

A critique of the impact of Eskom's quality management system failures on business operations

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Mini-dissertation submitted in partial fulfilment of the
requirements for the degree *Masters of Business Administration*
at the Potchefstroom Campus of the North-West University

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April 2016

ABSTRACT

The implementation of Quality Management Systems plays a major role within the majority of the companies wishing to excel in their business operations and customer service. Eskom embarked on a journey to Business excellence in March 2012, which involves the implementation of auditable Quality Management Systems in all its divisions and departments in its value chain. The company achieved a companywide ISO 9001:2008 certificate in March 2013, compliance and consequent certification are a major achievement, particularly for a company of Eskom's size, more so due to the short period of time in which this achievement was reached.

For any company to reap the benefits of ISO 9001:2008 Quality Management System certification; surveillance audits, internal audits and other risk mitigation initiatives has to be conducted by the company as part the continuous improvement initiatives prescribed by the ISO 9001 standard.

This study was carried out by obtaining data from audit and inspection reports, focused group discussions with professional quality practitioners and a site visit to different power generating stations was also conducted by the researcher, engaging with different people at shop floor level as part of the direct observation data collection.

Although control of product and service non-conformances goes a long way in reducing failure rate in company operations, QMS also plays a critical role in ensuring that operations are controlled and ran efficiently. Results obtained from this study indicated that Eskom has not fully benefited from the implementation of the ISO 9001:2008 systems as a result of inconclusive audit findings, reoccurring non-conformances relating to the Turbine and Boiler equipment

And key terms

ISO 9001:2008, Quality Management System, Quality Management Representative, Management Systems, Process management, Business improvement methodologies, Document management, Business excellence, Continual improvement, Total quality management system, Cost of quality, Six sigma, Lean manufacturing

Acknowledgements

My heartfelt appreciation goes to Mr Johannes Jordaan for his supervision, guidance and motivation throughout the duration of the study.

My sincere gratitude goes to Mrs Fiona Havenga of Eskom, for allowing me to conduct this study and supporting me in the various aspects of the study.

Thanks go to my colleagues Patrick Thwane and Mmaphuti Moloto for their help, suggestions and correction in the different aspects of this study.

I gratefully acknowledge the support of Dr Sethusa for her criticism and the feedback I received to make this research what it is today.

I thank the following institutions for their financial and infrastructure support throughout the study: Eskom Quality Management Department and the University of North-West, Potchefstroom Business School.

To my ever supportive family, Lethabo, Rethabile and Kelebogile thank you very much for your patience and support.

Lastly I thank God almighty for standing by me and giving me strength through the duration of my MBA.

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LIST OF DEFINITIONS

Customer satisfaction: Degree to which customer requirements has been fulfilled

Efficiency: The state of being able to accomplish a task with a list amount of time or effort

Leadership: The art of getting someone else to do something you want done because he wants to do it

Management system: A system designed to establish company policy, objectives mission and vision to achieve operational excellence

Procedure: A specified way to carry out an activity or a process

Process: A set of interrelated activities which transform inputs into outputs

Product: Result of a process

Quality: Degree to which a set of inherent characteristics fulfils requirements

Quality management system: Management system to direct and control an organisation with regards to quality

System: Set of interrelated or interacting elements

LIST OF ABBREVIATIONS

CEO:	Chief Executive Officer
C&I:	Control and Instrumentation
COQ:	Cost of Quality
DPE:	Department of Public Enterprises
EFQM:	European Foundation for Quality Management
GDP:	Gross Domestic Product
IDC:	Industrial Development Corporation
JIT:	Just In Time
ISO:	International Organisation for Standardisation
ITP:	Inspection and Test Plan
MW:	Megawatt
NC:	Non-conformance
NCR:	Non-conformance report
PDCA:	Plan Do Check Act
QMS:	Quality Management System
QC:	Quality Control
QA:	Quality Assurance
TQM:	Total Quality Management

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

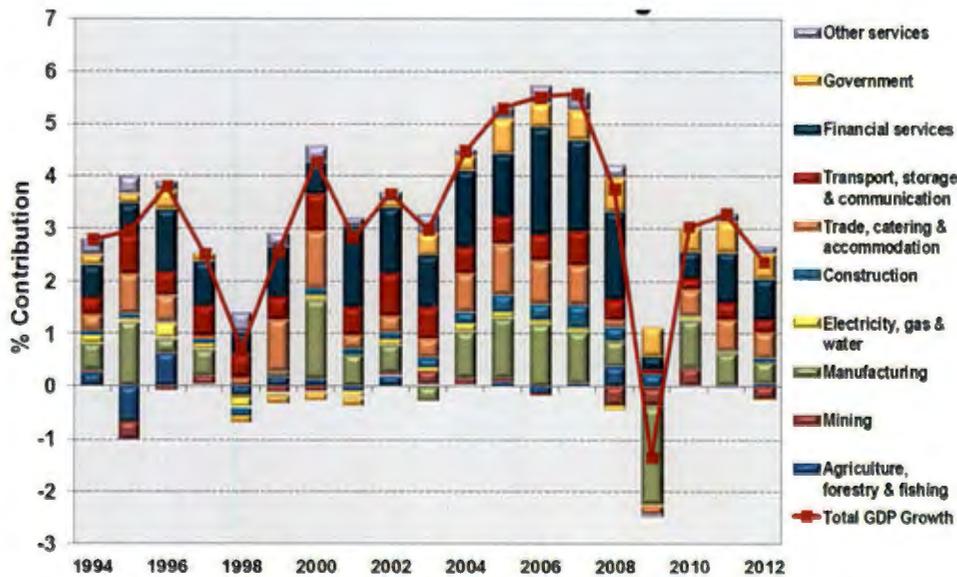
1.1 Introduction and background to the research area

According to a document published by the Industrial Development Corporation (IDC), the South African economy has been growing and was expected to continue growing into the foreseeable future since the beginning of 1994, it recorded an average economic growth of 3.3% per annum in the period of 1994 to 2012 (Department of Research and Information, 2013:1).

Electricity contributes about 2.8% to the South African economy, although seemingly small; electricity plays an important role in boosting other major economic activities/ contributors such as manufacturing, real estate, mining and the retail trade which collectively controls about 71.6% of the national economy (Department of Research and Information, 2013:4).

Fig 1-1 below shows Sectoral contribution to overall GDP growth of South Africa since 1994 to 2012.

Figure 2-1: Sectoral contribution to overall GDP 1994 to 2012



(Source: Department of Research and Information, 2013:7)

If electricity plays such an important role of stirring economic activities of other sectors, it is imperative that sufficient energy capacity be provided and further electricity infrastructure development be targeted by the government to support the anticipated economic growth.

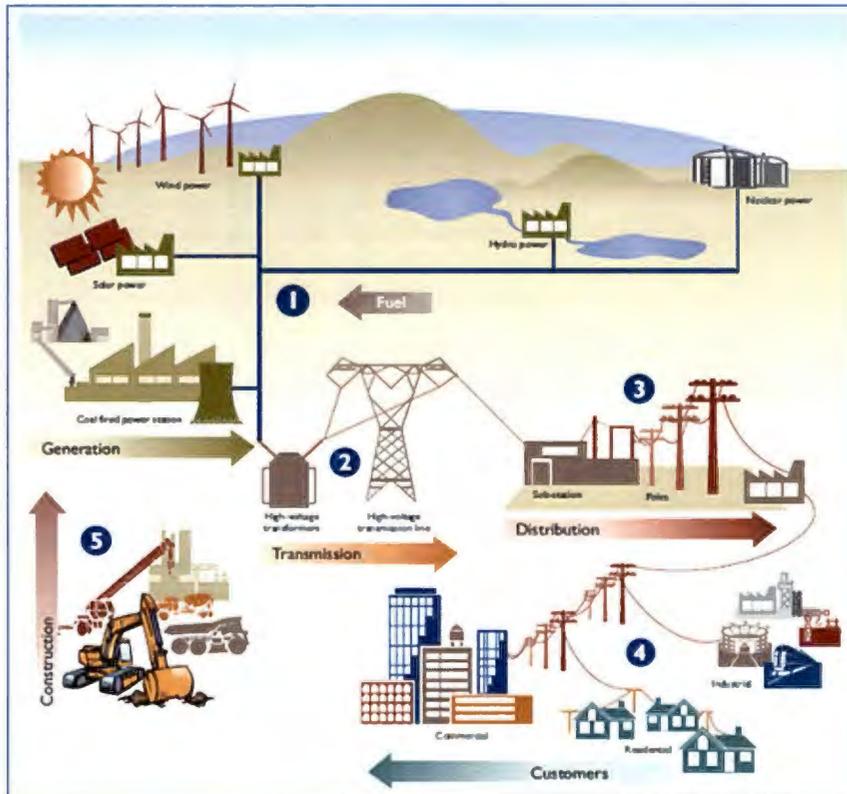
In 2004, the cabinet approved a five year investment plan in South Africa's electricity infrastructure amounting to R93 billion. Eskom was then mandated to be a custodian for about 70% of the country's power production in MW, with the balance produced by the independent power producers. The plan included the generation, transmission and distribution of electricity, with Eskom funding R84 billion of the total and independent power producers accounting for the rest, however the demand for electricity was not constant and the country experienced power cuts from 2008 which impacted the projected GDP growth. This resulted in the increase of Eskom's additional capacity building projects increasing to R150 billion (Department of Public Enterprises, 2007:03).

1.2 Background of Eskom

Eskom is a South African electricity public utility; the company was established in 1923 as the Electricity Supply Commission (ESCOM) by the government of South Africa in terms of the Electricity Act (1922) (Eskom Company Information, 2015b).

The company generates about 95% of the electrical energy used in South Africa and about 45% of that electrical energy is used in Africa. Eskom generates, transmits and distributes electricity to industrial, mining, commercial, agricultural and residential customers and redistributors; see Fig 1-2 below for Eskom's electricity supply chain. Additional power stations and major power lines are built to meet rising electricity demand in South Africa (Eskom Company Information, 2015b).

Figure 2-2: Eskom Electricity Supply Chain



(Source: Eskom Fact Sheet, 2015c)

The company sells electricity directly to about 3 000 industrial customers, 1 000 mining customers, 50 000 commercial customers and 84 000 agricultural customers. It also supplies electricity to more than 4.7 million residential customers – many of whom are in rural areas – who account for about 40% of all residential customers in the country (Eskom Fact Sheet, 2015c).

Eskom buys electricity from and sells electricity to the countries of the Southern African Development Community (SADC). The future involvement in African markets outside South Africa (that is the SADC countries connected to the South African grid and the rest of Africa) is limited to those projects that have a direct impact on ensuring security of supply for South Africa (Eskom Company Information, 2015b).

To Date 11 941 MW of energy is in the project execution phase, of which 1 577, 68 MW has been handed over for commercial operation including Camden: 5 units, Ankerlig: 3 units, Gourikwa: 1 unit and 60 MW capacity increase at Arnot power generating station. (Eskom Company Information, 2015b). In 2006 and 2007 financial year, a total of 1 408, 68 MW has been handed over for commercial operation, an additional 430 km of lines has been built and 1000 MVAs installed. (Eskom Company Information, 2015b). These are considered major achievements for Eskom, considering the power supply challenges Eskom experienced in 2008.

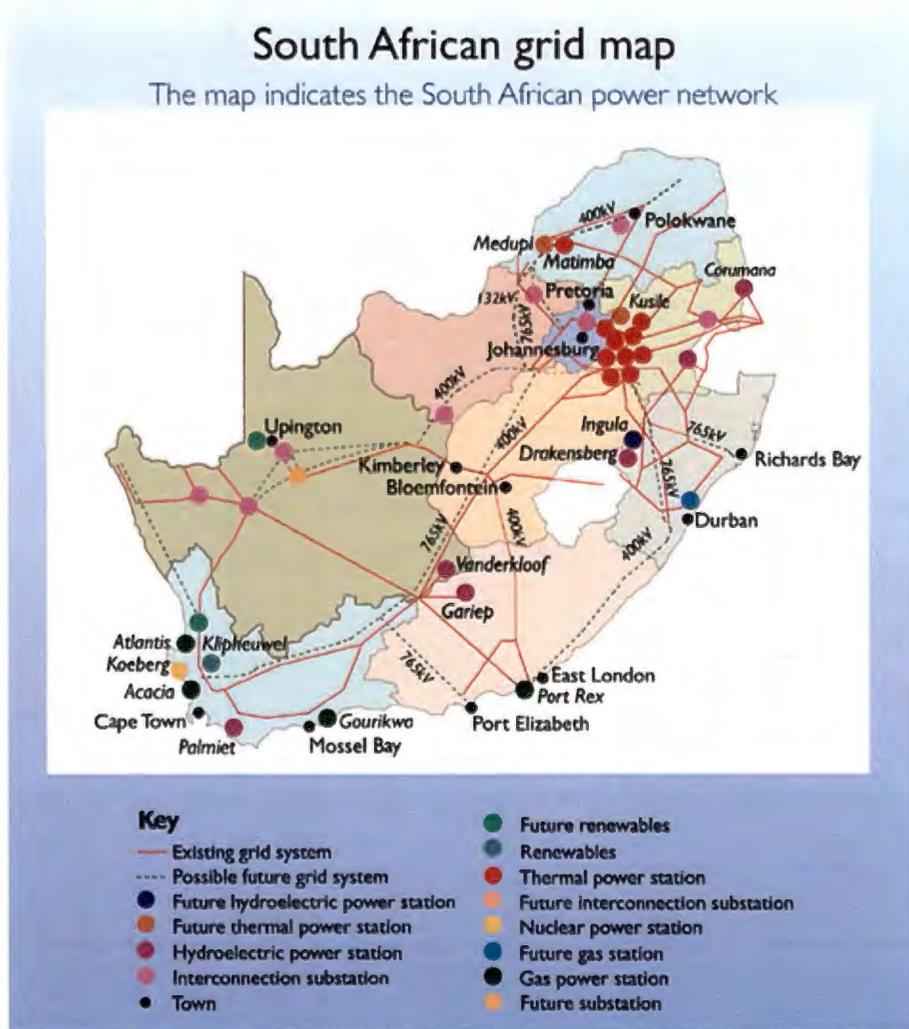
1.3 Projects in execution phase

In trying to meet the energy shortage demand, Eskom has embarked on a number of projects (Eskom Build Programme, 2015a):

- Return to service stations – 3 600 MW, this includes returning to service of old power generating units that were previously mothballed.
- Open cycle gas turbines – 14 x 150 MW, this is the use of Open gas turbines to generate electrical energy; this turbines are fuelled by liquid fuel, diesel or natural gas.
- Pumped storage scheme – 4 x 333 MW, this is the use of potential energy of water stored in dams converted into electrical energy; water is passed through the pipes or water ways from the upper dam to the hydro-turbines thus spinning the shaft coupled to the turbine to generate electrical energy.
- Coal fired stations – 6 x 700 to 900 MW, this is new power generating station build specifically to run out of coal. Eg Medupi PowerStation.
- Renewable energy – 100 MW, this is the use of wind and the sun energy to generate electrical energy.

Figure 1-3 shows Eskom electricity area of supply with projects placed in the South African map.

Figure 2-3: Eskom Area of Supply



(Source: Eskom Fact Sheet, 2015c)

1.4 Literature review of the topic/research area

The following topics are covered in the literature study:

- The role of Quality Management System (QMS) in organisations. This topic covers what a Quality Management is and how businesses use quality management systems in their organisations.
- The benefits of ISO 9001:2008 quality management system. This topic covers what an ISO 9001:2008 is and how it can benefit Eskom.
- Limitations of ISO 9001:2008 quality management system. This topic covers the shortfalls of ISO 9001:2008 and what Eskom should not expect from the implementation of this system.
- Total quality management. This topic briefly introduces TQM but because of the purpose of this study TQM is not covered in detail in this research.
- Failures in the implementation and maintenance of ISO 9001:2008 Quality Management System. This topic describes the common failures in the introduction of the ISO 9001:2008 quality management system.

Purpose of this research was intended to critique the Eskom's quality management system and how its failures affect the business operations. The above topics were chosen due to the fact that the company of study currently uses ISO 9001:2008 quality management system as the basis for its growth towards what the company calls business excellence.

1.5 Motivation of topic actuality

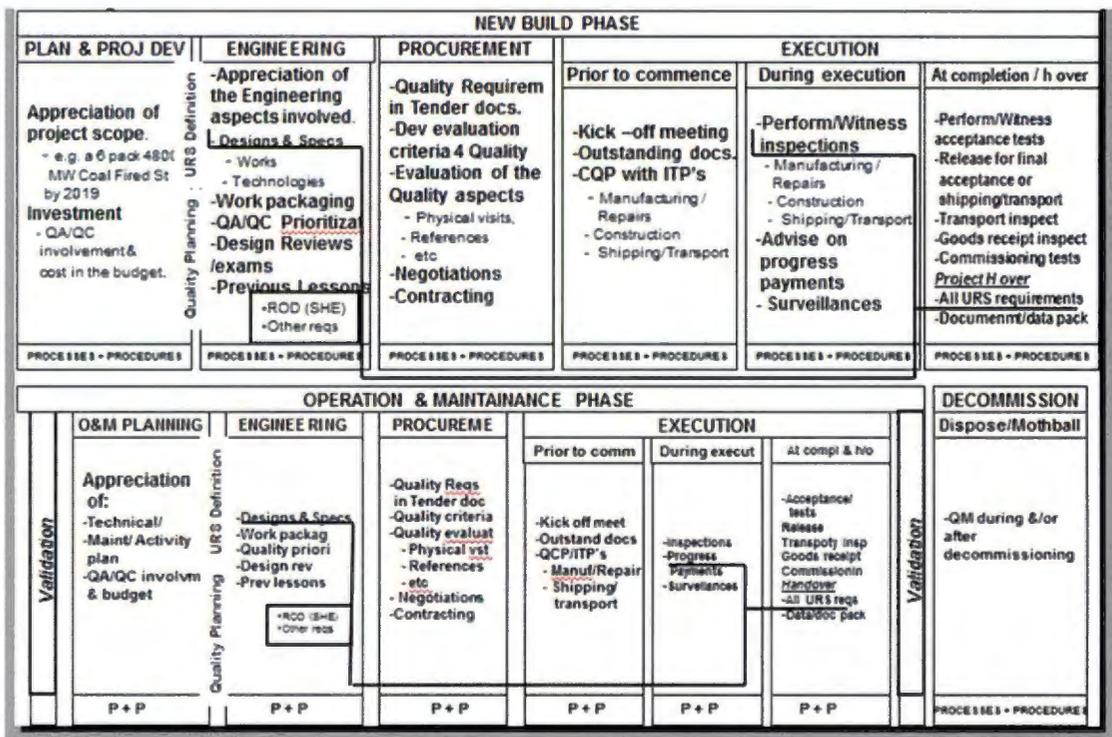
In 2013, electricity was recorded to be contributing about 1.8% of the country's GDP (STATS SA, 2013:2) as opposed to the previous calculation of 2.8% in 2012 (Department of Research and Information, 2013:4). It was also recorded that Eskom contributes about 95% of the country's electricity (Department of Public Enterprises, 2007:03), as previously discussed, the country saw major electricity shortages in 2008 which resulted in Eskom running a number of mega projects, in an effort to close the electricity shortage gap that exists in the country.

In order to ensure that Eskom complete this mega projects within reasonable time, minimal costs and acceptable quality specification, the company embarked on a project to implement an ISO 9001:2008 Quality Management System, for which the company was certified in 2013.

Using the requirements of this ISO 9001:2008 system, Eskom quality management department planned and developed a quality management lifecycle model which supports the development, maintenance and management of new and existing projects (fig 1-4). The quality management lifecycle model was developed to (Eskom Quality management strategy, 2011:16)

- address internal customer concerns by ensuring that appointed quality professionals sit in the project development meeting, in order to influence the new project scope and ensure that there is budget for quality control and quality assurance in the project;
- ensure that quality is embedded in the engineering designs and specifications and various work packages;
- ensure that quality requirements are also included during tendering stage of projects and project contracting activities;
- ensure that during the project execution phase that quality requirements are discussed during kick-off meetings, quality procedures are reviewed to ensure their relevance to the project with all inspection and hold points signed off by Eskom and the company providing the service;
- ensure that quality requirements are adhered to during the project operation and maintenance phase, this means that all product/service non-conformances have to be recorded, analysed and mitigated in accordance to the ISO 9001:2008 quality management system.

Figure 2-4: Eskom Quality Management Life Cycle Model



(Source: Eskom Quality management strategy, 2011:5)

Summary of the main activities of the model (Eskom Quality management strategy, 2011:6):

Quality Engineering: This stage of the life cycle which was developed to cut across all company projects to ensure that total quality management requirements are built into the Engineering/Design outputs throughout the Engineering/Design process and life cycle for projects, products and services from project planning to commission (Fig 1-4).

Procurement & Supplier Quality Assurance: This stage of the life cycle involved the development of risk based procurement quality strategies related to criticality and value of products and services to be procured. In this stage Quality management was to be involved in the company contract enquiries, contract evaluations, contract negotiations, contract adjudications and tender submissions, coupled with expediting support service which included supplier visits. This process was intended to ensure that all products/services that the company procures pass the quality tests before they can be put to operational use (Fig 1-4).

Quality Support: Focus of this part of the life cycle was to provide a strategic support service to Quality Management and its programs and to ensure effective and efficient multidirectional quality awareness throughout Eskom. The reason for quality support throughout the business was to ensure that all company employees, including the Chief Executive Officer (CEO), is aware of quality services and is in full support of them (Fig 1 -4).

Programme Quality Management (QA & QC): This part of the cycle includes Quality Control inspections & tests, Surveillances, Non-conformance reporting and tracking of corrective and preventive actions (Fig 1 -4).

Inspection means: Material inspections, Installation inspections, Construction/Erection, Shipping & Transportation inspections, Preservation inspections. Although the company knew very well that quality cannot be inspected but has to be built into the product, this part of the life cycle ensured that products coming from the company's suppliers are inspected in companies where they are and shipped for operational use with fit for use certificates.

Programme Quality Management QA & QC Gx OMO: This included Quality Control inspections & tests, surveillances and non-conformance reporting and tracking of corrective and preventive actions during planned and unplanned-maintenance. This process was tailored specifically for existing power generating stations to guard against reoccurring non-conformances and cut down of maintenance requirements and costs.

System Assurance & Supplier Audits: This part of the cycle was tailored to assess the Supplier Capability and Capacity Assessments (before/during Tendering Stages), supplier Quality Audits (post contract award), Divisional and Projects QMS effectiveness (Eskom internal audits) and Management of ISO 9001, 14001 and OHSAS 18001 compliance/certification and surveillance programme (by external certification bodies). This process was designed to provide an assurance function to the business by ensuring that the company's quality management system was audited and kept operational throughout the project lifecycle.

Quality Project Management Office: Facilitate and Programme Manage the implementation of electronically-enabled ISO compliant Management Systems and Business Excellence programmes. This was simply where all quality improvements projects were managed and planned.

Quality Performance Analysis, Risk and Improvements: Provide management information and reporting service in Quality Management on Eskom Quality performance.

As part of the requirements to maintain/uphold the ISO 9001:2008 certification, surveillance and internal audits are required to be conducted within a time stipulated by the company in order to keep the certificate. (ISO 9001, 2008:12).

During the 2014 to 2015 period, some business units started complaining about a decline in their ability to consistently apply the requirements of ISO 9001:2008 system, process/product reworks and project delays became evident in some projects and escalation of errors and non-conformances was also reported in some projects during this period.

1.6 PROBLEM STATEMENT

In its original intent, when effectively implemented and properly utilised, an ISO 9001:2008 quality management system is intended to see the entire business projects completed with minimal rejects, errors and or non-conformances.

During the time of the study, the status was that most projects within the business were battling to deal with an influx of product/service non-conformances, low staff morale due to service provider's lack of performance and a lack of usage of the non-conformance process and procedures, high down time of some critical equipment.

1.7 OBJECTIVES

1.7.1 Primary Objective

The primary objective of this research was to critique the impact that Eskom's quality management system failures has on its business operations.

1.7.2 Secondary Objectives

The secondary objectives of this research were as follows:

- To determine whether the introduction of ISO 9001:2008 quality management system has improved the way the business operate;
- to assess and critically analyse the reasons why Eskom's quality management system is failing, how this failure affect business operations and provide recommendations of how the business can resuscitate its quality management system in order to see benefits.

1.8 Limitations of the study

Certain information was not disclosed to protect the reputation of the business or the company that is being studied. The study was based on a chosen representative sample which focuses solely on the historic information collected during and after the ISO 9001:2008 quality management system was implemented. The ideal situation will have been to compare data before the ISO 9001:2008 quality management system was implemented and the situation after the introduction of the same management system.

The study focuses solely on the population of 14 power generating stations which were mostly situated in the Mpumalanga province. The status of the quality management system for each power generating station will also not be revealed in this study in order to protect the information that the company might find confidential. The information in this report is also not intended for public consumption or shared with the public but purely for MBA mini-dissertation purposes.

1.9 RESEARCH DESIGN/METHOD

1.9.1 Empirical research

Qualitative research is any research that relies primarily or exclusively on qualitative measure, qualitative measures are any measures where data is not recorded in numerical form. In some instances during the course of this study, data will be manipulated quantitatively; but a qualitative type of research method was largely followed in this study. Data was gathered from the existing quality management practitioners in the company, which were chosen from the 14 power generating stations within the country. The general purpose of qualitative research methods is to examine human behaviour in the social, cultural and political context in which they occur (Salkind, 2012:13). Qualitative research is typically the approach used in circumstances that have one or more of the following characteristics (Trochim *et al.*, 2008:142):

- For generating new theories or hypothesis.
- For achieving a deep understanding of the issues.
- For developing detailed stories to describe a phenomenon.
- For mixed methods survey.

A non-probability convenience sample, with research subjects taken from 14 Eskom power generating stations, who are mainly quality management professionals was used in developing detailed stories to describe the state of the quality management systems in the company; this group of research subjects composed of both members who are permanently employed by the company and members who form part of the contracted staff of the company but are both users of the ISO 9001:2008 quality management system. The qualitative research consisted of the following three aspects; focused group interviews using questionnaires, direct observation of operations through walkabouts and the case study methodology through the use of audits reports available in the company.

A primary and a secondary data collection method are used, whereby a primary data is applied in a form of discussion questionnaire discussed directly with the research subjects by the researcher (Annexure 1 and Annexure 2). A secondary data is applied in a form of data collected from company audit reports. According to Welman *et al.* (2010:149), primary data are original data collected by the researcher for the purpose of his or her own study at hand and a secondary data are information collected by individuals or agencies and institutions other than the researcher him or herself.

Because the majority of projects are planned at head office and executed at the Eskom power generating stations, this research was conducted using data mainly from Eskom power generating quality practitioners as research subjects and the sites visited are based at the Mpumalanga province.

1.10 Layout of the study

The study was divided into five chapters as outlined below:

Chapter 1

This chapter introduces the topic and discusses what the study is all about; it forms the basis of this study by introducing the problem statement, objectives, scope and limitations of the study and also describes the method used in carrying out the study.

Chapter 2

The literature applicable to this study is discussed in this chapter; more emphasis is placed on the failure of QMS and the resulting impact to the business.

Chapter 3

Chapter 3 mainly discusses the method that the researcher followed in collecting data, analysis of data and explains how this data will be interpreted in order to arrive at a conclusion.

Chapter 4

Focused groups discussions with the role players were conducted and questionnaires distributed to the relevant sample in order to collect data for this study; evidence of this data is contained in chapter 4.

Conclusions and recommendations from the analysis of the collected data are discussed in this chapter 5.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter 2 discusses literature around the ISO 9001:2008 quality management systems. The chapter starts by defining quality, quality management systems and proceeds to discuss what the ISO 9001:2008 quality management system is and how companies accredited to the requirements of ISO 9001:2008 system can use system.

In this chapter the value of documentation as the building block for ISO 9001:2008 system is also discussed. The benefits, limitations and what constitute an ISO 9001:2008 system failure is also discussed in this chapter. The chapter concludes by discussing the total quality management, Six sigma and finally Lean manufacturing.

To the majority of companies, quality means; cost savings, additional revenue, less or no product/service non-conformances and a seamless process that deliver value (ISO 9000, 2015). With this concept in mind, it is important to notice that non-conformances can take any form, for example; bypassing of inspection points during mandatory inspection periods, a newly procured high pressure rotor delivered with an incorrect balancing certificate on its name plate, indications of cracks found on the low pressure rotor machine. In labour intensive environment like a power generating station, errors are very common and the costs attached to them may seem very minimal. When allowed to exist over a period of time however, these costs can add up to a significant amount. Eliminating non-conformances can result in a significant improvement to the company's bottom-line.

2.2 Definition of Quality

Tricker (2010:23) defines quality as the degree to which a set of inherent characteristics fulfils the requirements. The definition implies that for any product or service to qualify as a quality product or service, it must meet a pre-set set of requirements or specifications, failure of which disqualifies the product or service. ISO 9000 defines quality as the ability of a product/service to satisfy customers and the relevant interested party's requirements (ISO 9000, 2015:2).

2.3 The ISO 9001:2008 QMS Environment

2.3.1 The Quality Management System (QMS)

“A quality management system is a management technique used to communicate to employees; what is required by the company to produce the desired quality of products, services and also used to influence employee actions to complete tasks according to the quality specifications or customer requirements” (Abahe, 2015:265).

As described by Abahe (2015:265), quality management system is a system intended to establish the company's vision and develop specifications to be met by the company employees. Companies can benefit from a quality management system by choosing and implementing a suitable quality management system for the company's operations which allows the organisation to keep up with and meet current levels of quality, meet the customers' requirements and retain motivated employees. The ISO 9001:2008 quality management system offers a system that meets these requirements, the system however, needs to be implemented, documented, maintained and continuously assessed in order to assure improvement in accordance with the ISO 9001:2008 standard (Abahe, 2015:265).

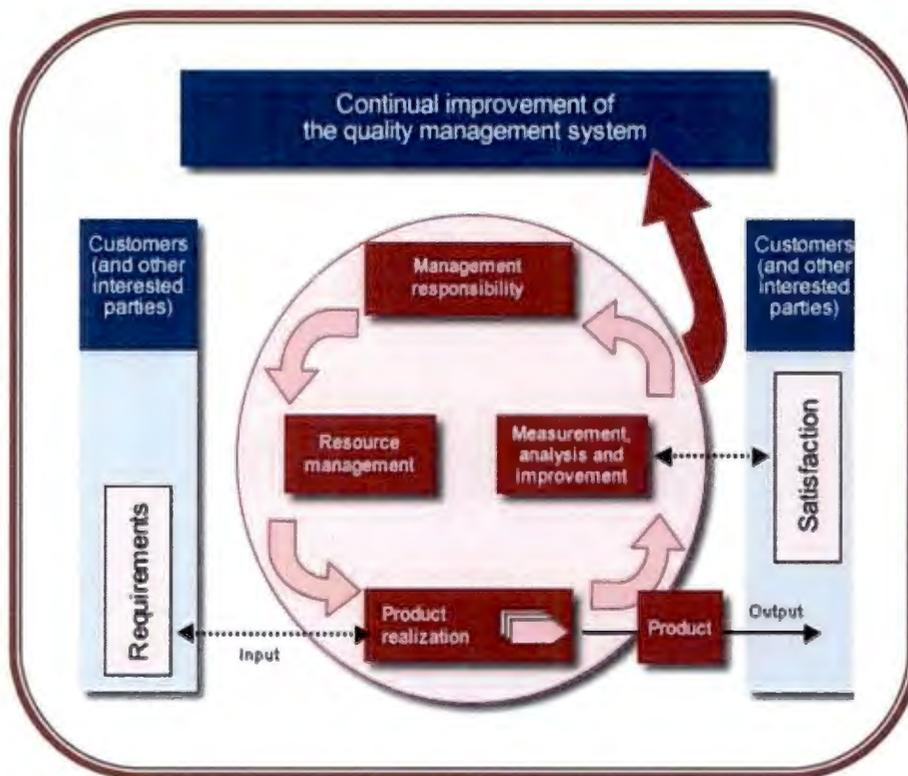
2.3.2 The ISO 9001:2008 QMS process

Although commonly referred to as ISO 9000 certification, the actual standard to which an organisation's quality management system (QMS) can be certified by the approved certifying body, is the ISO 9001:2008 standard. The ISO 9001:2008 standard is a comprehensive quality management system which continuously monitor and manages quality across all organisation's operations. ISO 9001:2008 Quality management system involves the implementation of a documented system that enables the organisation to record their day-to-day operations in a manner that meets customers' requirements and serves as the basis for continually improving products or services to exceed customers' expectations (Omer, 2012:1).

As depicted in fig 2-1, the ISO 9001:2008 system is a cycle which comprised of (Technopeers, 2015):

- understanding the customer requirements;
- planning and the development of a product that is likely to satisfy this requirements;
- measuring and the analysis of data to ensure product robustness;
- continual improvements of this product to ensure customer satisfaction; and
- involvement of management to direct, guide the employees into the desired direction by ensuring that there is sufficient resources and tools to execute the job successfully.

Figure 2-1: ISO 9001:2008 Model



(Source: Technopeers, 2015)

According to Gordon (2008:83), the complexity of the modern manufacturing organisation and the need to ensure that all aspects of business processes are focused on meeting organisational objectives, including the primary mission of customer satisfaction, has led to the development of quality management system (QMS) standards such as ISO 9001.

ISO, as the International Organisation for Standardisation is responsible for providing standards documentation but it is not a certification body. South Africa has certification bodies who offer certification services in fields where they have competent employees or resources. These certifying bodies go through a strict accreditation process which is performed by SANAS or South African National Accreditation Service, before they may offer any certification service to their customers (EXALTA, 2010:6).

According to EXALTA (2010:6), there are three existing bodies responsible for the planning, development and the adoption of International Standard:

- International Organisation for Standardisation (ISO) which is responsible for all sectors excluding electro-technical.
- International Electro-technical Commission (IEC) which is responsible for preparing and publishing of International standards for electrical, electronic and related technologies.
- International Telecommunication Union (ITU) which is an agency of the United Nations (UN) whose purpose is to coordinate telecommunication operations and services throughout the world.

Among this three, ISO is the world's largest developer and publisher of International Quality Standards, like the International Telecommunication Union, it was first established as a United Nations Agency in 1947. ISO is a network of the national standards institutes of 163 countries, one member per country, with a central secretariat in Geneva and Switzerland which is responsible for co-ordinating the system. It is a non-governmental organisation that forms a bridge between the public and private sectors (Tricker, 2010:31).

ISO 9001:2008 is based on the eight management principles which are (ISO 9000, 2005: v):

- Top Management commitment/participation: This means that the implementation of the ISO 9001:2008 system starts with the involvement and the commitment of company CEO or executives; they will be responsible for the establishment of the quality policy, quality awareness campaigns and the provision of suitable resources.
- Continuous improvement: This is based on the PDCA acronym which stands for Plan Do Check Act and if used properly, it encourages the system user to involve:
 - ✓ Planning (P) of their activities beforehand;
 - ✓ Implementation (D) of your planned activities which could be policies, training etc;

- ✓ Measurement (C) of business performances against targets or objectives; and
 - ✓ Review (A) of the system to ensure continuity and revision of the management system by taking corrective and preventive action steps.
- Measurement and analysis: Measuring the current system and be able to analyse the results.
 - Employee participation/Involvement of people: This means ensuring that the company's employees should be part of the implementation of the system and be involved in awareness campaigns and training.
 - Customer focus: The whole system is based on the customer first principle.
 - Process approach to data analysis: The ISO 9001:2008 system is based on the process and the analysis of factual data, the system should not be seen as a punitive measure by the company's employees.
 - Mutually beneficial supplier relationship: When implemented and maintained correctly the companies' suppliers will see value in dealing with the respective company and the client will also view them in the same light.
 - Total quality culture: This ensures that the employees value quality, think quality and ensures that whatever they do is of the highest quality standard.

The purpose of a Quality Management System similar to ISO 9001 is to help reduce the variation or re occurrence of non-conformances, not only in the product but also in the complex and integrated business processes by; identifying any part of the process that does not conform to the requirements of the business operational process. This is done in a form of issuing non-conformances, which according to the ISO 9001:2008 system, should have a process of how this are managed and closed out. A root cause analysis is also included in the ISO 9001:2008 series to ensure that similar non-conformances do not continually occur in the system. The existence of non-conformances (NC's) in the system is definitely another learning opportunity to reduce any system variables that might allow a non-conformance to occur and influence customer satisfaction but does not mean the company's QMS is failing. This allows for a certain amount of variability to exist and ultimately results in an overall process that is outside the capability of meeting 100% of the customer requirements 100% of the time (Gordon, 2008:84).

Looking at the definition of quality and what an ISO 9001:2008 quality management system stands for, one can simply conclude that a non-conformance, error, defect or a variation in any system is a waste and therefore not needed in any system because it costs the business money and if allowed to continue can destroy or cause a failure to any company's quality management system, but as with any company, management should ask themselves the following questions:

- At what stage is your company's quality management system considered failing?
- At what stage does the occurrence of non-conformances constitutes a failing QMS?
- At what stage does a failing quality management system affect operations or influence machine down times?

2.3.2.1 ISO 9001:2008 Overview

It is worth noting that documents and records management forms the basis for the ISO 9001:2008 system, but the ISO 9001 standard also looks at other management deliverables, that if managed effectively can influence the organisations' processes positively, below are other key points that an ISO 9001:2008 system focus on (ISO 9001:2008:3-12):

- Quality Management System - ISO 9001:2008 requires that a company should establish, implement, maintain, document a Quality Management System and continually assess and improve this Quality Management System in accordance to the ISO 9001:2008 requirements. This QMS must conform to the document management requirements as stated in ISO 9001 standard, all documents of this QMS shall be (ISO 9001, 2008:3):
 - ✓ Controlled: this means all documents produced shall be approved to be adequate for usage before issue.
 - ✓ Reviewed and updated as necessary: this ensures that the relevant versions of applicable documents are available to all in the company.
 - ✓ Legible and identifiable: this means that distribution of documents must be controlled; obsolete versions of these documents must be taken out of the system.
- Management responsibility - ISO 9001:2008 QMS cannot be successfully implemented and maintained by the company employees if it does not receive top management's commitment and support; top management must support regular reviews, customer feedback, NC process, preventive, corrective action process, give direction with regards

to policies and the companies vision and know how the system can be used and implemented (ISO 9001, 2008:3).

- Resource management - as a requirement a company wishing to maintain its ISO 9001 certificate should provide all required resources to realise their QMS; this include but not limited to human resources, training, skills, infrastructure and education (ISO 9001, 2008:6).
- Product realisation - processes that are required to deliver the product needs to be properly planned, taking into consideration the quality plans and objectives. A good communication between the customers is vital (ISO 9001, 2008:7).
- Measurement, analysis and improvement - according to ISO 9001 standard, continual improvement can only be achieved if regular measurements are carried out. Measurement, analysis and improvement are done to demonstrate conformance to QMS. Regular internal audits, benchmarking exercises help to keep meeting customer requirements; non-conformances must be identified; corrective action must be proposed to prevent reoccurrences which can mean a collapse of the QMS (ISO 9001, 2008:12).

2.3.2.2 The value of documentation

At the heart of the ISO 9001:2008 QMS is a clause dealing with document management; ISO 9001:2008 stipulates that every organisation has to keep an updated version of their documentation, ensuring that all documents used by the company are reviewed regularly with clearly marked document numbers and revision date. The ISO 9001:2008 system also stipulates that all records used by the business be correctly stored for easy retrieval should the need arise for them to be usage again; the ISO 9001 standard also mention the importance of the following document types (ISO 9000, 2005:4):

- Quality manual and the six mandatory procedures - a quality manual provide information about the organisation's quality management system and the six mandatory quality procedures provides information about how to perform company specific activities consistently.
- Quality plans - these are documents that indicate how the company deals with specific projects; quality plans are drawn up for every project.

- Quality specifications - these documents provide specific quality requirements.

Documents and records management is a process within the ISO 9001:2008 system which forms the basis for the ISO 9001:2008 certification. For a company the size of Eskom, it is important to have a working document and records management process, which gives assurance to the company's management that documents and records are kept safe, free from damage, fire and sabotage.

2.3.2.3 The benefits of ISO 9001:2008 QMS

If implemented correctly, the ISO 9001:2008 quality management system (QMS) will improve Business effectiveness, optimisation and improvement through (Eskom Quality management strategy, 2011:7):

- Proper analysis of customer and stakeholder requirements which result in minimal lead times;
- effective business objective and priority setting focused on meeting or exceeding customer and stakeholder requirements;
- identification of the organisation's strengths and areas that need improvement by means of gap analyses and self-assessments to ensure continuous improvement of process;
- ability to maintain a resilient power system and keep the lights burning in an era of increasing system constraints and ageing plant;
- long term plant health through proactive management of assets; and
- systematic approach to the definition, control and continual improvement of business processes.

According to Tricker (2010:85), the ISO 9001:2008 has some significant benefits:

- ISO 9001:2008 Quality Management System support continuous improvement – since the ISO 9001:2008 system follows the PDCA cycle, the system supports the continuous improvement methodology.
- Flexibility - the ISO 9001:2008 requirements are flexible enough to be used by a company of any size and shape, the requirements can be modified and quantified to suit each customer process or services for the seamless flow of the customers' operations with minimal non-conformances or defects.
- The ISO 9001:2008 documentation and records management process if governed and maintained properly can assist in ensuring that companies documents and records are managed and are easy to use within any business and can ensure that records do not exceed their storage life.

2.3.2.4 Limitations of ISO 9001:2008 QMS and certification process

When used as a quality management system, the ISO 9001 standard can help organisations obtain the ISO 9001:2008 certificate. What is not told to these companies is that ISO 9001:2008 systems does not tell you how to do the changes or prescribe the tested tools that can help the company improve its quality of products or services. When used as the only quality system, with ISO 9001:2008 in place, a company can obtain the certificate without having improved the quality of its operations or products. The easy acceptance of ISO 9001 by companies confirms how people are more willing to accept the introduction of technical matters that do not promise the improvement of their quality or improve their financial sustainability (Shih & Gurmani, 1997:24). As defined by Tricker (2010:86) ISO 9001:2008 system has the following limitations:

- The ISO 9001:2008 sometimes becomes difficult to understand how it relates or its applicability to the service industry, which forces management to first interpret the standard and understand which clauses can be used and which ones can be dismissed.
- For some companies, especially service, it requires more efforts and time to implement the ISO 9001:2008 system.

Some organisations do well in implementing their quality management system and obtain certification, but fails to put systems that last long after the benefits has been realised; this causes the value and the benefits of the initial effort to diminish over time (Omer, 2012:1):

- For an ISO 9001:2008 quality management system to function effectively, the system has to go through surveillance audits and internal audits by qualified auditors to prove its effectiveness. According to Omer (2012:1), although the current certification process is designed effectively, it is not always properly implemented by this certification bodies; it is always the case that some areas seem to be less stringent than others. According to Omer (2012), the principal cause of this issue is the fragile controls of the accreditation bodies over the certification bodies and the quality of their certification audits. The accreditation bodies should revise their current control tools to ensure a more effective process. Often certification bodies use poor certification auditors or unqualified auditors which often result in improper certification recommendations. This significantly affects the credibility of the ISO 9001:2008 certification in the international business (Omer, 2012:1).
- According to Omer (2012:2), the quality audit process is subjective in a sense that it is sensitive to the auditor's character, professional experience and educational background. The organisation should demonstrate proper compliance to the requirements as well as the established QMS procedures. It is often a fact that in some cases, the auditor may not have a deep enough understanding in the area of the QMS audit, so such an auditor may be convinced too easily by improper or incomplete information—or even fabricated the standard's requirements by the auditee. Then, once serious problems identified during the audit have been resolved to the satisfaction of the certifying body, written assurance (the certificate) is normally provided stating that the organisation's management system meets the ISO 9001:2008 requirements (Omer, 2012:2).
- According to Omer (2012:2), every ISO 9001 certificate is limited to a specific industry scope, such as design consultants or construction environment. The certificate generally is valid for three years and during this time annual surveillance audits are conducted by the certification body to ensure continued effectiveness of the implementation of the QMS (Omer, 2012:2).

Zairi & Jasar (2005) reveals a practical situation when the ISO system does not add value to manage the business processes, by mentioning that "ISO 9001 Quality standard is not regarded as a major driver of process performance, as most companies has policies on

achieving these standards based on commercial needs criteria and therefore used as a paper pushing exercise' (Zairi & Jasar, 2005).

2.4 What constitutes a Quality Management System failure?

As established earlier, appearance of non-conformances in the system does not necessarily mean the quality management system is failing, except when these non-conformances are reappearing (Shih and Gurmani, 1997:15). The quality management system depends on a number of things for its survival e.g. management support or commitment, culture change and maintenance of company document process; these things can also bring about the QMS downfall or failure. (Shih and Gurmani, 1997:15-31) listed the below issues as the primary causes of QMS failure:

a. Management style

The first common cause for failed introduction and maintenance of QMS is the lack of participation, inadequate commitment by the company's senior management, support and coherence from senior management; it is very common to see companies designate a junior manager as the co-ordinator of their quality programme; this junior manager is frequently abandoned by the senior management under the banner of empowerment (Shih & Gurmani, 1997:23) and (Kumar & Balakrishnan, 2011:8).

Once senior management does participate and take over the maintenance and the implementation of a quality management system they often show lack of coherence as they talk of empowerment and delegation of authority, yet they are normally the last ones to relinquish power and control. It is also very common for senior managers, when facing the dilemma of choosing between delivery on time and quality practices, to end up choosing to deliver the products on time, knowing that the product is defective (Shih & Gurmani, 1997:24).

b. Abstract company culture change programmes

The second common cause for a failed introduction of the QMS is excessive reliance on abstract company culture change through massive campaigns; people rarely change their behaviour because they are talked into changes. They change their behaviour when they are designated and expected to play a new different role (e.g. after a promotion to a managerial position), especially when they will be monitored according to their performance in this new role (Shih & Gurmani, 1997:24) and (Kumar & Balakrishnan, 2011:8).

c. Misunderstanding of QMS

The third common failure cause is a partial view and understanding of what constitutes a QMS. Many firms follow the waves of management fashions like QCC, kaizen, statistical process control, zero-defect, poka-yoke, 5S, six sigma, JIT, Lean etc, with a very poor idea of the role that each of them plays in the integrated system and the potential return that may be expected from them but end up with non-value adding meetings and excessive paper work (Shih & Gurmani, 1997:24) and (Kumar & Balakrishnan, 2011:8).

d. Lack of integration of QMS

The fourth case is the lack of integration between QMS and other functions of the business. Many programmes failed because they were seen as independent and isolated from the company's operations, weak plan-check-do-act cycle. It was not understood that the lack of proper integration with company strategy leads to unfocused quality efforts. The need to adapt the human resources management system was also overlooked. For example, one of the most common errors seen in the US is firms trying to encourage team spirit among their workers, without changing their performance evaluation system, which is exclusively based on individual performance and does not consider performance in teams (Shih & Gurmani, 1997:25) and (Kumar & Balakrishnan, 2011:8).

e. Maintenance of quality programme

The last case applies especially to companies that experience promising initial results but, after a while, without any apparent reason, the programme starts to slow down and further efforts bring only marginal gains. The most commonly observed cause for this premature death of tentative implementations of QMS around the world is inappropriate understanding of the mechanism for renewing and reviving the quality programme (Shih & Gurmani, 1997:25) and (Kumar & Balakrishnan, 2011:8).

There are many other important causes, like inadequate selection of quality co-ordinator, technological problems where the machines and equipment are not capable of satisfying the tight quality specifications, ineffective training and education system (Kumar & Balakrishnan, 2011:8).

ISO is in the process of changing the ISO 9001:2008 standard to an updated quality management system ISO 9001:2015 standard; this new system follows the principles of Total Quality Management, by incorporating three key areas in their system which will have a significant impact on any business (ISO 9001, 2015v):

- Standards perform better when they are aligned to the business strategies and goals; therefore the role of top management is the key in this new standard. This is the first key change in the new standard. Greater emphasis on the objectives and goal setting – ensures the new standard puts leadership at the centre of its thinking.
- Secondly it's all about integration; in this standard a new high level structure has been introduced to ensure that differing standards support each other. Future standards will be consistent in their structure and better integrated to ISO 9001 resulting in linked processes and activities that deliver value and efficiency.
- It is about managing change in any business, understanding the risks and challenges which may impact any organisation's ability to meet customer requirements and taking a preventative approach has been introduced in this new standard.

2.5 Other Quality management concepts

2.5.1 Total Quality Management (TQM)

Total Quality Management (TQM) facilitates the achievement of business objectives and continual improvement of overall business performance through the use of quality management systems (QMS) principles, which further supports the goals of corporate governance which are effective management of business processes, risk management and continual improvement of the organisation's performance. This takes into consideration all other aspects of the business which are considered essential for a proper business function (Abdallah, 2013:2).

TQM has been defined as a comprehensive company-wide approach for meeting or exceeding the requirements and expectations of customers that entails the participation of everyone in the organisation in using quantitative techniques to continually improve the products, services and processes of the company. Top management or leadership plays a fundamental role in introducing and facilitating the implementation of TQM strategy by creating a learning and co-operative environment that leads to customer satisfaction, continuous improvement and employee involvement (Abdallah, 2013:2).

According to Evans (2011:6), the total quality movement was first documented and recorded by W Taylor in the 1920s and Walter A Shewhart in 1931 with statistical quality control methodologies. Since then total quality management was recognised as a philosophy and developed into various management tools and corporate survival strategies by strategists like;

W Edward Deming, who assisted US Bureau of Census in applying statistical sampling techniques in 1940 and later joined the US war Department in 1941 to teach quality control techniques (Aguayo, 2008:23, Aikens, 2011:20).

Each of these quality strategists contributed immensely in the field of total quality management (TQM) and they all left different tools to manage and maintain a certain level of consistency in meeting customer requirements; a successful implementation of this tools could improve organisational performance such as product and service as well as reduce cost, more satisfied customers and improve financial performance (Prajogo & Sohal, 2006).

Total Quality Management gained popularity in Japan in the 1950s at the time when the Japanese products were considered inferior by the international market. It was during this time period that the Japanese manufacturers changed the way people think about their products. This involved a rigorous change in the Japanese culture and the way they do business. This resulted in countries realising that quality was the key competitive factor in the competitive market (Goetsch, 2010:2009).

TQM can be described as the culture and the attitude of the company's employees to continuously provide their customers with better products or services. This can be achieved through incorporating various tools and techniques within the company's business model to ensure a product or a service free of defects or nonconformities.

2.5.1.1 Six sigma and Lean concepts

TQM and Six sigma are quality concepts that complement each other but differ in how they are applied by different organisations. Six sigma is defined as "a business process that allows companies to drastically improve their bottom line by designing and monitoring everyday business activities in ways that minimise waste and resources while increasing customer satisfaction by some of its proponents" (Magnusson *et al.*, 2003).

TQM facilitates quality improvement processes, products and services which can be applicable in an electricity generation business like Eskom, whilst Six sigma assist in giving these improvements an edge and keeping them more focused (Aized, 2012).

There are two major improvement methodologies that Six sigma utilises; one used for already existing processes and the other for new processes. The first methodology used to improve an existing process can be divided into five phases as listed below (Aized, 2012):

- **Define.** Define which process or product that needs improvement and define the most suitable team members to initiate these improvements, define your customers, their needs and map a process that should be improved.
- **Measure.** Identify the key factors that have the most influence on the process and decide upon how these key factors can be measured.
- **Analyse.** Analyse these key factors that need improvements.
- **Improve.** Design and implement the most effective solution. Cost-benefit analyses should be used to identify the best solution.
- **Control.** Verify if the implementation was successful and ensure that the improvement sustains over time.

Lean is defined as “a systematic approach to identifying and eliminating waste through continuous improvement, flowing from the product at the pull of the customer in pursuit of perfection” (NIST, 2000).

Lean among the other quality management concepts that has been developed, is one of the more wide-spread and successful attempts in controlling the resources in accordance with the customers’ needs and to reduce unnecessary waste (NIST, 2000).

Unlike other quality concepts, Lean principles are fundamentally customer value driven, which make them appropriate for many manufacturing and distribution situations. Below are the five lean manufacturing’s basic principles which are generally acknowledged (NIST, 2000):

- **Understanding customer value.** Only what the customers perceive as value is important.
- **Value stream analysis.** Having understood the value for the customers, the next step is to analyse the business processes to determine which ones actually add value. If an action does not add value, it should be modified or eliminated from the process.
- **Flow.** Focus on organising a continuous flow through the production or supply chain rather than moving commodities in large batches.
- **Pull.** Demand chain management prevents from producing commodities to stock, i.e. customer demand pulls finished products through the system. No work is carried out unless the result of it is required downstream.
- **Perfection.** The elimination of non-value-adding elements (waste) is a process of continuous improvement. “There is no end to reducing time, cost, space, mistakes and

effort". Lean principles do not always apply, however, when customer demand is unstable and unpredictable.

2.6 Chapter 2 conclusion

Quality is defined as conformance to customer requirements, whereas quality management system is defined as a system that helps to uphold the current quality levels within an organisation and also assist in continually improving it. On the other hand an ISO 9001 quality management system is described as a system that consistently apply the requirements of QMS coupled with a good document management, measurement, analysis and verification processes which heavily relies on the leadership responsibility for its survival.

Unlike Six sigma and Lean manufacturing, an ISO 9001:2008 quality management system focuses on the overall business processes, taking into consideration that the business can have both servicing and manufacturing in their business value chain. Like any other system, an ISO 9001:2008 system can be considered failing if (Shih & Gurmani, 1997:15-31) and (Kumar & Balakrishnan, 2011:8):

- Non-conformances are allowed to re occur or repeat without proper follow ups.
- Leadership and the company's management fails to support the ISO 9001:2008 initiatives.
- The company's legacy issues or culture is allowed to creep into how the ISO 9001:2008 system is managed.
- There is a lack of maintenance through the use of audits and other continuous improvement initiatives that can improve the effectiveness of the ISO 9001:2008 system.
- Lack of understanding of QMS by the company's employees, especially the appointed management representatives or people tasked with looking after the QMS.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction and data collection methodology

This chapter outlines the methodology that was used in addressing the research objectives specified. According to Welman *et al.* (2010:02) research methodology provides the researcher with a guideline to follow in solving a research problem.

According to Yin (2003:2) the case study method allows researchers to retain the holistic and meaningful characteristics of real life processes, neighbourhood change, international relations and the maturation of industries. As a tool for data collection for this qualitative research, focused group discussions, direct observation of operations complemented by a single case study research strategy was utilised. The single case study research strategy was implemented using collected engineering audit and inspection reports.

According to Welman *et al.* (2010:202) focused groups should be of an appropriate sample consisting of not more than 12 sessions and not fewer than 6 participants. It is recommended that these participants should be knowledgeable or experienced with regards to the topic of investigation which is discussed. See Annexure1 for a list of questions used during the focused groups.

Walliman (2001:202) argued that, in conducting qualitative research the researcher needs to interact with the participants under investigation. In conducting this research, the discussions were conducted in a face to face manner where not less than six groups of subject matter experts within the quality fraternity were asked to discuss predetermined questions in a group setup.

According to Leedy and Ormrod (2005:94), the qualitative methodology is used to answer questions about the nature of the phenomena and it is mostly used for the purpose of understanding the phenomena from the participants' point of view. According to Leedy and Ormrod (2005:134) qualitative research serves four purposes; description, interpretation, verification and evaluations. For the purpose of this study an evaluation of Eskom's quality management system failure was studied and the resulting impact on business operations.

3.2 Research design

Welman *et al.* (2010:192) contends that there are two types of research design methods; positivists: this is a method that requires the researcher to decide on the research design method before data collection commences. Anti-positivists usually favour emergent designs which allow the researcher to adapt their data collection procedure during the study. This allows the researcher to benefit from the data which the researcher becomes aware of when the research process has already commenced.

Although this study follows a structured research design method, a post-positivist method was followed; whereby a large amount of qualitative data was categorised to produce quantitative data to be analysed, using simple statistical methods. New data, made available in the duration of the study was also incorporated.

3.3 Focused group discussion questionnaire

The questions below were mostly focused at contracted Eskom quality professionals, who have been with the company for a period of more than two years. Because the majority of these professionals come from quality control and different engineering background, the majority of the questions discussed were tailored to encourage a discussion among these contracted workers.

The aim for these questions was to assess the level of understanding in terms of definition as well as the application of quality management system principles.

Questions/ questionnaire administered to contracted quality professionals

1. The term quality management, what does it mean to you?
2. In your own words, what is quality control?
3. Can you define your daily work activities?
4. Do you think your skills and experience is effectively used by Eskom?
5. Is there anything else that you think you can offer that the company is not taking advantage of?
6. How often does your employer contact you in a month?

7. Do you think your employer cares about your health and your wellbeing (please explain)?
8. What is your understanding of the cost of poor quality?
9. Do you think Eskom is doing all they can to make your work pleasant?
10. Do you think you are being effectively utilised by Eskom?
11. How is your relationship with the Eskom people (please explain)?
12. Do you have any other issues you may want to address?

The questions below were aimed at the permanent Eskom quality professionals mostly coming from the management and quality assurance background; the aim of these questions was also to assess the knowledge of the professionals understanding of the topic being studied.

Questions/ questionnaire administered to permanent quality professionals

1. What does the term Total Quality Management (TQM) mean to you?
2. Do you know the benefits of QMS?
3. Do you think Eskom is taking advantage of such benefits and why?
4. Do you think Total Quality Management is failing/ succeeding in Eskom?
5. Do you think the implementation of ISO 9001:2008 was a great success?
6. Where do you think the company failed or succeeded?
7. Do you think Eskom contractors are effectively utilised (please explain)?
8. What do you consider to be the limitations of Eskom's QMS?
9. Do you think the management of quality affect employee morale (please explain)?
10. How is the relationship between Eskom's quality staff and outage (maintenance) management contractors?
11. Do you have any other issues you may want to address?

Because the majority of the audit reports mentioned in this study were completed by the Eskom quality permanent and contracted professionals, it was important for the researcher to ascertain that people interviewed understood the topic being studied; therefore the questions were tailored to assess the level of the interviewees understanding of the quality management system.

In order to investigate the current situation regarding Eskom's quality management system and how the system impacts the business operations, a case study research method was also used. Yin (2003:13) defined a case study as "an empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between the phenomenon and context are not clearly evident".

Leedy and Ormrod (2005:108) further stated that a case study is a method of qualitative research in which an investigation regarding an individual, an organisation or a situation is conducted. According to Yin (in Baxter & Jack, 2008:545), a case study method should be considered when "(a) the focus of the study is to answer the 'how' and 'why' questions; (b) you cannot manipulate the behaviour of those involved in the study; (c) you want to cover contextual conditions because you believe they are relevant to the phenomenon under study; or (d) the boundaries are not clear between the phenomenon and context." The reason for considering a case study method for this research was to answer the "how" and the "what" of the research topic:

- How: Question 1, 2, 8 under contracted quality professionals and question 5 under permanent quality professionals look at how the quality management system was implemented, while question 4, 6 and 8 and reports from the audit look at how the failure or success of an implemented system affect business operations.
- What: Question 5,6 under permanent quality professionals look at what tools and techniques were used in implementing the quality management system, and what are other methods that could have been used during the implementation of the system.

Zeiller and Schauer (2011:2) further stated that a case study research method has a broad applicability; hence, it is mostly used in knowledge management research. Bell (1999:10) argued that, a case study method is an appropriate research method as it enables the researcher to study one aspect of a problem in depth within a limited time, it also allows the researcher to concentrate on a specific situation and identify interactive processes.

The case study method can be categorised as either an exploratory study, descriptive study or explanatory study. Table 3-3 summarises the types of case studies.

Table 3-1: Types of Case Studies

Types of case studies	Description
Exploratory study	This study is also termed formulative research study and its main purpose is to formulate a problem or develop a working hypothesis with the emphasis of discovering ideas and insights. The techniques that are mostly used with exploratory study are surveys or experiments.
Descriptive study	This study provides a rich and detailed analysis of the phenomenon under study and it tells a story of what happened and how different people witness what occurred.
Explanatory study	This study goes further than the descriptive study and explains why certain events happened.

(Source: Oates, 2006:143)

For the purpose of this research, a descriptive type of case study method was used to investigate the current situation regarding Eskom's quality management system failures and how the system impacts the business operations.

According to Leedy and Ormrod (2005:179) a descriptive study involves identifying the characteristics of a phenomenon or relationships between two or more phenomena under study. Creswell (2003:113) argued that a descriptive study favours the "what", "who", "where" and "how" research questions.

According to Olivier (2004:98), irrespective of the type of case study category chosen, the study may use either single-case design or multiple-case design. This research was conducted using a single-case design since only a single department of a division within the organisation was studied.

According to Bouma (1996:89) a single case study is conducted using a single incidence and the case is investigated in its entirety over a period of time and the results are recorded. Bouma (1996:89) further stated that, with a single-case only one group or institution is investigated and there are no comparisons made with other groups or institutions.

Data gathering in this study was mainly collected using focused interviews, reports from previous audits and the site walkabout.

3.4 Measuring instrument

The measuring instruments used in this research took the two types of data sources into consideration which are (Welman *et al.*, 2010:149):

- Secondary data source which is normally information collected by individuals or agencies and institutions other than the researcher himself; for the purpose of this research, this is a data collected from previous engineering operational assessments and quality management audits;
- A primary data source which is the original data collected by the researcher for the purposes of his or her own study at hand; for the purpose of this study, this is data collected by the researcher directly from the focused interviews with quality professionals.

In order to ensure that the research objectives are met and that the research question has been answered, an appropriate measuring instrument was used for these data source.

3.5 Analysis of data

According to Walliman (2001:263) analysis of data requires putting analysing, editing and putting data together into meaningful patterns and themes that will assist in answering the research question(s) and therefore giving explanations of why and how certain situations happened. In this study data was collected in a form of:

- a. Focused group's methodology with permanent and contracted staff at different time intervals.
- b. The single case study methodology was also used, whereby reports which included findings from previous audits and inspections were also used to arrive at a conclusion to this research.

For ease of analysis of data collected from both focused groups and the single case study, collected data was edited, evaluated against the six quality management failure types established, data was then put together to form meaningful patterns through the use of frequency tables for ease of interpretation, however data from a case study was further tabulated and summarised in a manner that made it easy to answer the primary objectives of the research question.

Motlhodi LM (2012:47) further stated that analysis of data involves performing related operations such as editing, coding, classification and tabulation of data which summarise the collected data in a manner that they are able to answer the research question(s).

3.6 Research sample

According to Welman *et al.* (2010:52) a population is explained as the study object and consists of individuals, groups, organisations, human products and events or the conditions to which they are exposed. Therefore a population encompasses the total collection of all units of analysis about which the researcher wishes to make specific conclusions.

A population is the full set of cases from which a sample is taken (Welman *et al.*, 2010:53). A sample is a part of something larger, called a population. A sample can simply be defined as a subset of a given population. Diamantopoulos & Schlegelmilch (2000:10) also defined a sample as simply a method of checking out part of a whole in order to say something about the whole.

According to Welman *et al.* (2010:55) in order for the research conclusions to be accurate, the research sample needs to be a representative of the study population, meaning that the sample has to have the exact properties as the population from which the sample was drawn.

For the purpose of this study, a purposive type of sampling was used, according to Welman *et al.* (2010: 69) purposive type of sampling method is a very important type of non-probability

sampling as the researcher relies mostly on their experience, ingenuity and /or previous research findings to deliberately find units of analysis or population. This is done in a manner that ensures that the sample that is selected can be regarded as a representative sample of the relevant population.

The company of study is composed of 14 operational power generating stations. In each station there was 1 quality manager (permanent) and a maximum of 8 quality practitioners, both quality assurance and quality control; which makes a total of about 14 quality managers and 112 quality practitioners as a total population. A total of 7 stations, which makes 56 practitioners, were sampled to make 50% of the 112 quality practitioners' population. Purposive interviews were arranged with each manager and the practitioners per station to discuss the questions outlined. For additional data, in some stations risk and assurance managers and the power station managers which are the highest authority within the powers generation hierarchy were also interviewed in order to ensure that the data was most reliable and accurate.

Engineering reports and results from previous quality audits were also used to form part of the case study type of data collection in order to arrive at a conclusion.

3.7 Ethical considerations

A qualitative research is often conducted using people or human subjects; it is for this reason that ethical considerations are very important (Leedy & Ormrod, 2005:101). Jankowicz (2005:123) stated that, irrespective of the research methodology used, researchers need to be careful about the confidentiality of information obtained from the respondents. Jankowicz (2005:123) further stated that, the confidentiality of information has a special importance for research based on the interpretivism paradigm. According to Leedy and Ormrod (2005:101) research ethical issues fall into the following categories:

- Informed consent.
- Protection from harm.
- Right to privacy and honesty with professional colleagues.

Informed consent

Leedy and Ormrod (2005:101) further stated that research participants should be informed about the nature of the study and be informed of their right to either participate or not to participate and if agreeing to participate, they should also be informed of their rights to withdraw from the study at any time.

According to (Rajendran, 2001:6) there needs to be a way researchers can use to guard against their own biases, because any research strategy needs credibility to be useful; one way of removing bias from a qualitative study is to record field notes which includes reflection of the researcher's subjectivity. A consideration of self as a researcher and self in relation to the topic and the research sample is a precondition for dealing with bias; data can also be reviewed by others to eliminate bias of the researcher.

Participants of this research were verbally informed of their right to refuse to take part in the study and that refusing to take part will not have any negative impact on their jobs as a way to ensure that the researcher was not bias to the research; notes taken from this study were verified with other members to ensure that the researchers style of handling such data was minimised.

Protection from harm

Researchers should ensure that people who participate in their research are at all times protected from physical or psychological harm (Leedy & Ormrod, 2005:101). According to Oates (2006:59) the participants' identity and location should be protected and disguised in a research report.

None of the names of the people who participated in this study were mentioned anywhere in this research.

Right to privacy

The participants' right to privacy should be respected and data obtained from the participants should be kept confidential hence it should not be left lying around where anyone can look at it (Oates, 2006:59).

Data for this research, especially the one from interviews was treated with the highest confidentiality. To ensure confidentiality, data recorded on paper was filed and stored in the researchers work locker and only accessible to the researcher.

According to Leedy and Ormrod (2005:102) if the participants' behaviour is described in a research report, the participants' identity should be disguised by using a pseudonym to assure anonymity. Leedy and Ormrod (2005:102) further stated that an organisation's identity should also be kept confidential and disguised unless the researcher has been given the permission to use the organisation's name in their report. For this study, the researcher requested for approval from the Eskom management to use the organisation's name and information. Due to the lengthy process that must be followed in getting a written approval as it has to be done by the company secretary, approval was granted verbally by management in order for the researcher to continue with the study. Honesty with professional colleagues: The research findings should be reported in an honest manner and researchers should not mislead others by misrepresenting the nature of their findings (Leedy & Ormrod, 2005:102). Leedy and Ormrod (2005:102) further stated that any ideas borrowed from other authors, whether they are paraphrased or not, should be acknowledged in full. Lapan *et al* (2012:97) stated that all studies including the qualitative research studies need approval from the institutional review boards to provide an independent review of ethical issues relating to a research study. With this study involving interviewing employees within a service delivery organisation, the proposal was submitted to the University of North-West MBA faculty for Research Ethics and Integrity for the review of ethical issues. Approval was granted by the committee to continue with the research operation.

3.8 Chapter 3 Conclusions

The purpose of this chapter was to give an overview of the research methodology that was used in providing a solution to the research objectives discussed in chapter 1.

Open ended questionnaires to focused groups of quality management specialists together with the analysis of the previous data mainly collected from inspection reports and engineering audits were used.

CHAPTER 4: EMPIRICAL RESEARCH FINDINGS

4.1 Introduction

In this chapter, the emphasis is placed on analysing data collected, the chapter starts with:

Two sets of data from the focused group discussions. These are data from permanent quality professionals and data from the contracted quality professionals; followed by a direct observation of the problems discussed in a form of a site walkabout. The latter was to satisfy the secondary objectives of this study. Data for the focused groups were collected in a form of:

- Open ended questions asked by the researcher to the permanent quality management professionals at respective Power generating sites, at a focused group setup; these quality professionals were mostly company quality managers who worked for the company for a period more than four years.
- Open ended questions asked by the researcher to the contracted staff. Only contract staff contracted for more than two years was targeted. The questions used was intended to capture data relating to how the contracted staff view the organisations QMS and how they think the inefficiencies of the quality management system can be corrected and if they think the quality management system is properly managed and how it can be best utilised.

As part of the single case study methodology, data from quality engineering inspection reports were analysed, followed by the audit reports collected from different power generation stations.

The use of frequency tables was used in both instances for the purpose of simplifying information collected and also used as a form of interpreting the research findings. These methods are used in order to gain a better understanding of the research subject (Diamantopoulos & Schlegelmilch, 2000:58).

A sample of 56 quality professionals were chosen from the 14 power generating stations as discussed. Of the 56 quality professionals, 14 were quality permanent staff and 42 were contracted staff that has been with the company for more than two years. The sampled power generating stations were; Majuba, Tutuka, Lethabo, Kendal, Kriel, Camden, Komati, Grootvlei, Matla, Duvha, Kendal, Arnot, Hendrina and Matimba power generating stations.

Section 4.2.1 reports a summary of responses from each of the focused group questions. These responses are analysed and discussed. Section 4.2.2 of the study involves issues observed and discussed with the people in the plant during the site visit and 4.3.3 involves an analysis of a case by case method of all issues that were recorded in 2014/2015 period. This issue involves machine/equipment failures, poor workmanship and irregularities that took place within that period; these cases are recorded as they appear in the database and then analysed in 4.2.4.

For the purpose of this study, all four scenarios discussed; focused group, observation data, inspection reports and quality engineering audit reports were measured and critiqued against the six types of Quality Management System failure categories discussed in the literature survey as follows (Shih & Gurmani, 1997:24) and (Kumar & Balakrishnan, 2011:8):

- A. Failure due to re occurrence of non-conformances or errors.
- B. Failure due to lack of leadership support of the quality management system;
- C. Failure due to cultural issues in the company.
- D. Failure due to lack of integration of QMS with other systems.
- E. Failure due to lack of QMS maintenance.
- F. Failure due to lack of understanding of a QMS.

4.2 Focused group discussions

4.2.1 Contracted quality professional's discussion

Purpose: 42 contracted staff members were interviewed in groups per power generating station, generally the below questions were asked in order to test the respondents understanding of quality management system and how they apply it to their operations. It is also worth noting that the below section of the questionnaire was targeted at the companies' outsourced contractors. These contractors were interviewed at the time when they have been with the companies for more than two years for most of them and discussions were conducted at various power generating station.

1. What does the term quality management mean to you?

Summary of responses

- Conformance to requirements.
- Act of overseeing all activities to maintain an acceptable standards and excellence.
- System that helps the station to meet requirements of contractor and customer at minimum cost.
- Doing things right the first time and following the approved procedures for excellence.
- Management of all activities and procedures carried out in the organisation to ensure compliance to quality.
- Integration of all quality processes into one system and effectively utilise them.
- Governance of the processes which leads to successes or failure of the organisation.
- A way in which all the activities in an organisation are overseen to maintain a desired level of excellence.

Analysis of the response: Although quality management is a very broad topic, literature and the response from these professionals describe quality management as the activities for ensuring compliance in the processes by which products are developed, which refers to adherence to requirements (Tricker, 2010:23); this will involve ensuring that processes support the notion of doing things right the first time and ensuring that there are less defects of the product through ensuring that activities and processes are properly followed and managed as per the customers specification. When examining the summary of the responses above, it was evident that most respondents demonstrated a fair understanding of what quality management is and how it applies to their work.

The response to the question gives comfort that the Eskom contracted quality management professionals understand the concept of quality and therefore; failure of QMS due to lack of understanding of the system cannot be attributed to their incompetence.

2. What is quality control in your own words?

Summary of responses

- An act of controlling day to day activities in an operational environment to meet the required quality standards;
- Effective control of all activities carried out by the contractors onsite in order to ensure the quality of service;
- Zero defects, no rework, products produced according to set standards and zero harm to people and equipment;
- Process or set of processes and or procedures intended to make the final product or service defect free and ensure customer satisfaction with no reworks with improved plant availability;
- It is a physical act of observation on the fabrication to ensure non deviations of the procedures and processes by the contractor;
- It is a tool if used effectively and correctly, activities can be done right the first time and always and can help production of products at the lowest manufacturing costs.

Analysis: In literature quality control (QC) is often described as a set of activities for ensuring quality in products. This activities focus on identifying defects in the actual products produced; QC is then used to identify and correct defects in the finished product (Eskom Quality management strategy, 2011:16).

The responses above demonstrate a fair understanding of what quality control is and gives the indication that the respondents understand the topic well and therefore failure number six which is; failure due to lack of understanding of a QMS does not apply

3. Can you define your daily work activities?

Summary of responses

- Morning safety and production meeting, receive inspection job card, drafting of Quality Control Plans(QCP), carry out the inspection work, review the work scope, writing reports of inspections findings and giving technical advice to engineering and operations when required;

- Receive material, approve Inspection and Test Plans (ITP) according to required scope of work given, do plant walk about and ensure compliance to requirements as per work specification, sign intervention points, attend meetings and conduct general inspections;
- Morning production meetings with management and other contractors, do plant walk about to observe operations, do equipment inspections and checks, spares acceptance in the material stores and give general advice to maintenance team;
- Review and understand the scope of work, accept QCP and sign off data packs;
- Responsible for all welding activities that takes place at the station by ensuring that they meet the specifications and that all the supporting documentation is in order.

Analysis: In Eskom plants, Quality Control (QC) employees are required to (Eskom Quality management strategy, 2011:16)

- conduct physical inspections on all maintenance activities and identify maintenance deficiencies, recommend improvements initiatives;
- review quality control plans;
- stop work when a non-conformance to the product/process which can result in a poor product or service is identified; and
- co-ordinate external inspection on suppliers to ensure compliance of products and services.

Since the main purpose of this question was to test the understanding of the QC personnel with regards to their work output and also to asses if failure of the quality management system in the company can due to lack of the quality peoples' understand of their work. From the responses above, it was evident that the QC personnel and inspectors understand their work requirements and perform their work as per the expectation, therefore criteria number six is still not applicable in this regard

4. Do you think your skills and experience is effectively used by Eskom?

Summary of positive responses

- Because of my skills as a welding inspector my skills are being used effectively and I believe that my skills make it possible to contribute meaningfully to the station to avoid reworks and save money.
- The work that I do is relevant to my skills, qualifications and experience and is being used effectively by the business.
- The station allows me to operate in the field that I was trained and gained experience on over the period of three years.
- Yes, as we ensure less rework in the station and we are the eyes and ears of the station in terms of the work executions on plant.

Summary of negative responses

- My experience is not used and I feel that is being crippled by a lot of red tape in the business of which most it is due to poorly structured contracts.
- My work area does not allow me to apply my skills and experience which is not what I expected when I joined the business.

Analysis: This question was structured to test the QC personnel's fit to their work and how well they are allowed to contribute effectively in the business; 36 out of 42 people responded positively to the question, by outlining how well their skills are being recognised by the company but the remaining 14% believe that their skills are not recognised by the company. Literature proves that the introduction of QMS in the company improves employee morale and enhances work performance (Azaranga et al., 1998:266). QMS failure number three which states failure of QMS can be attributed to the cultural issues in the company, is applicable in this regard.

5. Is there anything else that you think you can offer that the company is not taking advantage of?

Summary of responses

- 10 of the 42 respondents have skills in project management and supervision and feel that the station is not taking advantage of them.

- 18 of the 42 respondents have skills in maintenance planning/scheduling, engineering, safety and health software's; of the 18 respondents 5 has between 9 to 25 years' experience in engineering and feel that the company is not tapping into those skills.
- 40 of the 42 respondents say; their availability in the plant is limited, they wish they can be allowed more time in the plant especially on weekends when most activities take place.

This was a follow up question to the previous question and the general feel of the respondents is that; the majority of them have skills that are not used by the company, although it was not easy to see which failure these responses belong to, failure due to cultural issues in the company seems to be applicable.

6. How often does your employer contact you in a month?

Summary of responses

- 34 of the 42 respondents say that the main contractor or the employer never contacts them except when something urgent is needed and they can influence it.
- 39 of the 42 respondents say they never get contacted by the employer but when time sheets need to be submitted they are contacted to submit them.

Failure due to lack of leadership support of the quality management system seems to be most applicable. These resources interviewed were the custodians of the Quality Management System in the company; support of such employees is mandatory according to the requirements of ISO 9001:2008 (Abdallah, 2013:2).

7. Do you think your employer cares about your health and your wellbeing (please explain)?

Summary of responses

- 36 of the 42 respondents said no to the question and stipulated that their employer is mostly concerned about what they can produce and making money out of them.
- A direct response from one of the respondents said: No, "They expect us to be ready for work each day without worrying about whether we are equipped to work that day or not;

should problems occur as always, they normally expect us to seek assistance elsewhere but never willing to assist”.

- A direct response from one of the respondents said: “Sometimes our salaries are cut without any notice; there is normally no training or any induction in order to equip us for work to help us work in a safe manner”.

Top management or leadership plays a fundamental role in introducing and facilitating the implementation of TQM strategy by creating a learning and co-operative environment that leads to customer satisfaction, continuous improvement and employee involvement (Abdallah, 2013:2). Some direct response to this question were included in the analysis to explain that failure due to lack of leadership support can be the main contributor of the above issues.

8. What is your understanding of the cost of poor quality?

Summary of responses

- Poor quality means escalation of costs, more power cuts and inefficiencies of work performance.
- Cost of poor quality means work performed at no extra cost, within expected time.
- Cost of poor quality is the costs of operation which escalates above the expected cost of operation and it can also mean the loss of value or spending on unbudgeted activities.
- It can mean poor product, poor plant availability and escalation of injuries to people and equipment.
- It is caused by deviations from the procedures and standards.
- Cost of poor quality often results in substandard product or product not fit for the purpose.

Analysis

According to literature, the cost of quality (COQ) refers to costs associated with implementing quality management in an organisation but there are also costs associated with not implementing quality management in organisations. The sum of these two costs function results in what is called the Cost of Quality (COQ), which refers to the total cost of all efforts related to quality. Literature explains the Cost of Quality in organisations in three categories: prevention costs, appraisal costs and failure costs (Eskom Quality management strategy, 2011).

100% of all the respondents understood what the cost of quality is but all referred to the COQ from the implementations point of view, overlooking the cost of not implementing quality management.

For the purpose of this study, it was important for these interviewees to be tested on their understanding of Quality Management and Total Quality Management concept, failure due to lack of understanding of a QMS was not the issue in this case.

9. Do you think Eskom is doing all they can to make your work pleasant?

Summary of responses

- The station is limiting the presence or the availability of QC to oversee most of the inspection activities taking place but the procedure allows the QC inspectors to do regular walkabout and oversee all the maintenance work taking place onsite because the actual work does not give contractors the power to oversee or stop any irregularities as they are supposed to. Some maintenance contractors and even service providers take advantage of the situation and take short cuts during the time when they know that QC inspectors are not onsite.
- Eskom is trying but the middle man who is the company or the main contractor that brought the contractors onsite is not. Contractors are dumped onsite and nobody cares whether they exist or not except when the time sheets has to be submitted.
- No clear lines of reporting between the contractors and Eskom, work is performed haphazardly and often causes confusion and frustration to the employees.

Analysis

Quality control (QC) is described as a set of activities for ensuring quality in products; it is only fair that the quality control inspectors be given the power to stop non-conforming work where it is absolutely necessary; from the respondents above QC is not empowered to stop work when irregularities are identified (Eskom Quality management strategy, 2011:16).

Literature also describes quality as being able to improve business processes by allowing employees to be part of the decision making; thus, employee involvement increases employee morale which in turn leads to further improvements in productivity. It further says a well maintained quality management system should be able to improve work performance and positively affect employee morale (Azaranga *et al.*, 1998:266).

Because the majority of employees within the QC space are contracted workers, there were no clear lines of reporting between the contractors and the permanent employees. This often led to permanent employees feeling used but not recognised for what they bring to the business. On the other hand contracted staff also feels less empowered and not part of the decision making, even when such decisions affect their work output which is a clear sign of lack of leadership support.

10. Do you think you are being effectively utilised by Eskom?

Summary of responses

- 25 of the 42 respondents feel that they should be allowed to work overtime so that they can be available to oversee activities that take place after hours.
- 17 of the 42 respondents feel that the company is doing all it can to effectively utilise the resources but because of lack of clarification of roles in the project employees often find themselves disgruntled over issues that should have been clarified.

Analysis

A study conducted by Chi & Chung (2014:1247) aims at exploring the relationship between the application of quality management practices and employees' well-being. The study concluded that if implemented or practiced, the quality management practices alter workplace characteristics, affect employees and improve work-related attitudes and work life outcomes. The findings supported the hypothesised model, which suggested that all things being equal quality management practices increases employees' belongingness and job satisfaction and also decrease their work overload and work stress (Chi & Chung, 2014:1247).

In the case of this study it was evident that 60% of the interviewed resourced feel that they are not effectively utilised and the remaining 40% feel that the company is doing all they can to utilise them but the clarification of roles causes major dissatisfaction and low morale of employees in the business. As discussed earlier, the company has a culture of utilising employees entirely for what they have been contracted to do without considering what else these resources can offer the company; failure due to cultural issues in the company is most applicable in this situation.

11. How is your relationship with the permanent colleagues? (Please explain).

Summary of responses

- 20 out of 42 respondents feel that they receive support from their permanent colleagues and have a good working relationship with them but the remaining 22 feel that they have misunderstandings most of the time which often remain unresolved by the managers as most of them have poor understanding of QC's role in the plant.

Analysis

For any business wishing to provide proper service/products to their customers, internal relationship amongst the internal employees is most important. In this case 52% of the respondents feel that because of the manager's lack of understanding of their role, this often result in misunderstanding with other role players in the business. Failure due to lack of support and failure due to cultural issues in the company apply in this case. Throughout the interviews it was evident that permanent employees did not really have a healthy relationship with the contracted staff. This could be due to lack of leadership support and cultural issues that exist; leadership should ensure that the work environment provide pleasant working conditions for the company's employees by making sure that work is challenging for the employees, that the employees are allowed to be responsible in what they do. Smerek and Peterson contend that individuals are not content with the satisfaction of lower-order needs at work; for example, needs to be associated with minimum salary levels or safe and pleasant working conditions. Rather, individuals look for the gratification of higher-level psychological needs having to do with achievement, recognition, responsibility, advancement and the nature of the work itself (Smerek & Peterson, 2007:230).

12. Do you have any other issues you may want to address?

Summary of responses

- 28 of the 42 respondents feel that there is a need for continuous quality awareness trainings to all employees to clarify the role of quality on sites. The same number of people feels that short contracts like the one they are involved in should be eliminated as they put people in awkward situations and hinder people from unleashing their full potential.

- 29 of the 42 respondents feel that quality control is one of the most misunderstood professions on site, as people seem to use QC only for checking other peoples' work but not use it as it was intended; meaning keeping it as an assurance function.
- 42 of the 42 respondents feel that quality control should be given authority to stop non-conformances as they happen, not as what is happening currently because QC is kept as a reactive function.
- 42 of the 42 respondents feel that in-house training is required to keep quality controllers informed with current trends and changes within the field.

Analysis

From the respondents above, it was evident that the majority of the people involved in the discussion were not happy with the current system of the way QC is being run. This is due to 100% of the respondents admitting that although they are contracted staff, the company has not taken them for any refresher training or any training that keep them in par with other professionals in the same field. 100% of them also explained that quality control is a reactive function on sites as they only deal with issues after they have happened. This could be due to the fact that some of their superiors do not understand what their roles and responsibilities should be. Lack of leadership support was very evident in this case. It is the leadership's role to ensure that employees remains motivated, challenged in their job in order to remain productive (Smerek & Peterson, 2007:230).

4.2.1.1 Summary of Contracted quality professional's discussion

Table 4-1: Frequency of failures per failure type

#	Failure type	Frequency of failure	Percentage frequency
A	Failure due to re-occurrence non-conformances or errors	0	0
B	Failure due to lack of leadership support of the quality management system	5	56
C	Failure due to cultural issues in the company	4	44
D	Failure due to lack of integration of QMS with other systems	0	0
E	Failure due to lack of QMS maintenance	0	0
F	Failure due to lack of understanding of a QMS	0	0
	Total number of failures	9	100

Failure due to lack of leadership support was found to be the biggest concern of the Eskom contracted employees, as this failure type scored 56% of the percentage frequency or concerns raised by the contracted staff, followed by the failure due to cultural issues at 44%. Throughout the study, it was evident that there was a lack of involvement between the company's leadership and the contracted employees' wellbeing, lack of training, lack of direction and failure to recognise other skills that these employees can offer have also been evident.

Leadership plays a vital role in any business, they introduce and facilitates the implementation of quality management system and ensure that they write policies that support enhancement of the companies' employees capabilities; they also drive the implementation of the company's mission and creating a learning environment that leads to customer satisfaction, continuous improvement and employee involvement (Abdallah, 2013:2).

4.2.2 Permanent quality professionals

The below questionnaire was targeted at the company's permanent staff which are 14 and the 42 contracted staff which adds up to the 56 respondents of the chosen sample. It is worth noting that some of these permanent employees were managers in charge of the contracted staff interviewed and therefore the same criteria were used:

- A. failure due to re-occurrence non-conformances or errors;
- B. failure due to lack of leadership support of the quality management system;
- C. failure due to cultural issues in the company;
- D. failure due to lack of integration of QMS with other systems;
- E. failure due to lack of QMS maintenance; and
- F. failure due to lack of understanding of a QMS.

1. What does the term Total Quality management (TQM) mean to you?

Summary of responses

- A management system intended to control and directs the organisation regarding quality.
- Total management of quality by ensuring that all management systems are managed and improved in order to ensure non-conforming products or services.
- Total control of deviations.

Analysis

The responses above show that the respondents understand the topic of quality and therefore the quality failure type due to lack of understanding of QMS as discussed is not applicable in this instance.

2. Do you know the benefits of QMS?

Summary of responses

- good documentation and records control system;
- national and international recognition;
- improved supplier relationship;
- improved employee morale;
- less reworks and non-conforming products and or deviations;
- improved customer satisfaction; and
- improved processes.

Analysis

The responses above still prove that Eskom's permanent quality resources, which are composed of quality managers and quality supervisors, understand QMS and its benefits and therefore do not contribute to the failures of quality as discussed

3. Do you think Eskom is taking advantage of such benefits and why?

Summary of responses

- According to the respondents, the company does not take seriously in the company, there are no proper structures to manage quality, there is no proper quality management mandate, quality management vision and the company view quality as just paper work but not embedded in the process.

Analysis

Failure due to lack of leadership support of the quality management system was evident in this case as 100% of the 14 respondents believe that the company is not taking advantage of the benefits that QMS can bring to the company and that the QMS is not regarded highly like other systems like safety, environment and security.

According to Tricker (2010:85) management can ensure that the ISO 9001 quality management system which follows the principle of PDCA, supports the business and ensures that the business continually improve and keep motivated employees.

4. Do you think Total Quality Management is failing in Eskom?

Summary of responses

- The majority of the respondents believe that quality is failing within the company because processes that exist to ensure Total Quality Management are just not adhered to. They say the company does not do enough to ensure such processes are followed, eg Non-conformance process exist, NC's are raised but remain open for ever.

Analysis: According to 14 of the 14 permanent resources, leadership support of the QMS is the cause of failure; failure due to re-occurrence NC's is another problem within the company.

5. Do you think the implementation of ISO 9001:2008 was a great success?

Summary of responses

- The majority of the respondents said; yes, the system was implemented in a swift manner but the maintenance and continuous improvement of the system does not exist and therefore the company does not reap the benefits of this implementation.

Analysis: According to this respondents failure due to lack of QMS maintenance is the big issue within the company.

6. Where do you think the company failed or succeeded?

Summary of responses

- The respondent says that lack of management commitment is the biggest downfall of this system, the system exists but management does not support it.

Analysis

These respondents contend that failure due to lack of leadership support will bring about a downfall of Eskom's QMS.

7. Do you think Eskom contractors are effectively utilised (please explain)?

Summary of responses

- The respondents said; No, contractors do as they please onsite; the company just planted them here and there is no proper way of managing them. They conduct audits; report on audits and nothing get done with this information.

Analysis: As discussed, the company has a culture of using people for only what they have been contracted to do, they run awareness campaigns on work improvement, job satisfaction and other initiatives but fails to realise that people often become motivated when they are recognised and valued in their work; failure due to cultural issues that exist within the company was the main contributor.

The common cause for a failed introduction of the QMS in companies is the excessive reliance on abstract company culture change through massive campaigns; people rarely change their behaviour because they are talked into changes. They change their behaviour when they are designated and expected to play a new different role (e.g. after a promotion to a managerial position), especially when they will be monitored according to their performance in this new role (Shih & Gurmani, 1997:24) and (Kumar & Balakrishnan, 2011:8).

8. What do you consider to be the limitations of Eskom's QMS?

Summary of responses

- According to the respondents, the Eskom QMS has many limitations, one being lack of management commitment to quality and lack of qualified resources to manage and improve quality.

Analysis: Failure due to lack of leadership support of QMS seems to be the biggest concern of the interviewed permanent resources but literature says; Limitations of the ISO 9001:2008 system is sometimes due to difficulty to understand how the system relates or its applicability to the service industry, which forces leadership to first interpret the standard and understand which clauses can be used and which ones can be dismissed. For some companies, especially service, it requires more efforts and time to implement the system (Tricker, 2010:86).

This alone can cause a serious lack of commitment by leadership to the implementation of the ISO 9001 standard.

9. Do you think the management of quality affect employee morale (please explain)?

Summary of responses

- According to the respondents, the way quality is currently managed, it negatively affect employee's morale; contracts are cancelled without prior notice, salaries are reduced without notice, no vision for quality, structures are rejected and not implemented in quality. All these lead to a lot of rework and breakdowns due to lack of management of quality.

Analysis: A lot has been set in this short statements but; failure due to lack of leadership support of the QMS, failure due to cultural issues and failure due to re-occurrence of non-conformances are the main contributors. Herzberg contends that both effective supervisors and senior management are the positive predictor's job satisfaction (Smerek & Peterson, 2007:247).

10. How is the relationship between Eskom's quality staff and outage (maintenance) management contractors?

Summary of responses

- The majority of the respondents believe that although not perfect, the relationship exists between permanent and contracted staff but due to staff shortages and lack of direction this relationship is impacted.

Analysis: failure due to leadership support of the QMS is another contributor of the relationship between contractors and the permanent resources.

22 of the 42 contracted employees believe that they have some misunderstandings but believe that the company is not doing enough to enhance this relationship and ensuring that the work of both contracted and permanent staff is fulfilling. Smerek and Peterson contend that individuals are not content with the satisfaction of lower-order needs at work; for example, needs associated with minimum salary levels or safe and pleasant working conditions. Rather, individuals look for the gratification of higher-level psychological needs having to do with achievement, recognition, responsibility, advancement and the nature of the work itself (Smerek & Peterson, 2007:230).

11. Do you have any other issues you may want to address?

Summary of responses

- Respondents believe that: A proper quality reporting structure, management commitment that provides guidance to quality within all the business units is the immediate solution to the quality dilemma.
- 14 of the 14 respondents believe that: Quality processes driven from head office is another solution to the problem at hand to ensure profitability and consistency of work execution and the alignment of all the level 1 and level two processes.

Analysis: failure due to leadership support of the QMS within the business is the biggest problem according to the 14 permanent resources interviewed.

4.2.2.1 Summary of Permanent quality professionals responses

Table 4-2: Frequency of failures per failure type

#	Failure type	Frequency of failure	Percentage frequency
A	Failure due to re-occurrence non-conformances or errors	2	17
B	Failure due to lack of leadership support of the quality management system	7	58
C	Failure due to cultural issues in the company	2	17
D	Failure due to lack of integration of QMS with other systems	0	0
E	Failure due to lack of QMS maintenance	1	8
F	Failure due to lack of understanding of a QMS	0	0
	Total number of failures	12	

Almost all the failure types were represented from the findings gathered from the permanent employees interviews but the failure due to lack of leadership support scored the highest at 58% and it seems to be a concern amongst the permanent staff, followed by both failure due to re-occurrence NC's and failure due to cultural issues for both; this is not consistent with the results found from the contracted staffs response as their responses show that 56% is due to leadership support and 44% due to cultural issues. These findings are consistent with the fact that leadership support campaigns which are meant to improve the employees' wellbeing and enhance their job satisfaction but the employees on the other hand view these initiatives as norms.

4.2.3 Site visit observation

Out of the 14 power generating stations sampled, only 7 shop floor walkabouts were conducted due to the time allocated for this mini dissertation. 2 group discussions were conducted per station and only 7 observational walkabouts was conducted; due to the fact that power generation walk often take the whole day per station to complete and that this stations are spaced far apart from each other. The visit mainly took place in the morning whereby the normal company protocols were followed which started with: A meeting with all the professionals to discuss safety, evacuation procedure of the site in case of emergency, relevant quality issues or concerns that the professionals had were also discussed during this time; site walkabout was conducted with a site representative taking the researcher through most sections of the power generating areas which were most affected by a lack of quality management system. Additional staff responsible for different activities within these visited areas were informally interviewed to gather data relevant to their environment and the closing meeting to further discuss the issues took place.

Below are some of the issues observed or uncovered during the visit

- In five of the sites visited, the non-conformance process which has been implemented within the business for the purpose of managing deviations was not properly followed, a number of reworked products were evident.
- In three of the sites visited, there was one quality assurance personnel who focused on quality assurance issues; there was no permanent quality control staff and contractors were used to do quality control for the sites.

- These QC contractors only work from 07:30 to 16:30 on Monday to Friday, to alleviate the effect of maintenance on the consumers; the sites preferred to conduct planned maintenance work on weekends and after 20:00 each day, this maintenance schedules was taking place with no QC involved.
- Maintenance work often commences without quality control plans “QCP”; this often leads to quality control discrepancies, lack of quality inspections and inspections on critical hold points specified within the ISO 9001 standard and the company manuals.
- Because of the poor relationship that exist between the contractors and the permanent staff within the company, the QC contractors report to outage (maintenance) management which is a section dedicated to deal with planned and unplanned maintenance work; this quality control contractors raise quality related issues to outage management but this issues often exist for months without being addressed or resolved.
- There were no clear guidelines by quality management in head office to the sites; this leads to deliberate ignorance of quality procedures and systems by the contractors and permanent employees on site.
- Main contractors place their staff onsite and never bother to take care of their wellbeing; they leave this responsibility to Eskom and this leads to less informed staff and disgruntled employees which affect their morale.
- QC contractors attend to outages/maintenance work without proper scope of work; this leads to members attending to a problem without really understanding what was expected of them; this was a risk to the Eskom maintenance management system and could lead to product/equipment reworks.
- Because of the flaw that existed within the companies contracting strategies, main contractors often send less experienced resources to do QC maintenance work which leads to maintenance people overlooking QC hold-points and lead to more re-works.
- Because the suppliers that execute the maintenance work often do not have a dedicated QC personnel, to ensure a good quality product but relies on the Eskom appointed QC to inspect their work/product/service, this leads to a repetition of QC work and poor workmanship by the supplier executing the work/service.
- The current system does not allow the QC contractors to stop any non-conforming work when it happens but rather rely on the issuing non-conformances which often remain unaddressed.

- Scope variances discussions and all other discussions which involve changes of the schedules and the scope changes onsite often do not involve QC staff.
- There was a lot of messages regarding quality coming from head office but was never clear regarding who should attend to such messages and this messages often do not reach the contracted staff and there are no awareness campaigns relating to quality taking place.
- The quality non-conformance reporting “NCR” process was not understood by all employees, hence it was not followed; this lead to shortcuts and product reworks.
- Complains which involved main contractors utilizing resources that were not competent, often went without being addressed.
- Flaws that exist in the system allow systems engineers to send practice notes when they want to by-pass the quality control process in their system.
- Powers station managers “PSM” which were the highest authority in the plants were not contracted on quality; this allowed for poor management commitment.
- Reworks were a common practice onsite and nobody took initiatives to do things right the first time, because almost the entire quality responsibility was left to contractors.
- Two of the sites visited had very minimal quality resources; at the time of the visit there was only 1 quality officer and no QC resources. Outage/maintenance management used maintenance people to do QC work.

4.2.3.1 Summary of Site visit observation

Table 4-3: Frequency of failure per failure type

#	Failure type	Frequency of failure	Percentage frequency
A	Failure due to re-occurrence non-conformances or errors	4	20
B	Failure due to lack of leadership support of the quality management system	11	55
C	Failure due to cultural issues in the company	0	0
D	Failure due to lack of integration of QMS with other systems	0	0
E	Failure due to lack of QMS maintenance	1	5
F	Failure due to lack of understanding of a QMS	4	20
	Total number of failures	20	

Failure due to leadership support was observed to be the biggest concern at 55% due to a number of percentage failure allocated to this failure type, however failure due to re-occurrence NC's and failure due to lack of understanding of QMS was also evident at 20% for each. It is worth noting that these failures were picked up from the operational staff members that were interviewed during the site walk about with the quality resources.

4.2.4 Single case study: Use of the available audit and inspection reports

In this part of the study, data from quality management inspection and audit reports were used to arrive at a conclusion. The purpose for the use of this data was to analyse how a failure caused by inadequate use of quality management system resulted in failure of equipment, with a specific focus on the Eskom power generating stations. From the engineering point of view equipment fails due to a number of reasons (Sondalini, 2015:13):

- Failure from error: What this means is that equipment can fail because of defective parts that have been installed, poor quality of assembly or poor workmanship and

equipment can fail because a defective manufacturers process in producing the equipment.

- Failure from induced stress: This refers to equipment failing because of the operating overload; rapid aging of some parts which makes up the equipment, equipment operating in an environment it was not designed for, operator's error, poor operating practices or poor design choice.
- Failure from usage: The equipment can fail because too many of its parts are aging or many of its parts are degraded

Machine/equipment reliability = sum of parts' reliability; what this means is that when parts are put together, they form a collection of parts which is a system and makes up an equipment or a machine (Sondalini, 2015:13). When equipment or any of its part fails, it is called a non-conformance or error.

For an organisation certified to the requirements of ISO 9001 standard, clause 8.3 which is control of non-conforming products is one of the most effective clauses in dealing with NC's, defects or errors of any type. This clause says "the organisation shall deal with non-conforming product by taking action to eliminate the detected nonconformity" (ISO 9001, 2008:13). This is done so as to ensure that these non-conformities do not re-occur or go out of control and result in further breakdowns or defects. Irrespective of the age of the equipment, how the equipment is utilised, poor environmental factors or degrading parts of the equipment, a non-conformance must be detected and eliminated.

When a nonconforming product is corrected, it shall be subject to re-verification to demonstrate conformity to the requirements and ensure that it does not re-occur (ISO 9001, 2008:13).

Literature identify six types of quality management failures, which are; failure due to re-occurrence NC, failure due to lack of leadership support, failure due to cultural issues in the company, failure due to lack of QMS integration with other systems, failure due to lack of QMS maintenance and failure due to lack of understanding of QMS (Shih & Gurmani, 1997:24) and (Kumar & Balakrishnan, 2011:8). Because this part of the study deals with non-conformances only failure due to re-occurrence of non-conformances will be evaluated.

4.2.4.1 Inspection reports taken from 2014 to 2015 period

At this stage of the study non-conformance reports from the 2014 to 2015 financial year were utilised. These reports were written by quality professionals during this period; in order to be consistent with the study, only reports falling within the period of 2014 to 2015 were chosen. According to the power generations terminology, a critical equipment was the equipment that form part of planned and unplanned maintenance, due to their possibility of causing major breakdown of other equipment if it was not serviced on time. This equipment can also result in power interruptions if not properly maintained and looked after, this equipment are: Boiler, Turbine, Generator and High pressure pipework.

Because in this part of a single case study, the study focuses on the NC's resulting from failure of critical equipment, it was worth noting that this part of the study was not related to the previous findings which were conducted with people involved in a face to face set up. This section of the study was conducted using reports written in 2014 and 2015 period. In order to take a deep look at these NC's, quality inspection records were also used in this instance. It is also worth noting that only 10 of the sampled 14 power generating stations were represented as this were the only ones with data available.

4.2.4.2 Inspection results taken from 06/ 2014

Table 4-4 shows an average number of all NC's recorded from the beginning of 2014 until June 2014 per power generating station and the equipment inspected within that specified period by the qualified quality inspector.

Table 4-4: Non-conformances per equipment per power generating station 06/2014

Power generating station	Non-conformances/type of equipment inspected							
	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	Total
Arnot	0	0	3	2	3	0	0	8
Camden	12	3	12	0	2	0	0	29
Hendrina	3	0	6	0	0	0	0	9
Komati	6	0		5	3	0	0	14
Grootvlei	22	3	4	0	0	4	0	33
Kriel	7	0	4	0	3		0	14
Duvha	16	0	16	0	9	10	2	53
Lethabo	6	0	2	5	16	2	0	31
Matla	7	0	5	1	0	0	0	13
Tutuka	3	2		1	0	0	0	6
Equipment totals	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	
Non conformance	82	8	52	14	36	16	2	

Table 4-5 shows an average number of the status of all the non-conformances per station within the specified period per power generating station. This table also provide data relating to which NC's were still open, closed and how many were issued during the time at which the report was written. It further shows which ones were overdue during the time at which the report was written.

Table 4-5: NC status per power generating station 06/2014

Station	Non-conformance status per station			
	Issued	Closed	Open	Overdue
Arnot	8	8	0	0
Camden	29	22	7	7
Hendrina	9	0	9	9
Komati	14	9	5	5
Grootvlei	33	15	18	18
Kriel	14	3	11	11
Duvha	53	20	33	25
Lethabo	31	31	0	0
Matla	13	13	0	0
Tutuka	6	3	3	1
Total overdue				76

Figure 4-1 below shows that out of the 10 power generating stations at study, Duvha station encountered more NC during the January to June 2014 period. The figure also shows that Duvha had more NC's open and overdue than the other 9 stations represented.

Figure 4-1: NC status in a graphical form 06/2014

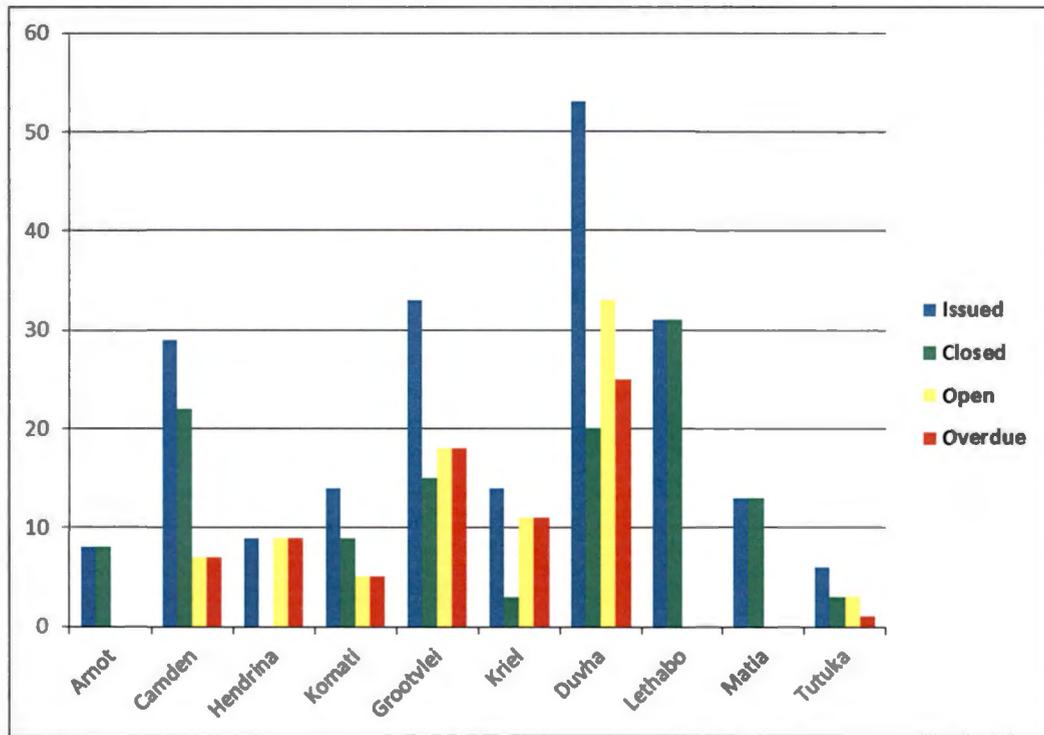
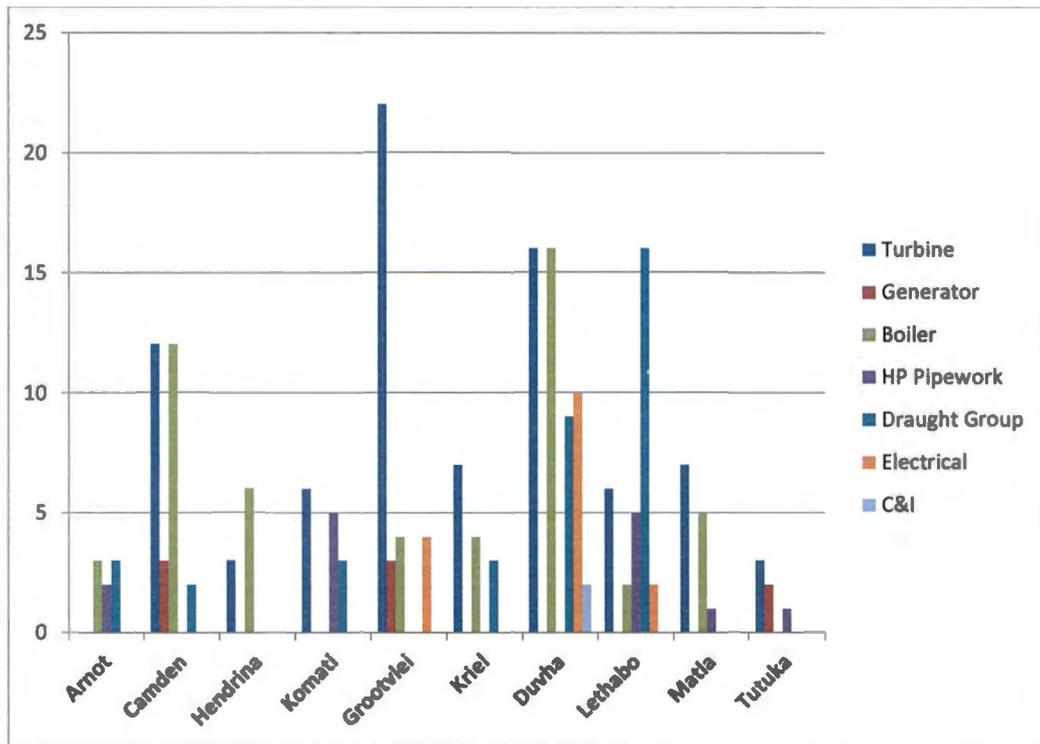


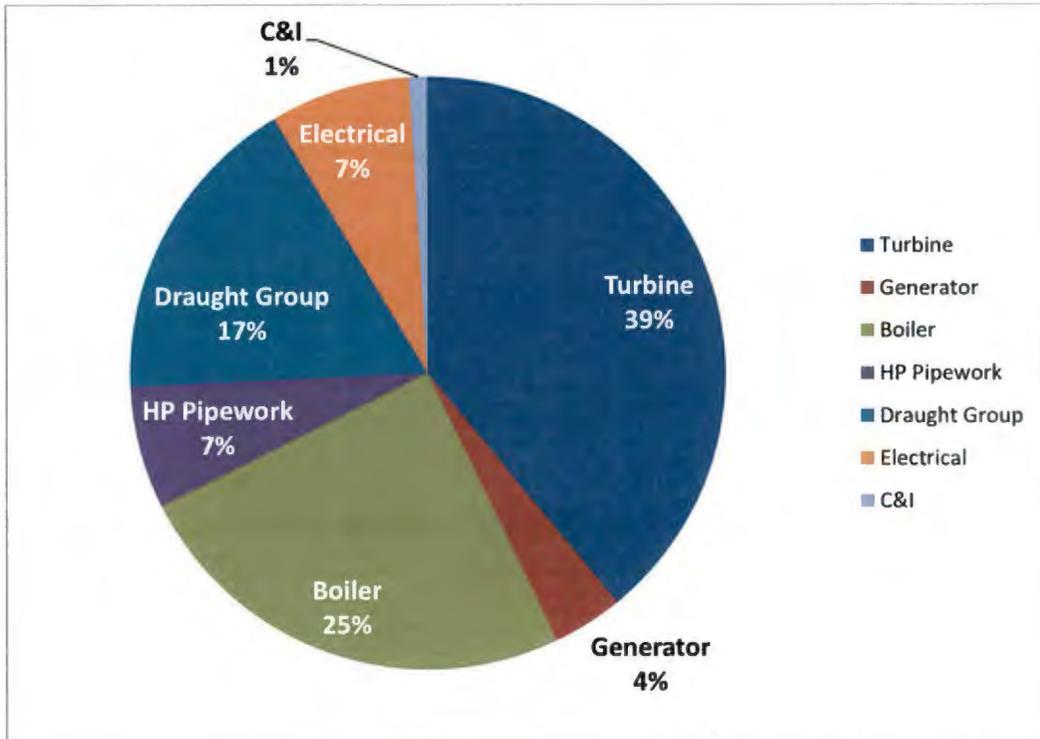
Figure 4-2 below shows that out of all the equipment inspected within January to June 2014, Grootvlei power generating station had more NC's relating to the turbine followed by Duvha and Lethabo during this period. What this means was that the station had more problems with the turbine than other stations represented.

Figure 4-2: NC status in a graphical form 06/2014



What is depicted in figure 4-3 below is that 39% of the problems encountered within the January to June 2014 were related to the Turbine equipment and 25% related to the boiler equipment and the rest occupied by other equipment.

Figure 4-3: NC status in a graphical form 06/2014



4.2.4.3 Inspection results taken from 12/2014

Table 4-6 shows an average number of all NC's recorded from the mid of 2014 until the end of 2014 per power generating station and the equipment inspected within that specific period by the qualified quality inspector.

Table 4-6: Non-conformances per equipment per power generating station 12/2014

Power generating station	Non-conformances/type of equipment inspected							
	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	Total
Arnot	2	4	3	2	3	2	0	16
Camden	10	3	12	0	2	0	0	27
Hendrina	3	0	6	0	0	1	1	11
Komati	6	0		5	3	0	0	14
Grootvlei	22	3	4	0	0	4	1	34
Kriel	7	0	4	0	3		0	14
Duvha	16	0	16	0	9	10	2	53
Lethabo	6	0	2	5	16	2		31
Matla	7	0	5	1	0	0	2	15
Tutuka	3	2		1	4	0	0	10
Equipment totals	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	
Non conformance	82	12	52	14	40	19	6	

Table 4-7 shows an average number of the status of all the non-conformances per station within the specified period per power generating station. This table also provide data relating to which NC's were still open, closed and how many were issued during the time at which the report was written. It further shows which ones were overdue during the time at which the report was written.

Table 4-7: NC status per power generating station 12/2014

	Non-conformances status per station			
Station	Issued	Closed	Open	Overdue
Arnot	16	8	8	0
Camden	27	10	10	7
Hendrina	11	1	5	5
Komati	14	4	10	5
Grootvlei	34	15	19	18
Kriel	14	3	1	10
Duvha	53	20	8	25
Lethabo	31	31	0	0
Matla	15	13	2	0
Tutuka	10	3	3	1
Total overdue				71

Figure 4-4 below shows that out of the 10 power generating stations at study, Duvha station encountered more NC during the June to December 2014 period. The figure also shows that Duvha had more NC's overdue, meaning that they have gone passed their close out period, but Grootvlei power generating station had more NC's that were still open during that period.

Figure 4-4: NC status in a graphical form 12/2014

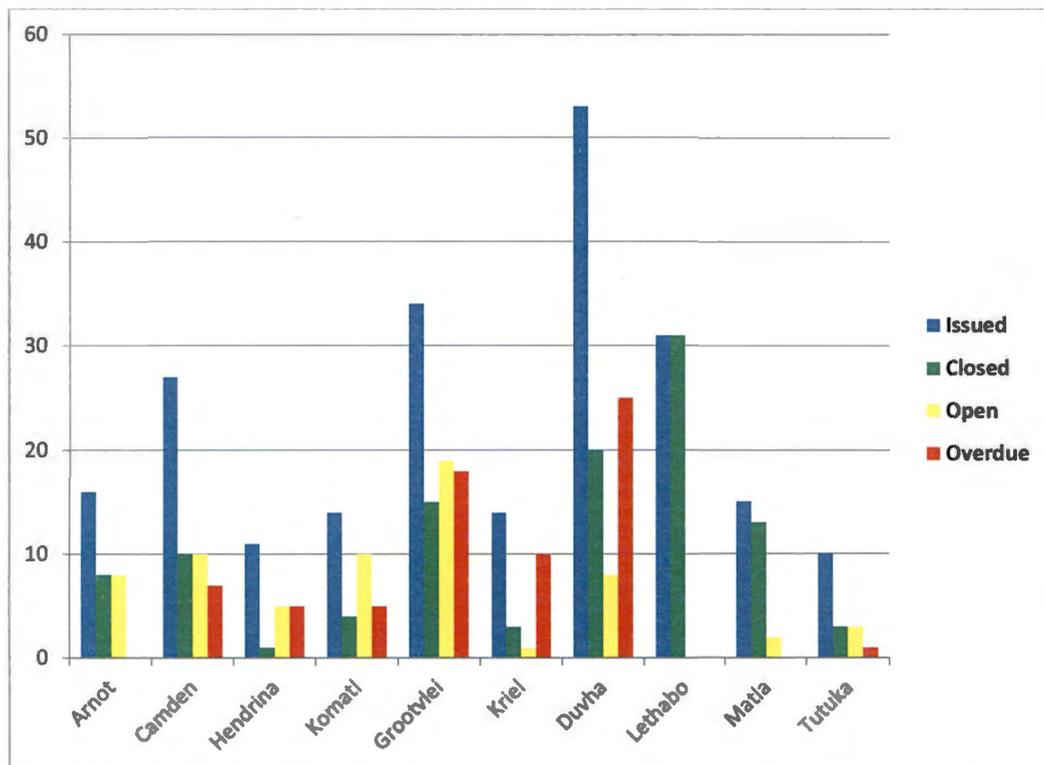
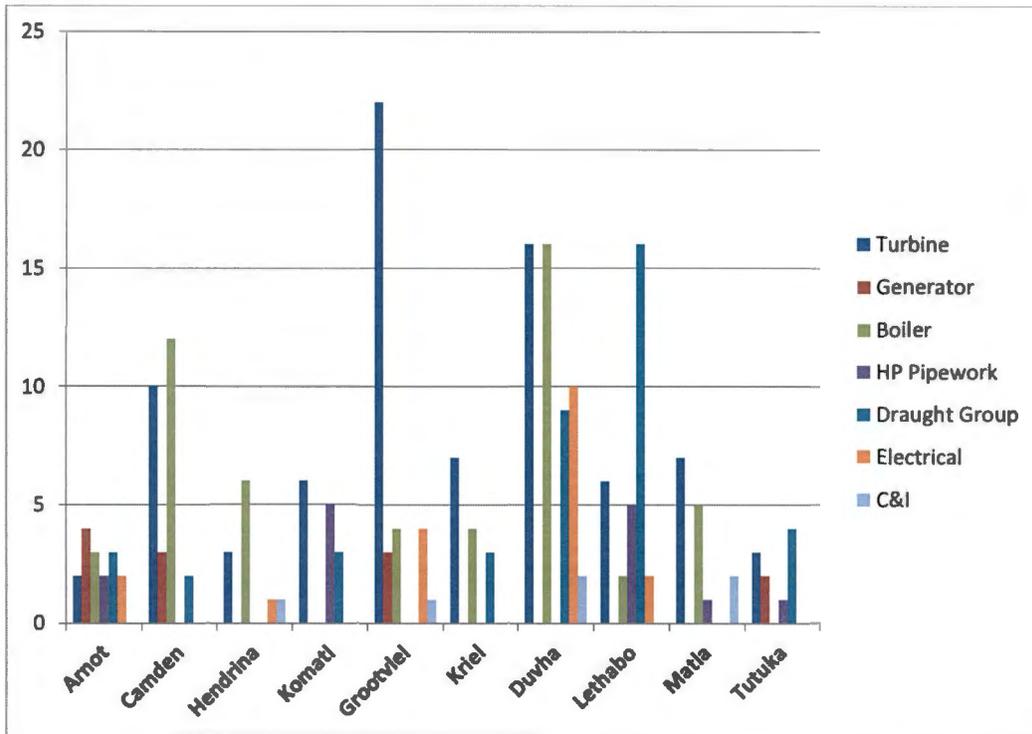


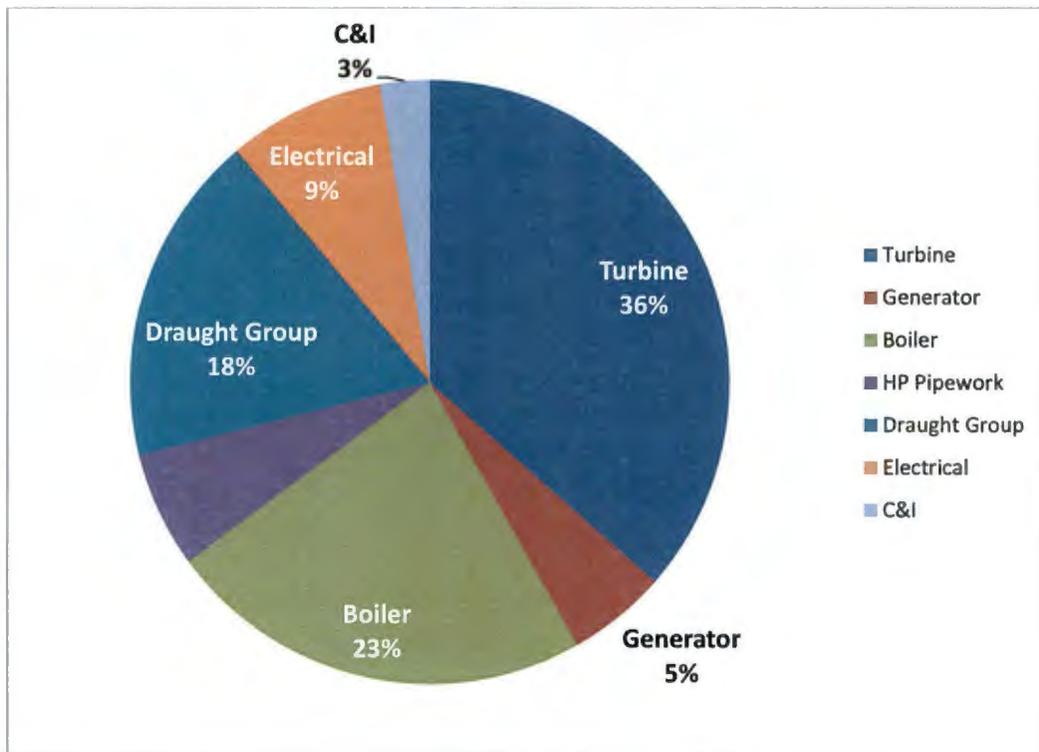
Figure 4-5 below shows that out of all the equipment inspected within June to December 2014, Grootvlei station had more NC's relating to the turbine followed by Duvha and Lethabo during this period. What this means is that the station had more problems with the turbine than other stations represented.

Figure 4-5: NC status in a graphical form 12/2014



What is depicted in figure 4-6 below is that 36% of the problems encountered within the June to December 2014 were related to the Turbine equipment and 23% related to the boiler equipment and the rest occupied by other equipment.

Figure 4-6: NC status in a graphical form 12/2014



4.2.4.4 Inspection results taken from 06/2015

Table 13 shows an average number of all NC's recorded from the beginning of 2015 until the June of 2015 per power generating station and the equipment inspected within that specific period by the qualified quality inspector.

Table 4-8: Non-conformances per equipment per power generating station 06/2015

Power generating station	Non-conformances/type of equipment inspected							
	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	Total
Arnot	2	4	3	2	3	1	0	15
Camden	10	3	11	0	2	3	0	29
Hendrina	3	0	6	1	0	1	3	14
Komati	6	1		4	2	0	0	13
Grootvlei	22	3	4	0	0	4	2	35
Kriel	7	2	4	0	3		0	16
Duvha	13	0	15	0	7	9	2	46
Lethabo	6	0	2	5	18	2		33
Matla	7	0	4	1	0	1	2	15
Tutuka	3	2		1	4	0	0	10
Equipment totals	Turbine	Generator	Boiler	HP Pipework	Draught Group	Electrical	C&I	
Non conformance	79	15	49	14	39	21	9	

Table 4-9 shows an average number of the status of all the non-conformances per station within the specified period per power generating station. This table also provides data relating to which NC's that were still open, closed and how many were issued during the time at which the report was written. It further shows which ones were overdue during the time at which the report was written.

Table 4-9: NC status per power generating station 06/2015

Station	Non-conformance status per station			
	Issued	Closed	Open	Overdue
Arnot	15	8	7	0
Camden	29	10	10	9
Hendrina	14	4	5	5
Komati	13	2	11	0
Grootvlei	35	11	24	0
Kriel	16	5	1	10
Duvha	46	20	1	25
Lethabo	33	31	2	0
Matla	15	13	2	0
Tutuka	10	5	3	2
Total overdue				51

Figure 4-7 below shows that out of the 10 power generating stations at study, Duvha station encountered more NC's during the January to June 2015 period. The figure also shows that Duvha had more NC's overdue but Grootvlei had more open and Lethabo had more NC's closed than all the stations.

Figure 4-7: NC status in a graphical form 06/2015

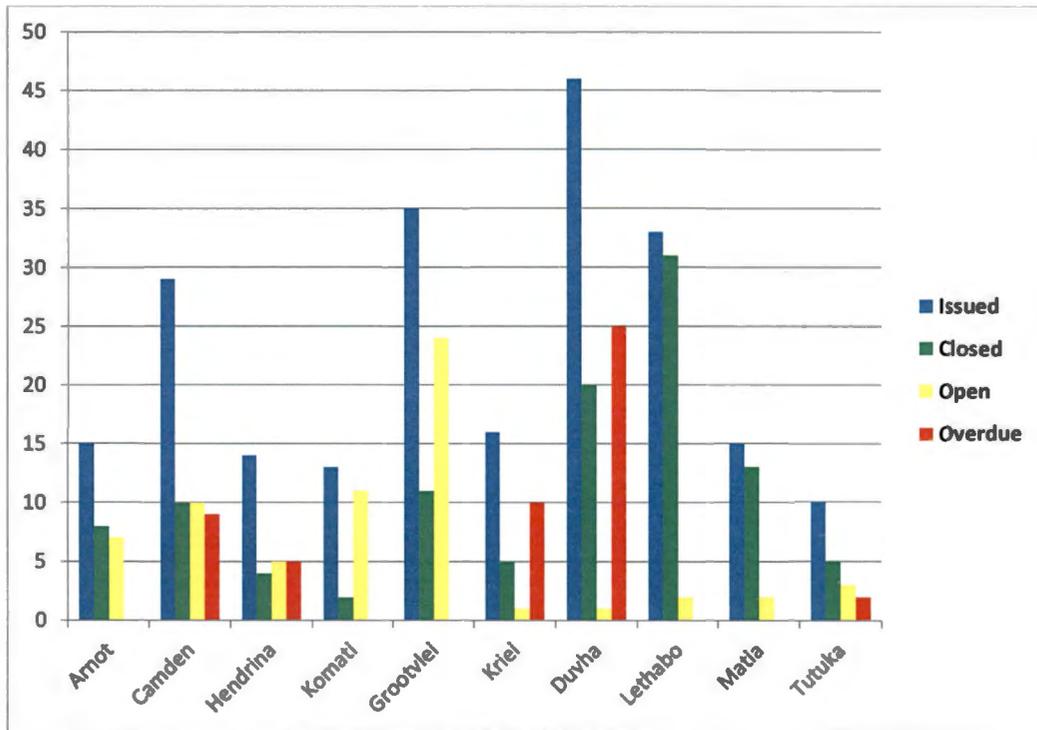


Figure 4-8 below shows; out of all the equipment inspected from January to June 2015, Grootvlei station had more NC's relating to the Turbine followed by Lethabo and Duvha who had more relating to the Boiler equipment during the same period. What this means is that the station had more problems with the turbine than other stations represented.

Figure 4-8: NC status in a graphical form 06/2015

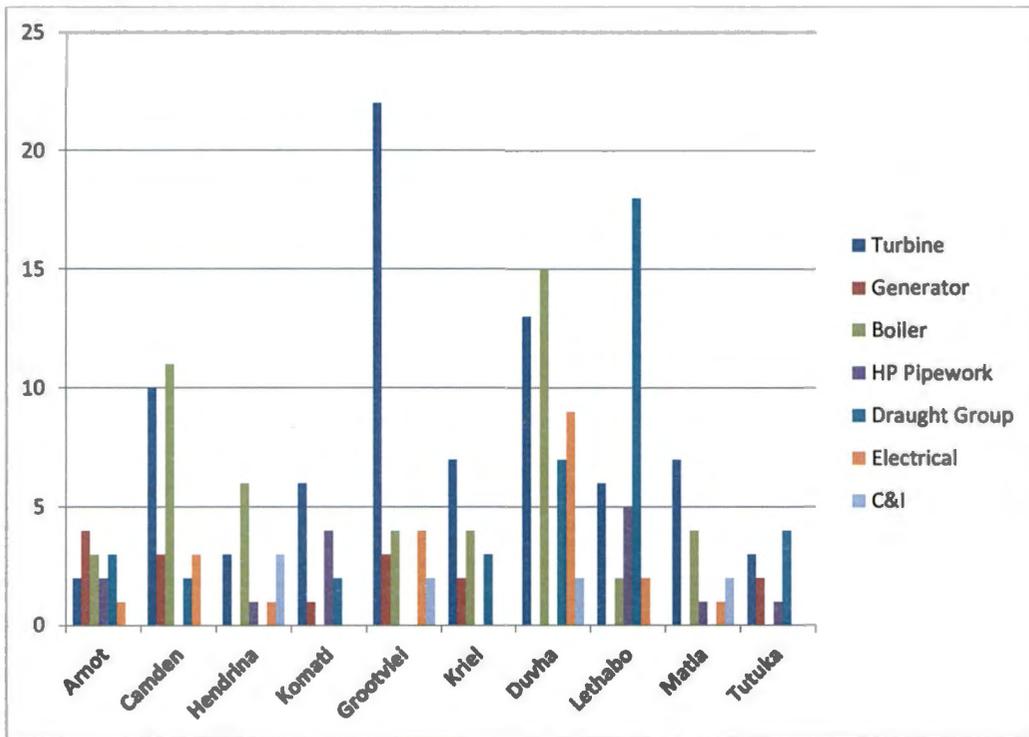
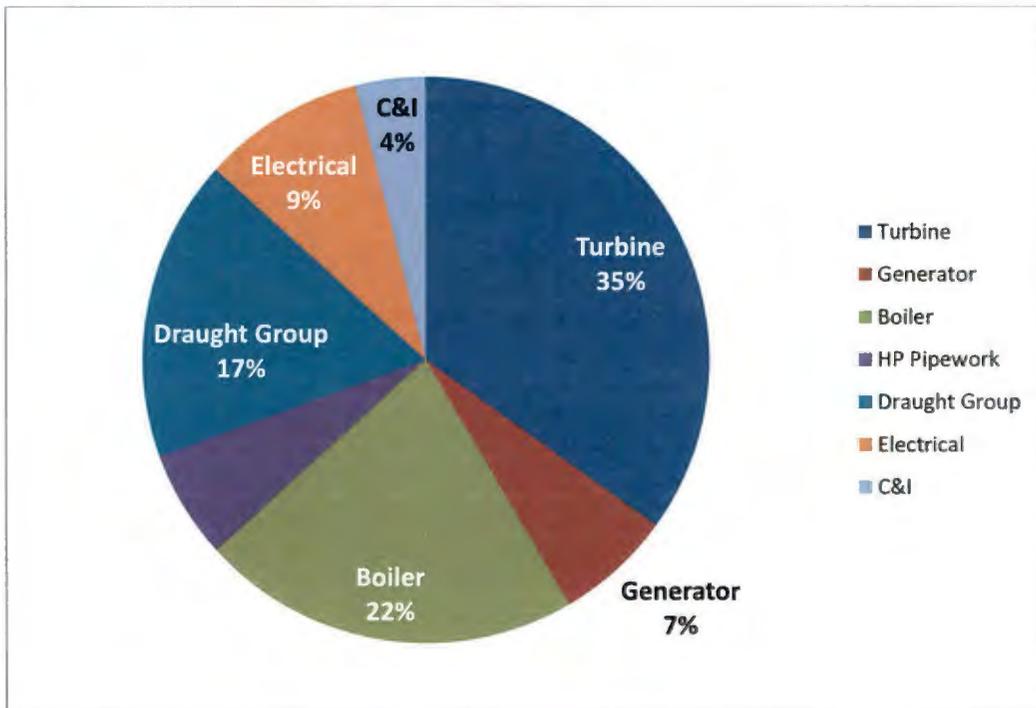


Figure 4-9: NC status in a graphical form 06/2015



Depicted in figure 4-9 is that; 35% of the NC's was due to Turbine failures and 22% of NC's were due to failures occurring in the Boiler.

4.2.4.5 Summary of inspection report findings

Analysis of these inspection reports proves, that repeat failure of equipment (Boiler and Turbine) causes re-occurrence of non-conformances, but the control of non-conforming product clause in the ISO 9001 standard states that; “the organisation shall take action to eliminate the detected nonconformity by taking action to eliminate the detected NC’s” (ISO 9001, 2008:13).

Table 4-10 below shows that:

- In June 2014, 76 non-conformances were overdue or past their elimination time, 39% of non-conformances were due to Turbine equipment failure and 25% was due to Boiler equipment failure.
- In December 2014, 71 non-conformances were overdue, 36% of non-conformances were due to Turbine failure and 23% was due Boiler failure.
- In June 2015, 51 non-conformances were overdue, 35% of non-conformances were due to Turbine failure and 22% was due to Boiler failure.

Table 4-10: Summary of relevant information

June 2014	Table 4-5	76 NC's overdue	Figure 4-3	39% NC's Turbine and 25% NC's Boiler
December 2014	Table 4-6	71 NC's overdue	Figure 4-6	36% NC's Turbine and 23% NC's Boiler
June 2015	Table 4-9	51 NC's overdue	Figure 4-9	35% NC's Turbine and 22% NC's Boiler

From literature, we know that equipment fail due to a number of reasons; aging parts, poor workmanship and bad environmental conditions (Sondalini, 2015:13), however irrespective of the cause of failure, ISO 9001 standard says it must be eliminated to avoid re-occurrence. Because the Turbine and Boiler equipment failure rate were higher than other equipment and that their NC’s often went without being corrected, they simply kept on repeating or re occurring in every period of the study, this only means that control of nonconforming product prescribed by ISO 9001:2009 system was not properly applied and therefore failing.

Below are specific problems relating to Boiler and Turbine equipment failure, collected over the same time period.

4.2.5 The use of the quality engineering audit reports

Data below was collected from various quality engineering audits, depicting common failures relating to Boiler and Turbine equipment during the period 2014 to 2015.

The purpose for using these engineering audit reports was; to further critique the impact that quality management failures is having on Eskom's operations.

Table 4-11: Quality audit engineering reports 01/2014 to 06/2015

Quality Engineering report findings	Corrective measure taken
Turbine: Generator rotor datum were incorrect – (out by 2mm)	Corrected by changing the gasket thickness (from 8mm to 10mm)
Turbine: Air heater radial seals clearance data is not available	Copper pins to be installed to determine the clearances – Engineering Instruction
Still waiting for QCP's from Turbine supplier	Supplier to submit QCP's for the remaining work
Turbine: Objects (welding rods, slings) are being inserted on open ended HP Pipework	NC Issued to the supplier
Turbine drain valves thermocouples were found damaged – suspect damaged during lagging	Investigating the root cause for damage and the QCP being developed for lagging
HP Turbine: Inner casing was delivered with incorrect or small sizes	Sent back to the supplier for repairs
HP Rotor was delivered with an incorrect balancing certificate. Plane 2 has 5 balancing weights and the check sheet or certificate has 4 weights	Awaiting response from the supplier
Turbine: During Unit 1 FAC data packs reviews problems were picked up with documents not matching up	Sent to supplier to rectify

Turbine: No.6 BTM half bearing was not blued to satisfaction.	Supplier to further scrape the bearing
Turbine Centerline (U2): HP/IP, IP/ LP and LP/GEN coupling final concentricity specification (0.04) and final coupling bolt torques (1300bars) could not be achieved after several attempts	Coupling was split to conduct 3D scans to establish if there are errors /distortions
Boiler Valves (U8): The following valves are defective: Drain valves; Blow down regulating & isolating valves; Boiler drum isolating & control valves, Feed reg valves.	Engineering to issue a concession to box up, valves to be changed in the next opportunity
And there are no spares	NC to be issued to the spares co-ordinators
Supplier not adhering to QCP intervention points	NC to be issued to the supplier
Supplier not doing pre-inspections before calling the plant QC representative, which is the reason why most of the inspections fail	NC issued to supplier
Boiler water drain valve has a M16 bolt stuck inside	Recommended valve to be cut out to remove the bolt
Wrong size of spring used on the RH and Main Steam Turbine Lead Valve. Spacers are being used to compensate for length difference	Issue highlighted to Engineering Concession with the contractor to be put in place
Boiler Valves (U8): Supplier site Manager refusing to sign and accept NC issued for boxing-up defective valves without a concession	Outage Manager escalated the NC to the supplier senior management
Outage coordinator refusing to sign and accept the NC for instructing the contractor to box-up defective valves	Outage manager to submit NC to the coordinator
Boiler Secondary Air heater: Expansion joints cracked and damaged found by the suppliers QC representative	Outage manager and Engineering notified but Engineer stated that they must just weld without specifying quality/welding requirements which is in contravention with

	the company's procedures
Turbine: Gland box keys were machined incorrectly several times resulting in delays	Rejected twice, delaying the build-up of the machine
Turbine: HP gland box number 3 radial and axial clearances out of specification on arrival from Matla Workshop for refurbishment i.e. radial clearances too small on short fins and gland box axial position out of specification	New scope of work was issued to Matla workshop to correct both radial and axial clearances and the job is still in progress as it requires machining of spacer ring, spacer ring material was supposed to be 21chrome but due to unavailability of material OEM recommended the use of 13chrome. During RTS gland box axial position was never corrected
Turbine: HP stage 10 diaphragm inter-stage seals configuration wrong on delivery from the suppliers workshop	New seals were found on site and refitted, we discovered that stage 10 seals for units 1,2,3 and 4 are different from units 5 and 6
Turbine: New diaphragm seal groove from the supplier for HP stage 7 were giving wrong axial position due to wrong machining	Adjustments had to be done on the seals by inserting pins on one side and machining the other. Diaphragm had to go back to the supplier
Turbine: LP stages 20 and 21 (both flows) top to bottom clearances too small after machining bores due to butt faces bore oval from supplier refurbishment	NC issued to the supplier
Turbine coupling nuts pressure faces badly damaged with cold welding score marks	To be reworked
Francis turbine and pump alignment out of specification	Send back to the supplier
Turbine: HP and LP jacking oil pumps coupling not locked on the pump side	To be reworked

Turbine: The specified concentricity of 0.01 on LP/GEN coupling spigot ring ID and coupling OD could not be achieved through onsite machining	NC issued
Turbine: Balance weights fitted incorrectly on the spare LP rotor which is to be installed on Unit 2	NC issued
Boiler: Boiler valves packing is failing at 11 Bar	Engineering is reviewing the current spec for the packing used
Boiler: Leak test failed at 5.8 MPa. The steam drum stub to tube weld failed (old weld from RTS)	Repaired. Leak test passed at 6 MPA
Turbine: Pedestal cover was dropped on the pedestal damaging oil baffles. The rigger used the wrong threaded eye bolts to lift the cover	Oil baffles sent to Matla works for repairs. NCR issued to the supplier
Turbine: Indications of cracks were found on the Unit 6 LP rotor steeples	Sent to the engineering supplier for repairs
Turbine: Oil baffles 3 & 5 clearances are out of specification	The engineering supplier to raise a Technical Notification

Because Eskom was certified to the requirements of ISO 9001 standard, control of non-conforming product process is in place, but the information presented in the above table proves that this process was not effectively followed as per the ISO 9001:2008 requirements stated in section 4.2.4.5, this result in the escalation of non-conformances as depicted in table 4-10.

CHAPTER 5: RECOMMENDATIONS AND CONCLUSION

5.1 What conclusions can be drawn from the research conducted?

Looking at the summary of each scenario, below is what was picked up per section:

- 4.2.1: Failure due to lack of leadership support was found to be at 56%, which was the biggest concern among the Eskom contracted employees, followed by the failure due to cultural issues at 44%.
- 4.2.2: Almost all the failure types were represented from the findings gathered from the permanent employees interviews but the failure due to lack of leadership support was the biggest concern at 58%, followed by both failure due to re-occurrence of NC's and failure due to cultural issues at 17%.
- 4.2.3: Failure due to leadership support was observed to be the biggest concern due to a number of failure allocated to this failure type 55%, however failure due to re-occurrence of NC's and failure due to lack of understanding of QMS were both at 20%; it is worth noting that this failure was picked up during the site walk about.
- 4.2.4: Although there was no clear relationship between 4.2.1, 4.2.2 and 4.2.3; when looking at the findings collected from a single case study, 39 % of all non-conformances were due to Turbine equipment breakdown and 25% of all non-conformances recorded in June 2014 was due to Boiler breakdown. Although re-occurrence of non-conformances might not be the only predictor of equipment failure; the findings from this case study proved that re-occurrence of non-conformances plays a role in influencing equipment failures and therefore affect the business operations.

In this study, it was also found that majority of the problems relating to re occurrence of NC's were mostly at Duvha power generating station and that most of them were related to Turbine failures followed by the Boiler failures (see table 4-4, 4-5, 4-6, 4-7, 4-8 and 4-9); it is recommended that should the company decide to follow up on the re-occurrence of NC's and a lack of the utilisation of the quality management systems, Duvha is the best place to start.

Section 4.2.5, depict common issues relating to the Turbine and the Boiler equipment failure, these were highlighted by the quality engineering reports in this section; these issues are the result of re occurrence of NC's; as depicted in section 4.2.4.5, this means that the company is not taking advantage or reaping the full benefits of the implemented quality management system and therefore this system is failing the organisation.

5.2 Recommendations: What improvements of the company's QMS can be proposed?

According to Tricker (2010:85) ISO 9001:2008 has some significant benefits; below is what Eskom can take advantage of:

- ISO 9001:2008 quality management system follows the principle of PDCA principle which supports the continuous improvement methodology. Although the company is certified to the requirements of this system, Eskom is not fully taking advantage of this system, for the company to see significant improvements in their business operation, Eskom should fully adopt this principle prescribed by ISO 9001:2008 system, especially when dealing with issues relating to the Turbine and Boiler problems in order to address most of the shortfalls discovered by this study.
- The ISO 9001:2008 documentation, if followed and maintained properly, can make documents and records management systems easy to use by any organisation. Issues relating to incorrect activities taking place or NC's going passed their escalation period can be solved with a proper use of the document and records management system which already exist within the company.
- The ISO 9001:2008 system can be used by a company of any size. Leadership can show their support of the system by taking a leadership role of the maintenance of the QMS, by ensuring that they support awareness campaigns relating to the QMS and ensuring that resources are available to support this initiative.
- Benefits can be quantified by elimination of non-conformances and therefore eliminate reworks which cost most companies a lot of money. A correct non-conformance process should be drafted and followed by everyone in the company. A non-conformance process should be such that NC's can be identified and trended to show any reoccurring NC's and the ones that has passed their escalation period.

5.3 Research objectives

5.3.1 Primary objectives

The primary objective of this research was to critique the impact that Eskom's quality management system failures has on business operations. The study provided information showing that the failing quality management system is directly related to the failing Turbine and Boiler equipment. With a proper quality management system in place, most Boiler and Turbine non-conformances will be identified, root cause will be identified and a preventive measure will be determined (ISO 9001, 2008:14).

5.3.2 Secondary Objectives

The secondary objectives of this research were as follows:

- To provide recommendations of how the business can resuscitate its quality management system;
- to determine whether the introduction of ISO 9001:2008 quality management system has changed or improved the way the business operate; and
- to assess the reasons why Eskom's quality management system is failing.

The secondary objectives of this study were met but it is worth mentioning that the company's QMS has not collapsed but more damage can be done to the system should it be left the way it was during the time of this study. Through this study it was also evident that the company has not fully benefited from the implementation of the ISO 9001:2008 systems. A proper leadership support and training tailored towards covering all key employees within the business can greatly benefit the business.

5.4 Final conclusion

If the company is to see clear benefits from the introduction of the quality management system, leadership needs to be in the forefront of its management systems; they need to understand the role they play in the management of these processes; they also need to be contracted by the company on the maintenance of the quality management system by ensuring that:

- They establish measurable quality and business objectives.
- They approve the quality policy and set out the vision for quality in the business.
- Resource plans are available for quality management.
- They focus on meeting customer (both internal and external) requirements to enhance customer satisfaction.
- Define and communicate responsibilities and authorities within the company.
- They assist in the appointment of management and executive representative for quality, to enable the development, implementation, co-ordination and promotion of the requirements of the management system.
- They review the management system in accordance with the documented management review procedure as stipulated by ISO 9001:2008.
- Assist in planning the implementation of total quality management and business excellence in the company.

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ANNEXURE 1

QUALITATIVE QUESTIONNAIRE TO CONTRACTED QUALITY PROFESSIONALS

The questions below were focused at the contracted Eskom quality professionals mostly coming from the quality control background; the aim for these questions was to assess or gauge the understanding of the interviewees understanding of topic being studied.

1. The term quality management, what does it mean to you?
2. In your own words, what is quality control?
3. Can you define your daily work activities?
4. Do you think your skills and experience is effectively used by Eskom?
5. Is there anything else that you think you can offer that the company is not taking advantage of?
6. How often does your employer contact you in a month?
7. Do you think your employer cares about your health and your wellbeing (please explain)?
8. What is your understanding of the cost of poor quality?
9. Do you think Eskom is doing all they can to make your work pleasant?
10. Do you think you are being effectively utilized by Eskom?
11. How is your relationship with the Eskom people (please explain)?
12. Do you have any other issues you may want to address?

ANNEXURE 2

QUALITATIVE QUESTIONNAIRE TO PERMANENT QUALITY PROFESSIONALS

The questions below were aimed at the permanent Eskom quality professionals mostly coming from the management and quality assurance background. The aim of these questions was also to assess the knowledge of the professionals understanding of the topic being studied

1. What does the term Total Quality management (TQM) mean to you?
2. Do you know the benefits of QMS?
3. Do you think Eskom is taking advantage of such benefits and why?
4. Do you think Total Quality Management is failing/ succeeding in Eskom?
5. Do you think the implementation of ISO 9001:2008 was a great success?
6. Where do you think the company failed or succeeded?
7. Do you think Eskom contractors are effectively utilized (please explain)?
8. What do you consider to be the limitations of Eskom's QMS?
9. Do you think the management of quality affect employee morale (please explain)?
10. How is the relationship between Eskom's quality staff and outage (maintenance) management contractors?
11. Do you have any other issues you may want to address?