and transfer of real-time information between departments be achieved. The study continued to reveal that up-to-date and real time information can proactively inform management and operational decisions. The study then proposed a conceptual system that was underpinned by the Delone and Mclean (2003) model that can be possibly implemented to enable the achievement of real-time information sharing for management and department as a whole. The study was subject to limitations such as the sample size, participant behavioural limitations as well as geographical/location limitations. The study recommended that the organisation must invest in skills and development programmes in order to establish an information sharing and transparent culture, adoption of the proposed model and the same study should be rolled out in the Eskom distribution division as different variables may be evident in other provincial operating units. There are various directions for future research and these have been stipulated in the study such as conducting a study within Eskom Distribution division and a comparative study between the Eskom Holding divisions, Generation, Transmission and Distribution divisions. Other studies could include Information systems in energy development organisations in Africa and internationally.

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Appendix 1

Survey Questionnaire.

Section A

2. Kindly indicate your age group

Less than 21 year	21-25 years	25 – 35 years	35 – 45 years	Above 45

3. Indicate the number of years in which you have been employed at the KZN Operating unit in Asset Creation.

Less than 1 year	1-5 years	5 – 15 years	15 – 25 years	Above 25 years

4. Indicate your race denomination

African	Indian	Colored	White

5. What is your current title?

Technologist	Technician	Engineer	Supervisor	Project Manager
Official	Snr Technician	Land Surveyor	Snr Clerk	Secretary
Project coordinator	Assistant officer	Manager	Draughtsperson	Admin Clerk
Clerk or works	Planner	Schedulers	Quantity Surveyor	Other

Section B

7. Do you think that there are operations taking place within Asset creation that are happening in isolation (silos) ?

Yes	No

8. In your view, please indicate which of the following operations/activities are happening in isolation *(These are in no particular order).*

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
NERSA Grid code					
Compilation & defining of					

capable networks					
Constrained network strategies and reports					
Network Master plans & Network Development plans					
Electrification Planning reports					
IDP Requirements					
Electrification current year plan					
Project schedules					
CAPEX					
Electrification daily connection movement					
Reticulation Progress					
Physicals vs actuals					
Outage management					
Refurbishment planning & performance					
Minor works planning & performance					
Power and control plant design of network components					
Drawings, spatial and attribute data					
Preliminary and Final designs completed by 31 March for each year.					
Land development packages					
Environmental legislation					
Environmental and safety contraventions					

9. Do you feel that the above operations, when functioning in isolation have a negative impact on Asset creation Department?

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree

10. An appropriate Management information system that focuses on information sharing can enhance the operations across each department?

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree

11. In your opinion, how can operations be improved via the implementation of a proper management information system?

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Increase the flow of critical information across departments					
Improve response time					
Provide real time status on field activities					
Enhance proper project planning through effective scheduling					
Enforce adherence to the construction plan					
Enable sharing of information between departments for decision making					
Provide accurate reporting					
Provide fairly accurate projections					

12. In your opinion, a good quality Management Information System that can enhance operational efficiency for your department should be one that is:

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Focused on information sharing					
Precision of forecasting, budgeting and execution of work					
Easy to use and understand					
High information processing capacity					
Exact measurement of finished project					
Accurate scheduling tool with alert of activity sent to each custodian, Project manager COW PC and contractor					
User friendly and mobile					
Provide accurate information (in reports) when needed					

13. Is Information quality important to your department?

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree

14. An effective MIS should provide high quality information to the department

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree

15. Highly quality information should be:

	1=very important	2 = Important	3 = im not sure	4= not important	5= irrelevant
accurate and correct					
Complete					
Relevant variety of information					
real-time and up to date					
Secure					
provided structured reports that are easy to understand					
Accessible					

16. Do you think that real time information can promote the proactive management for departments within Asset Creation

?Yes	No

17. And can real time information positively impact each departments outputs?

Yes	No

18. Can real time information have a positive impact on asset creation

Strongly Agree	Agree	I don't know	Disagree	Strongly Disagree

19. Real time information can promote proactive management by:

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Promoting proactive decision making					
Informing Relevant risk and resilience plans					
Informing current and future strategy developments					
Provide statistics on key drivers to improve business effectiveness and efficiency.					
Providing an inclination of future occurrences of similar					

nature					

20. Real time information can positively impact your departmental outputs by promoting

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Proactive information about completeness of tasks and activities					
Proactive review of risk management through real-time information					
Ensure all departmental KPI targets are known and met.					
Informed decision making at departmental level					
Informed strategic action					

21. Do you feel Service quality can be improved if effective IM is implemented?

Yes	No

22. Does Asset creation have the following systems in place

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Databases					
Dashboards					
Data mining					
Predictive analytics					
Central data repository/ies					
Effective reporting interfaces					
Score carding (KPIs)					
Web 2.0					
Cloud computing					

23. Can an information management system with the below components assist with proper management of the department?

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Databases					
Dashboards					
Data mining					
Predictive analytics					
Central data repository/ies					
Effective reporting interfaces					
Score carding (KPIs)					
Web 2.0					
Cloud computing					

24. What benefits do you think an effective MIS can bring to Asset Creation

	1=Strongly agree	2 = Agree	3 = I don't know	4= Disagree	5= Strongly disagree
Better Planning and control					
Effective execution of core proficiencies					
Enable proactive reflexes					
Enable the conversion of internal and external sources of information for prompt decision making					
Enable direct control of activities					
Provide reliable and timeless information					
Automation of the managerial process					

Appendix 2

Interview Questions:

1. Are there operations within Asset Creation which in your opinion are happening in silos and affecting the division's performance? If so, what operations/processes are they and what are the reasons for this?
2. Do you think that a strong/effective information system can provide a strategic platform in integrating and dissemination of information in various departments within Asset Creation?

   How do you think this can improve operational efficiency for your department

3. How can real time information (having up-to-date_ information on hand) assist your depart with critical decision making and taking strategic actions.
   a. Do you think this will make your department more proactive in how it operates (as opposed to reactive)
4. What do you think can be the benefits of using an effective Information System (for provision of real time quality information) for Asset Creation, and can this influence the division's performance?
5. In your opinion, what features and functions should the system have in order to promote effective information management and sharing within the division?
6. How important is system quality and information quality in your environment?
   Do you think that having a good quality system that provides good quality information will enhance service quality of the department?
7. Tell me more about the organizational culture in asset creation.

   - What are the current feeling/beliefs about information sharing,
   - What are the espoused values(goals/strategies) of the department
   - Do you think employees will have added satisfaction should an effective Information system be implemented that facilitates sharing and dissemination of key information

Appendix 3

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

15 August 2016

Ms Nakhokonke Silomo Xulu (200200344)
Graduate School of Business & Leadership
Westville Campus

Dear Ms Xulu,

Protocol reference number: HSS/1161/016M
Project title: Enhancement of Information Management and Systems: Towards business efficiency and productivity within the Asset Creation Department of Eskom in KwaZulu-Natal

Full Approval – Expedited Application

In response to your application received on 29 July 2016, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Y[redacted]

.....
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Sachin Suknunan
Cc Academic Leader Research: Dr Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj / Ms Eileen Mohamed

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za