THE REVITALISATION OF PROJECT MANAGEMENT CAPABILITY MATURITY IN THE ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION INDUSTRY - THE CASE OF ESKOM IN THE REPUBLIC OF SOUTH AFRICA

by

TSHEPISO CHRISTIAN MOEPI

DISSERTATION

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SUPERVISOR: Prof G.P.J. Pelser

CO-SUPERVISOR: Prof O. Fatoki

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DECLARATION

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I declare that **THE REVITALISATION OF PROJECT MANAGEMENT CAPABILITY MATURITY IN THE ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION INDUSTRY - THE CASE OF ESKOM IN THE REPUBLIC OF SOUTH AFRICA** dissertation hereby submitted to the University of Limpopo, for the degree of **Masters of Commerce** in Business management has not previously been submitted by me for a degree at this or any other university, that it is my own work in design and execution, and that all the materials contained herein has been duly acknowledged.

Moepi, T. C.	14 June 2019
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Surname, Initials (Title)	**Date**

ABSTRACT

This research focuses on the evaluation of the project management maturity at Eskom. The problem is that Eskom struggled with delivery of projects as planned. The main objective of this research was to identify an applicable PMMM to assess the project management maturity level of Eskom's core business units, namely Transmission, Distribution and Generation, by assessing its capability to undertake projects effectively in order to provide electricity to the Southern Africa communities. A quantitative research methodology was selected. A survey was conducted with a closed-ended questionnaire made up of three parts (Applicable project management maturity model, project management culture and project management organisation strategy maturity). The population consisted of senior project managers, project managers, and related project management personnel from Eskom in MegaWatt Park Johannesburg. 200 questionnaires were distributed to the Eskom business units, namely Distribution, Generation and Transmission project management employees, selected purely on their experience and knowledge, hence purposive sampling was used. Surveys were emailed to the respective project management personnel with the help of the senior manager. 133 were returned. This is a response rate of 66 %, which was deemed acceptable. Descriptive statistics was utilised to assess the project management maturity level of Eskom business units. Statistical Package for Social Sciences version 24 (SPSS) was utilised for the purpose of data and reliability analysis. Correlation and linear regression analysis were undertaken to evaluate influence of maturity levels of organisational strategy and culture on the project management maturity level. A Cronbach's Alpha was utilised to measure the reliability of the data. It was concluded there were project management process areas, not performing well. Namely: project time management, project cost management and project procurement management. The assessment of project management organisational factors indicated that project management culture maturity did not perform well. It performed under the project management maturity level of Eskom. The recommendations of this study are that the applicable project management maturity model proposed should be continuously utilised to evaluate the project management maturity of Eskom on an ongoing basis; there should be a significant cultural change and a project management office should be established.

DEDICATION

This dissertation is dedicated to His grace the Right reverend Bishop Dr Barnabas Engenas Lekganyane., who through His guidance, mentorship and love, I was able to master this study. My late grandmother Nnaniki Maria Matlala, who passed away before the witness of great things,

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Chapter 1 : Introduction and background of the research

1.1 Introduction to the research

Many organisations are utilising project management to initiate, plan, manage, execute and complete their projects successfully. The reason for using project management is ensuring on time delivery, within budget and achieving the specifications required. Organisations should know how to effectively execute their projects to be capable of competing (Kerzner, 2002; Spalek, 2014) . In the 1960 – 1980s, the highest priority for project managers was the delivery of the project on time and within cost (Badewi, 2016). The effective utilisations of the project management process areas at the operational level enabled successful project outcomes. The following factors indicated the success of the project: delivery of the product or service is done timeously and on schedule (time); the costs incurred did not exceed the budget for the project, or funds were not underutilised (cost); and the deliverable is complete and as planned (scope) (Badewi, 2016). Performing against operational performance measures is not adequate if not for the achievement of strategic objectives. Strategic projects are in many instances initiated to reach business goals. This requires that the project management be perfectly aligned with the organisation's strategy (Yazici, 2009). The project is not only governed by the strategy of the parent organisation but can in turn influence the organisation's strategy (Yazici, 2009).

To assure that a company will reach its strategic objectives, a certain level of maturity in project management must be set and achieved. Simangunsong and Da Silva (2013) argue that the use of a project management maturity model (PMMM) provides a framework, which enables an organisation to develop its capabilities to deliver its projects successfully. The PMMM allows organisations to assess their project management methods and processes according to project management best practices. The maturity level reflects how well the organisation has performed with project management integration and management (Demir and Kocabaş, 2010). Organisations achieving high maturity levels can effectively manage and run projects. The benefits of project management maturity measurement are rooted in project prioritisation, development of improvement plans and a change in culture after assessing the current project management maturity level (Backlund, Chronéer and

Sundqvist, 2014). Project management maturity levels in organisations differ as organisations are different from each other and so are their project processes, project management implementation and methodologies (Miklosik, 2015). These variances are the outcomes of generic and special project management practices and processes, to be adhered to by the organisations. An appropriate PMMM must identify specific actions for implementation to improve the project management maturity level of the organisation instead of only identifying the project management maturity level.

Many organisations simply anticipate their ongoing performance of the project management at the required maturity levels, but never realise, there should be a timeous project process development. Failure to do so will result in achieving a very low maturity level (Burde, 2008). When an organisation undertakes a project management maturity assessment against a standard model, it will be able to identify its achievements and to know its strengths and weaknesses; therefore, it can take informative action to improve its maturity level. Enhancing the maturity level of the project management signifies intensive efforts directed to improve and establish the systematic implementation of project management. (Mihic, Petrovic, Obradovic and Vuckovic, 2015). This research focuses on the evaluation of the project management maturity of Eskom. Eskom struggles with delivery of projects as planned and needs to assess its capability to undertake projects effectively in order to provide electricity to the Southern African communities. Three business units of Eskom will be the focus of the study: namely: Generation, Distribution and Transmission.

South Africa has a mandate to ensure a sufficient supply of electricity to households, industrials and mines and Eskom is the driving force to achieve this goal (Khembo, 2015). Eskom is one of the state owned entities and its mandate is to generate, distribute and transmit power to South Africa (Ntshangase, 2017). Eskom owns the power network of over 300 000 kilometres of electricity lines with the transmission grid of over 27 000 kilometres (Muresan, 2017). The mandate of the Generation unit is to develop, maintain and control Eskom's power generating properties and assets for their lifetime period (Eskom, 2014a).

The Generation Unit of Eskom regulates the power generation plants, which consists of hydroelectric, wind and nuclear units, open cycle gas turbines, and coal fired plants.

The generation of around 95 per cent of the power utilised by South Africa is from Eskom, while four to five percent comes from neighbouring countries. Due to the rising increase in electricity demand, additional power stations are under construction by Eskom to meet the demand. Eskom began the expansion of their generation and transmission in 2005. By then, the generation capacity was 36 208 megawatt (MW), with the project aiming to add 17 384 megawatt (MW).

Eskom initiated the project of Medupi and Kusile power stations as part of its capital expansion to achieve its organisation strategy. Medupi, located in Limpopo province of South Africa, is a coal-fired power station. This plant can produce four thousand eight hundred megawatts(MW) (Pooe and Mathu, 2016) while Eskom trades electricity with the South African Development Community (SADC); this has limitations and Eskom has to safeguard the power supply of South Africa (Eskom, 2014a).

The Transmission unit's mandate is to develop, manage and provide maintenance to the assets and properties at its disposal to provide uninterruptable power interconnection, with the emphasis on energy supply balance and the international energy market (Eskom, 2014a). The Transmission unit is made up of 157 substations and 29 900 kilometres of lines (Eskom, 2014a).

The Eskom Distribution unit has a mandate to deliver electricity from the Generation unit to the Transmission unit and to develop, control, and maintain properties and assets associated with it, by establishing partnerships with industry leaders (Eskom, 2014a). The Distribution unit forms a network structure or a base to deliver electricity from the Generation unit through the Transmission unit to the end user being Eskom clients (Eskom, 2014a). The Distribution unit has electricity distribution lines in the region of 46 712 kilometres, reticulation power lines of about 308 899 kilometres, and approximately 11 018 kilometres of cables going underground, crowning it to be Africa's largest power line system (Value, 2002). Eskom has experienced power generation problems and what was named, stage 3 load shedding which resulted in about R80 billions of expenditure to South African economy (Rambe and Modise, 2016).

1.2 Problem statement

Turner (2014) observes that during the expansion of project management in the 1990s the question grew as to what exactly could or should organisations be gaining from investment in more professional project management. More than 30 PMMMs exist and these models lack detailed descriptions of their elements, are difficult to understand and possess several disadvantages (Neverauskas and Railaite, 2013).

The majority of PMMMs use five level models for evaluating the project management processes of organisations. It is recommended by Neverauskas and Railaite (2013) that researchers should critically interrogate the features, pros and cons of PMMMs that are in existence and attempt to select the most suitable one. Most of the PMMMs cater for different kinds of organisations but none has been developed for the evaluation of the project management maturity of electrical utilities.

As discussed in the previous paragraphs, Eskom struggles with delivery of projects as planned. The project management maturity level that Eskom operated at, is unknown (De Souza and Gomes, 2015). A PMMM to evaluate the efficiency of the organisational processes and practices with consideration of the environmental specifications, challenges and constraints of Eskom, does not exist. Such an appropriate, relevant PMMM can assess the effectiveness of the utility's project management efforts and highlight grey areas, which call for improvement. The model to be developed must assess the Eskom project management maturity, and must indicate changes required to the organisational strategy and organisational culture of Eskom's business units. An applicable model can therefore assess the level of project management maturity at Eskom in order to identify areas for intervention.

It is against this background that this study will seek to measure the project management maturity level of the core business of Eskom: Generation, Transmission and Distribution.

1.3 Purpose of the study

1.3.1 Aim of the study

The aim of the study is to develop an appropriate PMMM to determine the project management maturity level of Eskom's core business units (Transmission, Distribution and Generation) in order to point and highlight areas for improvement.

1.3.2 Objectives of the study

The objectives of this study are to:

- Identify an applicable PMMM to assess the project management maturity level of Eskom's core business units, namely Transmission, Distribution and Generation;
- Determine the current project management maturity level of Eskom's core business units: Transmission, Distribution and Generation;
- Determine the current project management culture maturity level of Eskom's core business units: Transmission, Distribution and Generation;
- Determine the current project management strategy maturity level of Eskom's core business units: Transmission, Distribution and Generation;
- Evaluate influence of maturity levels of organisational strategy and culture on the project management maturity level.

1.3.3 Research questions

The research questions for this study are:

1) What is the applicable PMMM to assess the project management maturity level of the core business of Eskom?
2) What is the current project management maturity level of Eskom's core business units?
3) What is the current project management culture maturity level of Eskom's core business units?
4) What is the current project management strategy maturity level of Eskom's core business units: Transmission, Distribution and Generation;
5) How do the maturity levels of organisational strategy and culture influence the project management maturity level?

1.4 Literature Review

Many projects are completed very late. This problem can be solved if the appropriate and relevant project management methodology is effectively utilised in the organisation (Miklosik, 2015). Kerzner (2002) concludes that the on-time delivery, within the budget completion and the completed scope of the project, are the characteristics of the organisation's ability to manage the project effectively and efficiently and this is crucial for the sustainability of the organisation.

PMMMs are the instruments designed to assess progress toward maturity by providing a systematic means to perform benchmarking and are considered to add value to organisations trying to achieve continued improvement (Pasian, 2014). The main concept of PMMM originated from the Humphrey Watts capability maturity model, created in the United States of America between 1986 and 1993 in Carnegie Mellon University (Goksen, Cevik and Avunduk, 2015). The Software Engineering Institute (SEI), with the help of Mitre Corporation, started to create a project management process maturity structure that assisted the developers to upgrade the business software processes (Goksen, Cevik and Avunduk, 2015).

The researcher developed the framework for analysis in Figure 1-1. As shown in Figure 1.1, various project management maturity models will be critically analysed and compared, the levels of the project management maturity models analysed; key process areas in project management taken into consideration; and measurement and goals will form the basis for the applicable project management maturity model. The organisational factors influencing the maturity (culture and strategy) were incorporated into the Applicable project management maturity model; and the improvements in project management maturity levels will be suggested and advised.

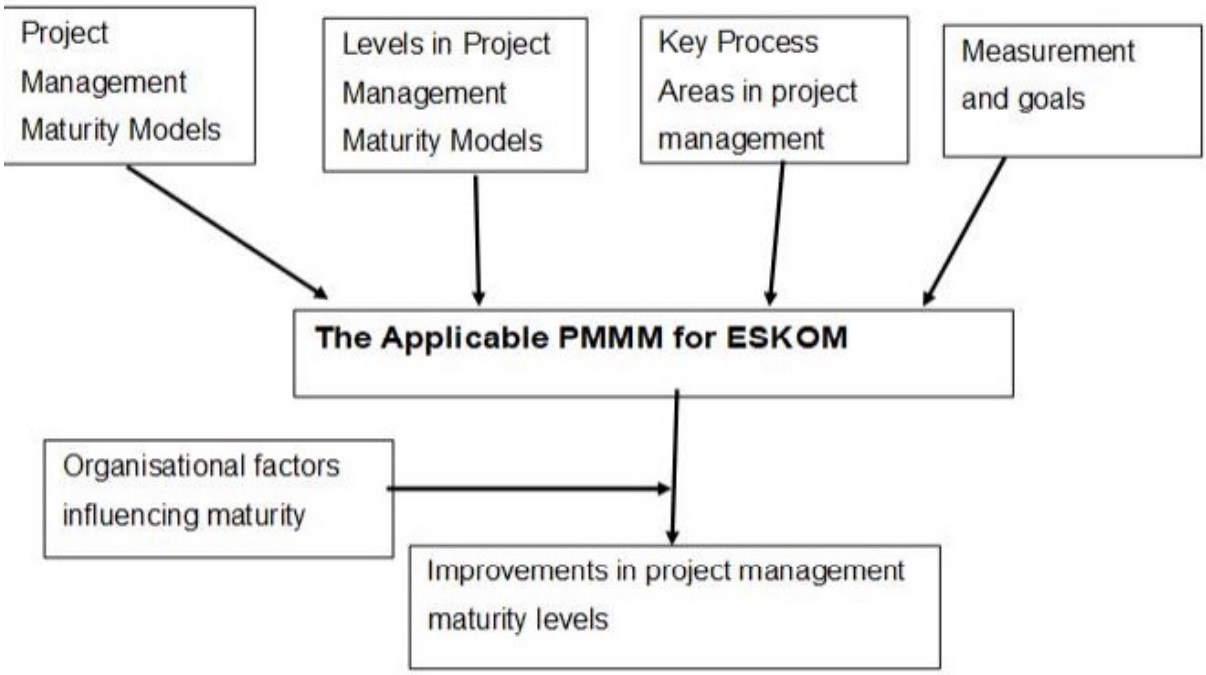

Figure 1.1: Framework for analysis (researcher)

The selection of the applicable project management maturity model as shown in Figure 1.1 was based on the various project management maturity models, which were critically analysed and compared. The levels of the project management maturity models were analysed; key process areas in project management taken into consideration; and measurement and goals formed the basis for the applicable project management maturity model. The organisational factors influencing the maturity (culture and strategy) were incorporated into the applicable project management maturity model and the improvements in project management maturity levels will be suggested and advised to Eskom.

1.5 Definitions of key concepts

The concepts used in this study are defined as follows.

Project

A project consists of systematic and sequential activities that are complex and unique, with a goal or purpose that has a deadline, specific budget and strict specifications (Munz, 2017).

Project Management

Project management is an organised technique approach that is deeply rooted in common sense and uses the relevant stakeholders' involvement so as to achieve customers' needs and deliver higher than expected business value (Wysocki, 2014).

Project Management Maturity

Maturity means fully developed, or perfected (Tahri and Drissi-Kaitouni, 2015). However, project management maturity is the organisation's current level in regards to its project management processes (De Souza and Gomes, 2015).

Maturity Model

Ahlemann, Schroeder and Teuteberg (2005) define a maturity model as a conceptual model to assess advances in phases of increasing quantitative or qualitative capability of a maturing element with respect to defined focus areas. A maturity model has a structure that is utilised for intensive evaluation of the organisational process and best practices position, hence allowing for comparison of the results with other organisations.

Maturity level

Maturity level means the description of the improvement of consistency, control and visibility of assembled project management capabilities (Tahri and Drissi-Kaitouni, 2015). Maturity level is the consequence of the maturity model. After assessing the business practices and processes of the organisation, the maturity level is derived at. In the first or lowest maturity level, the project management practices and process are hardly defined and ad hoc but the highest and last level is characterised by the excellent results and the continuous improvement of the processes (Tahri and Drissi-Kaitouni, 2015).

Capability

Tahri and Drissi-Kaitouni (2015) observe that for an organisation to implement project management processes and produce good products, it must possess a specific project management competency. Capability is the ability of an organisation to effectively

perform project management functions and manage business processes and practices efficiently.

Process

A process is the project governance which assists the organisation to reach its objectives by defining the project objectives, the constant monitoring of the current progress and performance, and the integration of the project management functions (Turner, 2014). The processes are the appropriate and relevant processes that will safeguard the competitive advantage of the organisation continuously, these include continuous learning amongst others, the aim being to revise the organisation's strategy (Song, Kim, Yu, Lee and Lee, 2012).

Key Performance Indicators (KPI) Analysis

The measurement and intensive analyses of all the project elements and specification of the knowledge required to perform the project activities (Todorović, Petrović, Mihić, Obradović and Bushuyev, 2015).

Best practice

It is the currently identified optimal way by businesses to attain a specified objective or goal. It is the capability and consistency of the successful delivery of a project, and the predictability of the implementation of the organisation's strategies which characterises the best practice (Bettuzzi, 2009).

Organisational strategy

These are the goals created by the senior management to reach results or feedbacks that are in line with the goals and missions of the organisation (Song, Kim, Yu, Lee and Lee, 2012).

1.6 Research Methodology

Primary respondents of the study are those people directly related to the research being carried out (Habib, Pathik and Maryam, 2014). Primary respondents were the Eskom project management personnel. The research was a survey with a positivistic

design. A structured questionnaire with responses which require a choice to be made which made it easy to be coded into numbers to perform statistical analyses (Sumerson, 2014).

There were 200 project management personnel involved and employed by Eskom in the selected three Eskom departments. The researcher asked the senior manager to indicate who should participate in the study. The following groups of Eskom project management employees constituted the population:

- Executives or Senior project managers
- Project managers
- Project management personnel.

To allow for non-return of some questionnaires it was proposed to select the whole population as the potential respondents due to its size. Purposive sampling was used as the researcher requested Eskom senior manager to select the study respondents. Self-constructed questionnaires, which encompass the proposed PMMM, were utilised in this study. The questionnaires were distributed to project management personnel with the help of the personnel unit of Eskom. The gathered data were analysed with the use of the SPSS statistical software package version 20. The data analyses used inferential and descriptive statistics.

1.6.1 Reliability and validity

The reliability of the questionnaire was tested by calculating the Cronbach's Alpha value; if it is above 0.70, it indicates a high internal consistency above (Passos, Silva, Pitangui, Oliveira, Lima and Araújo, 2017). The Cronbach's values from the survey were calculated and found to be above 0.70. The validity was ensured with the help of the theoretical PMMMs and adjusting them for this study. Statistical validations were used (Caillaud, Rose and Goepp, 2016). The capability of the survey to present the same or similar outcomes under similar setting refers to the reliability (Vergopia, 2008). The validity was ensured by using accepted theoretical PMMMs and adjusting them for this study. The senior Eskom project manager checked to see if the questions were clearly worded and that some aspects were not left out and questions that did not fit, were excluded (Sumerson, 2014). This indicated high consistency.

1.6.2 Research delimitation

The study is limited in scope to the following:

This research is limited to the electricity Generation, Transmission and Distribution industry of Eskom. Only Eskom employees were considered in the research, hence the project management maturity level of Eskom could be very different from its clients' perspective.

1.7 Significance of the study

The methodology and procedure is applicable to other electrical organisations, internationally and locally. As this applicable PMMM is not generic, it is applicable to other organisations on any type of a project.

This study enabled Eskom to advance its strategic goals by applying the project management processes, best practices and principles.

This proposed PMMM will assist other utilities to assess their project management maturity to benchmark themselves.

This study will help Eskom identify best practices and processes in their possession and ones not in their possession.

After implementation of the project management improvements, Eskom may start the project management maturity evaluation cycle again to evaluate the improvement effect. Utilities may improve in the areas identified as weak by the PMMM assessment.

1.8 Ethical considerations

The ethics in studies refers to ensuring that the actions of the programme evaluator are in no way causing harm or potential harm to programme participants, vested stakeholders, or the greater community (Spaulding, 2016). Ethical clearance from the Turfloop Research Ethical Committee was obtained, and the terms and regulations were complied with. The purpose of the study was explained to participants of the survey. The Eskom project management personnel had the right not to disclose information classified as private. The relationship was professional, based on trust between the researcher and the participants. The data collected from the participants were treated as confidential and respondents participated voluntarily.

1.9 Layout of the chapters

This study consists of five chapters, which constitute the dissertation, and here is their layout:

Chapter One: An introduction to the study presenting a critical discussion of the problem statement, hypotheses, purpose of the study, aims and objectives, research scope, significance of the study and ethical issues thereof.

Chapter Two: Here literature is reviewed and an empirical study relating to the PMMMs in relation to Eskom Transmission, Generation and Distribution of electricity is effected. The prescribed journals, relevant textbooks, articles, and previously researched project management maturity documents were included in the literature review.

Chapter Three: Provides an overview on the electrical utility Eskom of South Africa. In this chapter, history and background of Eskom are presented. Three business units of Eskom are distinguished. The projects, strategic goals, and challenges of Eskom are presented. There is a conclusion on the problems encountered by Eskom for delivering the projects.

Chapter Four: Focuses strictly on the research methodology with research design included were applicable for this research purpose.

Chapter Five: Focuses on the examination of gathered data from the respondents of the questionnaires, analyses and presentation of data collected.

Chapter Six: Focuses on the discussion of the obtained results, come to conclusions, and the recommendations.

1.10 Summary

This chapter briefly discusses the background of the research, the problem statement, the purpose of the study, aims and objectives including research questions, research

scope, significance and ethical considerations of the study and the layout of the chapters of the study. The literature on the project management and capability maturity will be reviewed in the following chapter.

Chapter 2 : Project management maturity

2.1 Introduction

This chapter deals with the critical review of the literature on project management, investigate research already done and evaluate concepts related to project management maturity and PMMM.

2.2 Project management maturity models

In this section, the project management maturity model overview is presented.

Bearing in mind the vast number of measures used in project management, as well as the large number of the measures able to reflect a project's success, it is crucial that an organisation evaluates its project management maturity (Todorović, Petrović, Mihić, Obradović and Bushuyev, 2015). The purpose of the PMMMs is to critically evaluate the organisation's project management maturity and assist it to improve so as to produce excellent projects (Todorović, Petrović, Mihić, Obradović and Bushuyev, 2015).

A PMMM may be appropriate and relevant for an organisation but irrelevant and inappropriate for another one which is the reason many organisations have integrated several PMMMs into one PMMM so as to have an efficient and effective assessment of its project management maturity level (Tahri and Drissi-Kaitouni, 2015). Albrecht and Spang (2016) proposed that in future research a distinction should be made between a generic PMMM and a contingency approach where a PMMM is developed for each organisation. This research takes a step in the latter direction as a PMMM will be developed for a specific organisation namely Eskom. This research will therefore concentrate on the selection and evaluation of a specific model for Eskom in South Africa.

2.3 The framework for analysis

In this section, the framework for analysis is presented.

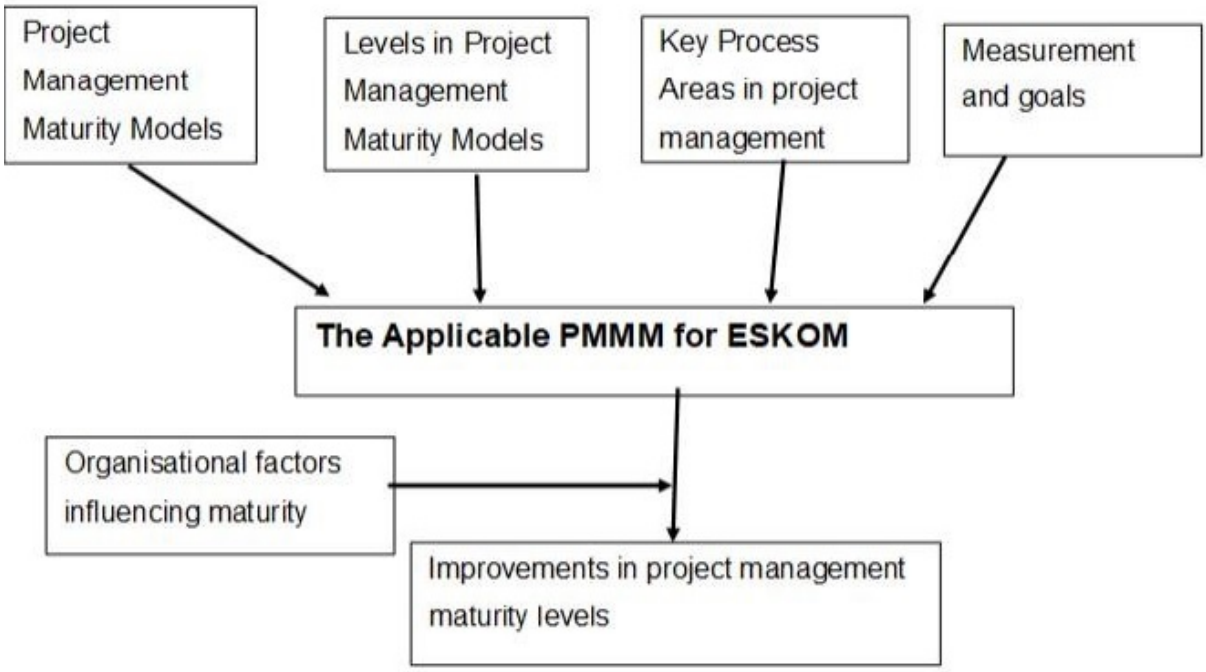

Figure 2.1: The framework for analysis (researcher)

The framework (Figure 2.1) illustrates the paragraphs in chapter two, various project management maturity models will be critically analysed and compared, the levels of the project management maturity models will be analysed; key process areas in project management taken into consideration; and measurement and goals will form the basis for the applicable project management maturity model.

The organisational factors influencing the maturity (culture and strategy) were incorporated into the applicable project management maturity model and the improvements in project management maturity levels will be suggested and advised to Eskom.

Conclusion

This framework for analysis will guide the literature review presentation in this study.

2.4 The evolvement of project management maturity models

In the 1950s the first PMMMs were developed. The assigning of levels of maturity to (project) management structures is rooted in the disciplines of quality and process management as epitomised firstly by Deming and later by Crosby, coupled with the management of software engineering projects as proposed by Paulk, Curtis, Chrissis and Weber (1993), and Albrecht and Spang (2016). Maturity models are also deeply rooted in the Project Management Body of Knowledge (PMBoK), as PMBoK is one of the sources for project management processes, process areas, and tools and practices. The generic project management processes of PMBoK are formalised and used widely in organisations (PMI, 2013; De Carvalho, Patah and De Souza Bido, 2015).

Project management has evolved into a discipline without which many organisations cannot function. In the modern world, the objectives of the projects are no longer just to create goods or services but rather to develop in such a way as to create a competitive advantage (Bettuzzi, 2009). Project management has evolved over time and this evolution occurred mostly due to the tools and techniques applied to problems experienced in single projects and the gradual improvement of human resource management (Spalek, 2014). The problems experienced are classified into three groups (Miklosik, 2015).

Firstly, low quality outputs and benefits – each project is implemented because of its benefits. These can include both financial and non-financial positive impacts for various groups (clients, suppliers, final users, country, inhabitants, investors and other stakeholders). Failing to deliver the outcome benefits is a serious problem for a project, because if it happens, there is no reason to continue with it (Miklosik, 2015). Secondly, increased costs – many projects require additional funding over its lifespan. The problem is that many projects end with a project overrun in time and this problem requires additional resources (Miklosik, 2015). Thirdly, non–achievement of schedules – projects tend to last longer than expected, despite the fact that their overrun on average was seven percent (7%) while, in other studies, this is classified as a major problem and often re-occurring (Miklosik, 2015). Although technological advances have brought new software applications that can perform scheduling techniques

(Spalek, 2014), reducing the completion time of projects is significant but not sufficient anymore. A new approach to effectiveness improvement is necessary. Martens, Carneiro, Martens and Silva (2015) observe that the study of Paulk, Weber and Chrissis (1995) shows that the highest achieving organisations include characteristics such as perfectly documented and specified project processes, a continuous improvement of processes, unwavering support from all senior management levels, and assessment of processes and products. Determining whether these characteristics exist in project management organisations can therefore provide a measure of effectiveness in project management. One way to do this is with PMMMs. Project management maturity is identified by the processes, capability level, and the evaluation of the continuous improvement and repeatability of the project management processes (De Carvalho, Patah and De Souza Bido, 2015).

PMMMs present a guideline for the efficient project management facilitation and identification of grey areas and resolving of those areas (Pinto, 2007). Organisations must adapt techniques and business tools when evaluating the effectiveness of project management. This includes doing benchmarking and continuously evaluating and improving project management (Kwak and Ibbs, 2002). Project management maturity is identified by the capability level of the organisation and the evaluation of the continuous improvement and repeatability of the project management processes (De Carvalho, Patah and De Souza Bido, 2015). The PMMM approach offers an improvement in measuring the effectiveness of project management, as it includes qualities such as customer satisfaction, and the effective attainment of the strategic objectives of the organisation's projects. PMMMs entails assembling the managerial process as well as the key areas which houses the practices, capabilities and the KPIs to be improved (De Carvalho, Patah and De Souza Bido, 2015).

PMMMs were built on the concept that human resources, organisations, processes, business functional areas, etc., go through a development stage and through systematic levels of maturity after the improvement process (Goksen, Cevik and Avunduk, 2015). Most of the PMMMs are in the development stage but the organisation employees' contribution is crucial for the success (Goksen, Cevik and Avunduk, 2015). Backlund, Chronéer and Sundqvist (2014) argue that the PMMMs

assist organisations with a framework to use to improve and refine their project capabilities for the effective delivery of projects in the end. Spalek (2014) argues that the idea of intensively measuring project management maturity is among one of the important concepts to aim to be more effective. The PMMM only identifies the project management grey areas but this does not fix project management problems, it is entirely up to the organisation to improve their project management maturity level (Backlund, Chronéer and Sundqvist, 2014).

There are differences in the conceptualisation of different PMMMs: their definition of project management maturity; their scope and the project management process areas all differ (Brookes and Clark, 2009). Table 2.1 below shows three different PMMMs and their approach to specific managerial issues or project management infrastructure generic areas such as process management, knowledge management, continuous improvement, etc.

Table 2.1: Different project management maturity models (Albrecht and Spang, 2016)

Name of project management maturity model	**Developed by**	**When developed**	**Number of Project management infrastructure**
PMMM	Levene *et al.*	1995	2
PMMM	Fincher and Levene	1997	7
CMM/PMMM	Goldsmith	1997	4
PMPM	Ibbs and Kwak	1997	5
PMMM	Jain	1998	2
PMMM	Ward	1998	6
POC Competence Model	Garrels and Huemann	2000	2
KPMMM	Kerner	2001	8
ProMMM	Hillson	2001	5
PMCMM	Volvediech and Jones	2001	5
PMPA	Bryde	2003	3
OPMM	Project Management Institute	2003	6
P2MM	Office of Government of Commerce and Williams	2004	7
P3M3	Office of Government of Commerce	2006	7
PMMM	Crawford	2006	5

A generic description of the five levels can therefore be as follows:
In level one there are hardly any project management practices and no defined development methodology (Elving, 2005). There are no structures and management tends to be based on informal systems. In project management level two, conceptualisation of project management processes becomes more realistic and basic project management systems exist that can be evaluated and measured (Nikolova-Alexieva, 2013). In project management level three, project management processes are coordinated, becoming institutionalised and with activities in place for improvement purposes (Elving, 2005). Nikolova-Alexieva (2013) argues that in this managed level, some organisations have a limited understanding of the relationship of project management processes and the strategic goals. In project management level four, the project management process is controlled by the organisation and managed integrated at the organisational level, and is linked to organisational strategy (Elving, 2005). In project management maturity level five (Optimising), testing of new technologies and ideas enables the improvement of project management processes (Elving, 2005). The project management process is controlled and used for continuous improvement and is linked to a formalised learning process.

2.5 The elements of project management maturity models

A typical capability maturity model involves four components:
Maturity levels- these explain in detail how good the project management process is;
Knowledge performance areas – the group of grey areas an organisation must improve on, to achieve the higher project management maturity level;
Key criteria – measurement scales that are crucial for the implementation of the key performance areas;
Goals - set the targets to be achieved in the key performance areas (Humphrey, Snyder and Willis, 2011; Zhong, Leung, Law, Wu and Shao, 2014).

In addition, the organisation must ensure that different factors in its management of projects are present when it considers measuring and improving project management maturity. These are as follows:
Top management support must be available. The function of top management is to implement, facilitate and formulate the vision, mission and the direction of the

strategies formulated by the organisations' shareholders, taking into consideration, the organisation's available resources and the internal and external evaluation of the business environment (Hyväri, 2016). The coordination of the project management processes by skilled, experienced and knowledgeable organisation people that can evaluate the current process level of the organisation, is required (Hellered, 2010; Christoph and Konrad, 2014). Project management related training must occur for acquiring of the skills, knowledge and techniques to perform project management functions effectively (Zhang, He and Zhang, 2012). A common project management terminology must be used. This is the language associated and applicable to the project management, e.g. a common language for the name of the maturity levels (Mateen, 2015).

Project management software tools and techniques must be established. The advancement and changes in technology are some of the reasons forcing the organisations to evaluate their project management maturity levels (Alzahrani, 2015) The tools are utilised in project development to estimate the resources, time and cost, to develop the scope, to communicate and to evaluate possible risks during the project undertaking (Brian Tracy International, 2013). Knowledge management and transfer of knowledge must be present i.e. the information processor of the project management system, the collection of adequate and critical information from all the previous projects must be transferred to other projects and the entire organisation (Todorović, Petrović, Mihić, Obradović and Bushuyev, 2015). Lastly the organisation must be able to critically evaluate its project management information and knowledge obtained by maturity assessment and make decisions regarding the process improvement, with the aim of continuous improvement (Hellered, 2010).

2.6 The benefits of project management maturity models

Different academics and groups developed PMMMs but the objectives are the same: the improvement of the organisations. The Project Management Institute Incorporated (2013) argues that there are organisation benefits derived from project management maturity assessment such as an improved link between the organisational strategy plans and their executions and the organisation's best practices are identified as well. (De Souza and Gomes, 2015). PMMMs are the scientific tools developed to evaluate

project management and to do continuous improvement. PMMMs add significant value to organisations that are aiming to attain improvement in project management (Pasian, 2014).

Most of the industrial organisations have two types of projects: expansion and innovation projects. Project management is beneficial to the industrial organisation significantly as it links the objectives of the project to the strategic goals, with the sharing of the organisational resources to level usage (Sousa, Tereso, Alves and Gomes, 2018).

Most PMMMs are based on the idea that organisations progress through five maturity levels, the first being the initial till the optimising level when improving their process capability and best practice effectiveness. This greatly assists the organisation to improve their project management (Backlund, Chronéer and Sundqvist, 2014). PMMM assesses an organisation's current capabilities and assists in improving the organisation to achieve better performance (Backlund, Chronéer and Sundqvist, 2014). By being aware of its weaknesses and strengths, an organisation is able to perform improvements to managing projects, which will in turn increase the project management maturity level (Spalek, 2014). Measuring the PMMM of the organisation allows the organisations to have a clear understanding of their strengths and where to improve and most importantly a roadmap to improvement (Solutions, 2009). The benefits of a critical project management maturity evaluation lie in the management setting direction and priority to the actions of the organisation, and starting a change in culture rather than just having knowledge of its project management maturity level (Crawford, 2006). There can be financial and non-financial project benefits when using a PMMM (Badewi, 2016).

Firstly, project management systems are evaluated and improved. PMMMs can serve as frameworks for evaluation of an organisation's project management competencies and for the strategic planning of actions that will result in an advancement of the organisation's project management competencies (Christoph and Konrad, 2014). Pretorius (2012) argues that a project management system is one of the dimensions that the project success depends upon. By using the PMMM to assess its project

management maturity level, the organisation can focus on how advanced the project management practices and process are, and on the development of these areas (Martens, Carneiro, Martens and Silva, 2015). Repeated use of the PMMM can assist the organisation to evaluate its progress towards assisting the organisation to reach its targeted goals. It was proven by Crawford (2006) that the timely evaluation of the project management maturity level ensures advancement of the maturity level thereby tracking the project management progress as an outcome of the initial project management maturity assessment. Secondly, PMMMs can be used for benchmarking. Torres (2014) argues that there are only three primary objectives of the PMMMs: evaluate the PMM level; provide a roadmap to reach a higher PMM level; and to benchmark with other organisations (Görög, 2016). Backlund, Chronéer and Sundqvist (2014) observe that PMMM is utilised for the comparison of the project management capability with other organisations. Thirdly, there is a direct link of financial and strategic benefits in an organisation with a high project management maturity due to their undertaking of complex projects (Christoph and Konrad, 2014). The increase in market share and the organisation growth are some of the indications of the benefits of project management maturity assessment (Christoph and Konrad, 2014). Good project management maturity governance has several benefits including investment optimisation (Hyväri, 2016). Fourthly, the improvement of an organisation's project management maturity entails improvements in operational measures like time, costs, customer satisfaction and project quality. Fifthly, good project management maturity governance has several benefits including project management staff motivation through increased communication (Hyväri, 2016). Lastly, Hyväri (2016) argues that the primary objective of PMMM evaluation is to identify project risks emanating from environmental changes. PMMMs reduce failure risks to an acceptable level. Project management risk is brought to a minimum level (Christoph and Konrad, 2014).

For an organisation to achieve an improvement in the project management level, i.e. to move from level two through to level five of the maturity levels, it has to define its goals and implement best practices (Miklosik and Janovska, 2015). PMMMs will identify the maturity level of the organisation so that it can subsequently implement a maturity level improvement programme (De Souza and Gomes, 2015).

2.6.1 Major criticisms of project management maturity models

PMMMs make the identification of PM grey areas possible but this does not fix PM problems. The major criticism of PMMMs is concerned with practicality. PMMMs are inflexible (Goksen, Cevik and Avunduk, 2015). It is difficult to utilise them if the organisation is continually experiencing external changes or is in the planning phase for PM process improvement. The models add bureaucratic red tape to management (Alami, Bouksour and Beidouri, 2015). The scope of PMMMs also drew criticism. The PMMMs are generic and are not specific enough for individual organisations (Goksen, Cevik and Avunduk, 2015). Other criticism are as follows:

The five PMM levels of the PMMMs are not enough to measure the PMM level of organisations. The PMMMs concentrate on the PM processes and do not take into consideration the human resources (Backlund, Chronéer and Sundqvist, 2014). The achievements claimed for the implementation of PMMMs are not always realised. The PMMMs fail to increase the project management knowledge (Alami, Bouksour and Beidouri, 2015). PMMMs do not improve the rate of adoption by the organisation of the latest technologies and changes in culture (Backlund, Chronéer and Sundqvist, 2014).

In the next section project management maturity levels will be discussed.

2.7 Project Management Maturity Levels

PMMMs use different levels to indicate the maturity level. A typical capability maturity model has five levels that explain in detail how good the project management processes are (Humphrey, Snyder and Willis, 2011; Zhong, Leung, Law, Wu and Shao and Shao, 2014). These five levels will now be discussed in detail for three different PMMM models in order to illustrate the essence of PMMMs. The researcher selected three models to illustrate the growth in capability maturity models and their increasing complexity.

2.7.1 Levels of the Humphrey- Watts Capability Maturity Model

A Capability Maturity Model provides a structured view of process improvement across an organisation (Daya and Lutteroth, 2011).

Figure 2.2 below, illustrates the five levels of the Humphrey- Watts Capability Maturity Model:

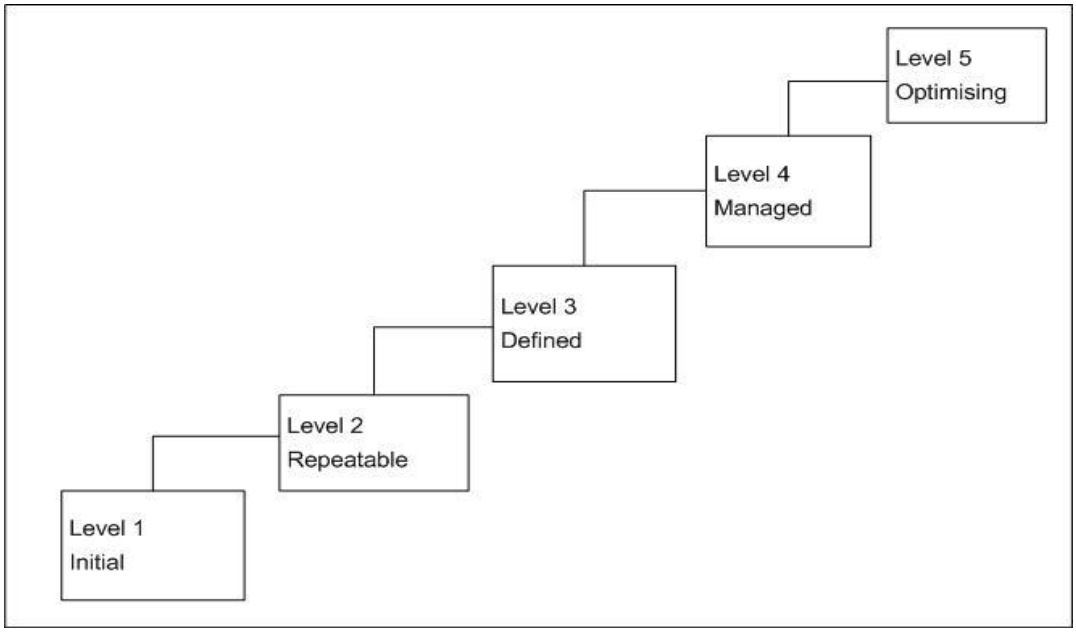

Figure 2.2: Humphrey Watts Capability Maturity Model (Pretorius, 2012)

The project management maturity levels of the Humphrey- Watts Capability Maturity Model (Capability Maturity Model) are utilised by most of the models (Brookes and Clark, 2009).

In the initial level, organisations manage projects with any method, as long the organisation is capable of doing the project. In the repeatable level, the organisation conceptualises processes, and evaluates and measures outcomes. In the defined level, there are standardised and documented project management processes in place. In the managed level, organisations have a limited understanding of the relationship of project management processes and the strategic goals of the organisation. In the optimising level, organisations expect that the upper management and the employees pull together for project management process improvements. The organisation understands its project management processes very well and is able to improve them (Nikolova-Alexieva, 2013).

2.7.2 Levels of the Kwak and Ibbs Maturity Model

Kwak and Ibbs project management maturity model list the levels as follows, ranging from project management maturity level one to level five: Ad-hoc, planned, managed at project level, and continuous learning (Kwak and Ibbs, 2002).

The levels of the Kwak and Ibbs PMMM is shown in figure 2.3.

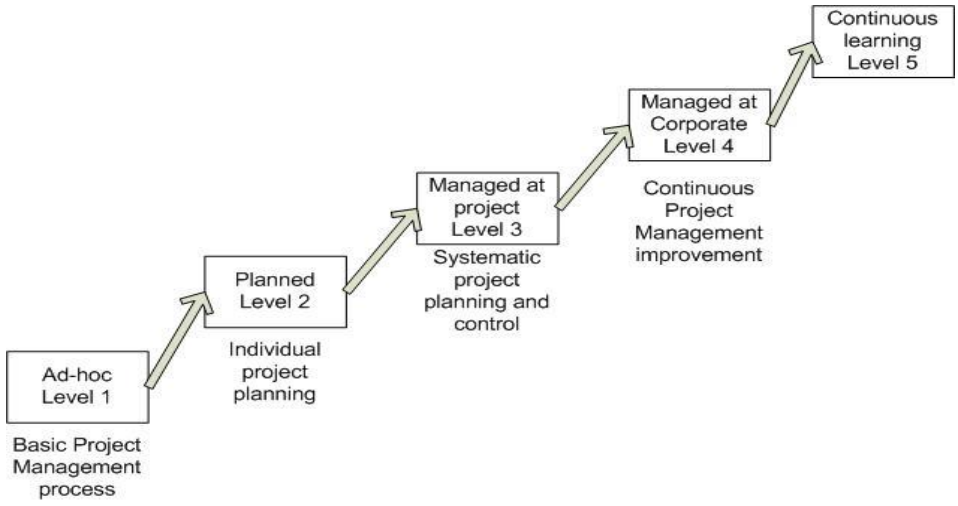

Figure 2.3: Kwak and Ibbs project management process maturity model maturity levels (Kwak and Ibbs, 2002)

The description of the levels from the figure above is clear (Figure 2.3).

At level one, the organisation does not prepare project plans in a structured format and no project management information system is available. At level two, the organisation uses informal project management tools and practices including a basic project plan and project organisational structure. At level three, the organisation manages with formal project management methodologies and a project management information system is used to collect, review, and distribute necessary project management data. At level four, project managers and the supervisor of the project managers integrate the project management information system for multiple projects. Integrated project control processes minimise the risk of scope, cost, schedule, and quality management. At level five, the entire process of integration management is planned, optimised, and sustained for continuous project management process improvement (Kwak and Ibbs, 2002).

2.7.3 Levels of the Crawford project management maturity model (CPMMM)

The Crawford Project Maturity Model also utilises the Humphrey Watts capability maturity model's five levels of project management maturity (Crawford, 2002). The descriptors of each level is displayed in Table 2.2 and need no further discussion.

Table 2.2: Characteristics of the levels of Crawford project management maturity model (Crawford, 2002)

Project Management Maturity Levels	**Project management maturity levels characteristics**
Level one	No management awareness; No established practices or standards; Project managers are not held liable by any process standards; Documentation is loos and ad hoc; Metrics informally collected on an ad hoc basis.
Level two	Number of project management processes exist in the organisation , but not considered in an organisational standard; Documentation only for basic processes; Project-centric oriented; Expert knowledge guided.
Level three	Management has institutionalised processes; Project management processes act as projects standards; Summary and detailed information; Baseline and informal collections of actual; Estimates, schedules may be based on industry standards and organisational specifics; More of an organisational focus; Informal analysis of project performance.
Level four	Projects managed with previous project management performance and future expectations; Efficiency and effective use of metrics by management to make decisions on current projects and their impacts; Projects changes and issues based on metrics i.e. cost and base-line estimates and earned value; Integration of project information to corporate technologies for enhanced business decisions; Adherence to organisational mandates by management.
Level five	Processes used to improve project management; Lessons learned documented for project processes, standards improvement; Continuous improvement is the main focus; Project metrics used to analyse past projects and improve thereon.

2.7.4 Comparison of the three models

Table 2.3: Comparison of the various levels (Crawford, 2002; Kwak and Ibbs, 2002; Pretorius, 2012).

Levels number	**Humphrey Watts Capability Maturity Model**	**Kwak and Ibbs project management process management**	**Crawford project management maturity model**
Level one : Ad hoc	No properly defined project management methodologies and practices.	No structured format.	Informal project management processes.
Level two : Defined	Project management processes same for single projects.	Project plan and structure are basic.	Project planning and control technology formal.
Level three : Managed at firm level	Limited project management processes and strategic goals relationship.	Project management methodology is formal.	Institutionalised project management processes.
Level four: Managed at corporate level	Project management processes control in place.	Project processes are controlled and integrated.	Project information integrated in project technologies.
Level five: Continuous improvement	New project technologies and processes ideas.	Continuous process improvement for best practices.	Integration of processes and best practices for the firm influence.

A generic description of the five levels can therefore be as follows:

In level one there are hardly any project management practices and no defined development methodology (Elving, 2005). There are no structures and management tends to be based on informal systems. In project management level two, conceptualisation of project management processes becomes more realistic and basic project management systems exist that can be evaluated and measured (Nikolova-Alexieva, 2013). In project management level three, project management processes are coordinated, becoming institutionalised and with activities in place for improvement purposes (Elving, 2005). Nikolova-Alexieva (2013) argues that in the managed level,

some organisations have a limited understanding of the relationship of project management processes and the strategic goals. In project management level four, the project management processes are controlled by the organisation and managed integrated at the organisational level, and are linked to organisational strategy (Nikolova-Alexieva, 2013). In project management maturity level five (Optimising), testing of new technologies and ideas enables the improvement of project management processes (Elving, 2005). The project management process is controlled and used for continuous improvement and linked to a formalised learning process.

2.8 Knowledge performance areas and key process areas.

Processes are defined as the activities of the organisation in producing the project, by utilising the organisation's resources continuously and repeatedly (Adeyemi, 2013). Processes are grouped and listed as follows: initiation, planning, executing, monitoring and controlling, and closing (Adeyemi, 2013). Knowledge performance areas are the group of areas an organisation must improve on to achieve a higher level of project management maturity. Process improvements are at the core of improvement in PMMM. Some PMMMs define process areas as key performance areas and as the group of areas, an organisation must improve on, to achieve higher project management maturity levels. The terms knowledge performance areas and key process areas will therefore be used interchangeably.

The PMMMs not only assess the project management processes but also integrate the processes with the organisational processes. Organisations that have not effectively implemented project management processes require serious interventions.

2.8.1 Key Process Areas of the Humphrey Watts Capability Maturity Model

The Humphrey Watts Capability Maturity Model was designed to compare the current processes of an organisation with the appropriate best practices as established by academia, industry role players or the legislature (De Souza and Gomes, 2015). The managerial processes are structured systematically in line with the set of KPAs in the improvement areas (De Carvalho, Patah and De Souza Bido, 2015).

The Humphrey Watts Capability maturity model identifies eighteen (18) Key Process Areas (KPAs) and describes each as a group of practices that are related in an area with a view to making improvement in that area (Babatunde, Perera and Zhou, 2016) Below are the KPAs:

Level one contains project definition and project management awareness as its KPAs (Demir and Kocabaş, 2010). Level two contains business case development; project planning; project monitoring and controlling; project establishment; suppliers' management; stakeholder management, risk management; communications management; configurations management; requirements management; and external environment management as its KPAs (Demir and Kocabaş, 2010). Level three contains benefits management; change management; information management; organisation focus; process definition; employee training; skills development; competency improvement; integrated management, project lifecycle control; intergroup management; quality control; and networking as its KPAs (Demir and Kocabaş, 2010). Level four contains quality management; organisation culture enhancement, and capacity management as its KPAs (Demir and Kocabaş, 2010). Level five contains problem management; technology change; continuous improvement; and defect prevention as its KPA's (Demir and Kocabaş, 2010)

2.8.2 Key process areas of the Kwak and Ibbs project management maturity model

The Kwak and Ibbs project management maturity model management developed the Humphrey Watt Capability maturity model even further, it did not only anchor on the nine process areas, but it also covers the project life cycle and gave an overview on the KPAs in those levels, as shown in Figure 2.4 below (Kwak and Ibbs, 2002). The Kwak and Ibbs project management process maturity model is based on the correlation between project management maturity and performance (Woodward, 2002).

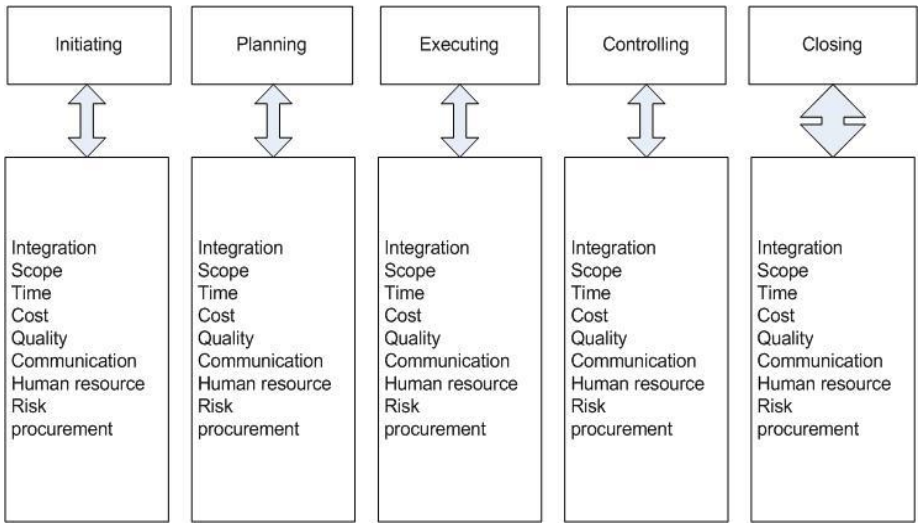

Figure 2.4: Integration of project management process areas and project processes (Kwak and Ibbs, 2002)

Kwak and Ibbs project management process maturity model identify nine project management process areas as its key process areas (Kwak and Ibbs, 2002).

Project Scope Management- make sure that all the project work and project related work crucial for the project are included and defined. There are key process areas for project scope management, namely: scope-planning process, scope definition, work breakdown structure, change control, and scope verification (Neverauskas and Railaitė, 2013).

Project Quality Management – comprises of the processes that gives an overview of the project policies, procedures in a way that there will be a project need satisfaction. The key process areas of project quality management are, quality planning, quality assurance and quality control processes (Bettuzzi, 2009).

Project Cost Management- the maintenance of the process of financial allocation of projects and includes the key processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs to complete the project within approved budget. The development of cost analysis presents the initial and the end estimation of the total project cost (Torp, Belay, Thodesen and Klakegg, 2016).
Project Integration Management- involves processes that focus on integrating the project management discipline with the other driving factors within the organisation.

The key process areas for project integration management are, plan development, execution process, and integrated change control (Bettuzzi, 2009).

Project Communication Management- includes the processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management control, and ultimate disposition of project information. It has key process areas namely: communication planning, information distribution, performance reporting and administrative closure. Project Human Resource Management- includes organisation, management and leadership of the project and project team. It has organisational planning, staff acquisition and team development as its key process areas.

Project Risk Management- comprises of the risk conduction management, risk plan, risk identification, risk analysis, and risk control. Project Procurement Management- comprises of processes to buy needed goods or services for the project. It is comprised of the following key process areas: procurement planning, solicitation planning, solicitation, source selection, contract administration, contract closeout and procurement control key process areas. Project Time Management- these are crucial processes to finish the project on time. The activity definition and activity duration estimation processes are some of the project time management's key processes (Nehru and Sumathi, 2013). A Schedule development process and schedule control are also included in the project time management key processes (Yazici, 2009).

2.8.3 Key process areas of the Crawford project management maturity model

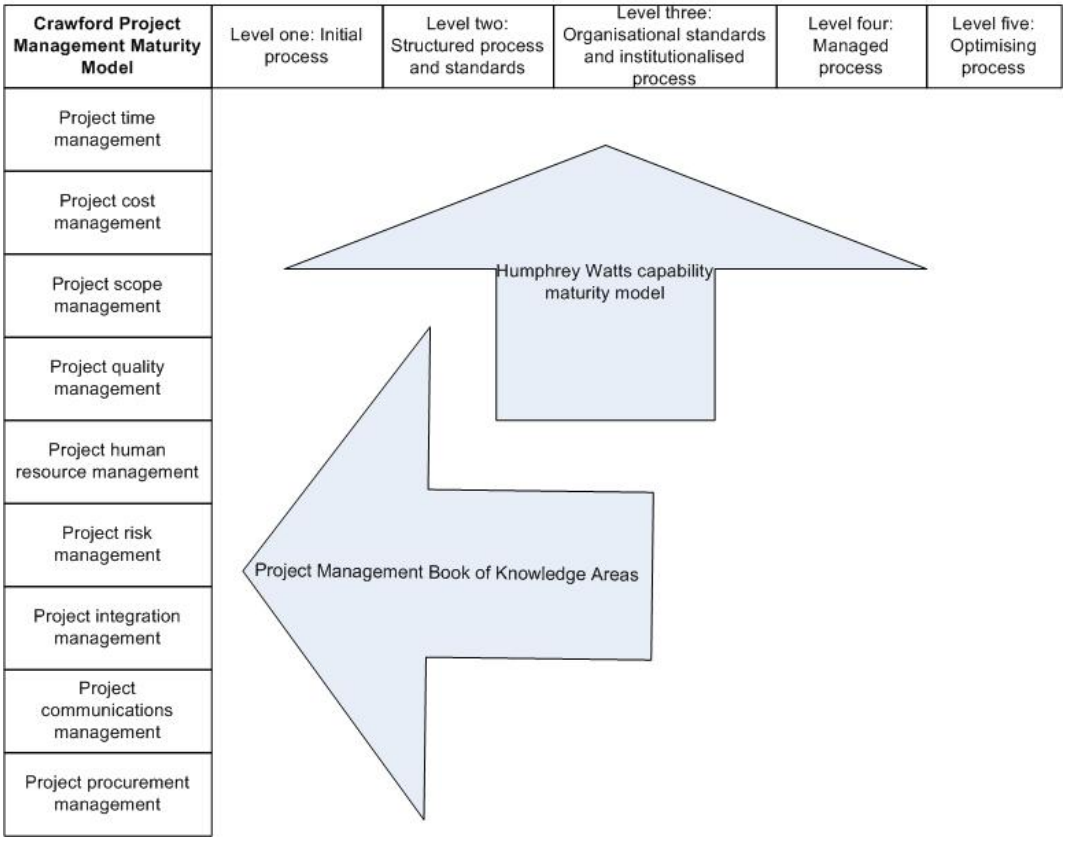

Figure 2.5: Crawford project management maturity model structure (Crawford, 2006)

The Crawford Project management maturity model develops the processes even more, by evaluating the KPAs, being the project management body of knowledge (Figure 2.5) descriptors of the organisation, and measured each of them against the Humphrey Watts Capability Maturity Model's five levels (Crawford, 2006).
The Crawford project management maturity model emphasises the three components: project management office, professional behaviour and lastly, management oversight (Crawford, 2006).

2.8.4 Conclusion

The project management processes define the KPAs that enable measurement of the efficiency of the entire project's lifecycle and assesses the organisation's project management maturity level. This enables identification of grey areas with the intention

of improving them (Bettuzzi, 2009; Tahri and Drissi-Kaitouni, 2015). The project management maturity levels show how the KPAs can be categorised for the organisation to acquire information regarding its current maturity level and utilise that information for its improvement purposes and to set its achievable goals and standards (Demir and Kocabaş, 2010).

2.9 Levels' criteria and goals in the PMMM.

Each KPA must include a set of key criteria and goals which must be satisfied in order for the KPA to achieve its goals (Kulik, 2000). The key criteria used to measure the key process areas will be discussed in this section.

2.9.1 Key criteria used for measurements in the PMMM

Every project management maturity model has key criteria used for measurement in each of its maturity levels. It makes the evaluation of the key process areas to be effective and simple. Key criteria are the measurement scales of performance in the key performance areas (Humphrey, Snyder and Willis, 2011; Zhong, Leung, Law, Wu and Shao and Shao, 2014). The generic criteria are associated with performance of people, processes, organisation, systems and culture.

2.9.2 Goals for each key criteria

The strategic objective for organisations using PMMMs is to measure the project management maturity level of the organisation, so that the organisation can strategise for the continuous improvement of its processes (De Souza and Gomes, 2015). This section will list and discuss the goals for each key criterion. Goals are the targets to be achieved in the key performance areas (Humphrey, Snyder and Willis, 2011; Zhong, Leung, Law, Wu and Shao and Shao, 2014). Hyväri (2016) argues that the goals for the key criteria are critical for the organisation when developing its business strategy and it should develop the key criteria goals to achieve its strategic goals.

The goals for each key criterion are generic but their application is dependent on each user and, therefore, not discussed separately for each of the three PMMMs, but only

their association with each level of the PMMMs. The association between criteria and goals are discussed below.

Organisations on maturity level one do not have a formal project management system, the organisations perform their functions any possible way to get them done (Nikolova-Alexieva, 2013). Organisations on project management maturity level two have their goals loosely aligned to their processes (Nikolova-Alexieva, 2013). Their goal is to have multiple project capability in all of their operation practices and authorisation procedures (Huffman and Whitman, 2011). Their second goal is to be capable of managing process and system knowledge and other related knowledge effectively and efficiently (Huffman and Whitman, 2011). The third goal is to manage the changes in the process effectively and efficiently (Huffman and Whitman, 2011). Kwak and Ibbs (2002) observe that the organisations performing in maturity level two possess a project charter, which is formal, and the roles of the project manager were identified and project management technologies and techniques are utilised. Organisations performing on maturity level two were found to have documented and standardised processes and managements' goals are only loosely linked to process goals. However, this level provides these key areas: benefits management, transition, information management, organisational focus, process definition, training, skills and competency development, integrated management and reporting, lifecycle control, inter-group co-ordination and networking, quality assurance, and centre of Excellence role deployment (Nikolova-Alexieva, 2013). Organisations on maturity level three are slowly growing, start to view business process as critical and begin to prioritise, arrange, and assess the outcome (Nikolova-Alexieva, 2013). The key process areas are approved and managed according to project requirements and specifications (Huffman and Whitman, 2011). Organisations on the maturity level four, have a clear understanding as to the relationship of the organisation processes and the alignment of the organisation strategy with the goals of the processes (Nikolova-Alexieva, 2013). Organisations on the fifth project management maturity level, are characterised by the organisation's awareness of the process goals and continuous improvement thereof (Nikolova-Alexieva, 2013).

2.9.3 Conclusion on goals and criteria

Each key process of the applicable project management maturity model has a goal. There are activities crucial for the attainment of that goal. For a key process area to be classified as “continuous improvement” there should be a capability of various projects management that is planned for in level two.

2.10 Organisational Factors influencing maturity

As previously discussed, the elements of organisational strategy and structures, organisational culture and people, and strategic goals influence the maturity level of organisations.

2.10.1 Strategy and structure of the organisation

Strategy is the analyses of the external and internal business environment, the effective usage of organisation resources, attracting and retaining clients, competing in the business world, and lastly, to be able to satisfy its shareholders (Heppes, 2006). The organisation’s strategy gives a clear indication as to the organisation’s direction, and its goals, with the available resources (Hellered, 2010). Strategic management is the creation and the implementation of the long term goals taken by the organisation’s top management, acting on behalf of shareholders and owners, taking into consideration, the organisation’s resources and the business environment (Hyväri, 2016). Many projects are the consequence of the strategic planning process to achieve the organisational strategy as changes planned in the organisational strategy are implemented with projects (Görög, 2016). Organisation management with a focus on the advancement of the organisation’s strategy, must have a clear understanding that projects are their way to reach strategic goals (Bettuzzi, 2009). Strategic goals of the organisation can be attained through the corrections of the application of the project management’s practices and principles after the project management’s maturity assessment (Bettuzzi, 2009).

The top management of all the organisations will not achieve their strategic transformation goals if there is no project management maturity evaluation (Hyväri, 2016). These strategic goals are the goals created by the senior management to reach

results or feedbacks that are in line with the vision and mission of the organisation (Cooke-Davies, Systems and Kingdom, 2009).

Project management maturity has a direct relationship with the organisation' project successes and the achievement of an organisation's strategic goals (Neverauskas and Railaitė, 2013).

The PMMMs give a clear definition of the organisation's ability to identify and manage projects that are in support of its strategic goals (Neverauskas and Railaite, 2013; Görög, 2016). Improved project management practices deliver an increased performance, good feedback and offers a highly competitive advantage (Hyväri, 2016). The objectives of a project strategy is therefore to create a clear view of the approach and understanding of the impact of the project on its stakeholders (Patanakul, Shenhar and Milosevic, 2012). The PMMM supplies the organisation with a framework for implementing process enhancement programmes (Burde, 2008).

In conclusion, the different levels exhibit different indicators of strategy, structures and systems development.

In level one, there is no business strategy defined. In level two, the importance of the business strategy is realised but it is not included in the business strategy. In level three, the importance of project management strategy is identified and included in the business strategy, but there is no project unit. In level four, the project management strategy is assigned a unit where project leaders and resources are readily available. In level five, there is a continuous improvement of the business strategy from the evaluation results.

2.10.2 People in the organisation

Maturity evaluation is normally a subjective analysis instead of an objective analysis, even though the most important researches' main focus is primarily what personnel are doing to get the work done (Hellered, 2010). Project management employees of the organisation are very important to the creation of the project and its delivery (Alzahrani, 2015). People are a factor that is included in the organisations' strategies alignment when evaluation of the PMMM takes place (Bettuzzi, 2009). Incumbents of the positions in project organisations must have the capability to manage projects and

improve outcomes, thereby increasing project success (Papke-Shields and Boyer-Wright, 2017). Project management employees must know how to handle the business aspects of their organisation's projects, and give full support to their organisational business strategy, rather than only meeting the allocated time, scope and goals (Hyväri, 2016). If the employees are given a chance to take part in the strategy process, their motivation and inspiration levels would increase (Hyväri, 2016). The knowledge required for the project is located in the minds of the people. This makes the project to be dependent on this very important concept. The people involved in the project is one of the key factors for a project to succeed (Hellered, 2010). When people are not committed to the project, it will eventually fail (Jiang, Klein, Hwang, Huang and Hung, 2004). The commitment by the people and excellent communication result in successful projects (Jiang, Klein, Hwang, Huang and Hung, 2004).

Organisations planning to have a competitive advantage, always attempt to find improvements and ways to improve the project management skills of the people (Neverauskas and Railaitė, 2013). It is crucial that people are included in the project management planning phase (Alzahrani, 2015). The inclusion of project workers in the project review after the completion of the initial schedule is crucial as their insights and experience can be appropriate, relevant, needed and very helpful (Brian Tracy International, 2013). Mateen (2015) argues that competent people are a resource focused on the closing of gaps that are present in the organisation.

Some organisations are involved in joint operations with other foreign organisations, to accumulate the best people for the management of the projects (Andersen, Dyrhaug and Jessen, 2002). The best organisation employees involved in the specific project can, if willing, be influential and take decisions which are found to be most important (Andersen, Dyrhaug and Jessen, 2002).

At the different levels of a PMMM the following people characteristics are expected. The organisations on level one, people do not have any knowledge nor experience to perform any project related activity (Mateen, 2015). The organisations on level two have a weak team orientation but possess an advantage due to repeating the similar work; these organisations must strengthen their teams to effectively implement their

strategies (Mateen, 2015). The organisations on level three were found to have allocated responsibilities to personnel whose main focus was to improve processes and enforce consistency (Hellered, 2010).

Organisations on level four possess a strong team and conduct formal training for its project team. However, organisations hoping to be evaluated as achieving the higher maturity level will improve their team to be strong, and focus on employee project management training and skills development to achieve its strategic goals of staying competitive (Hellered, 2010). Organisations on level five are continuously improving and learning form their past mistakes to avoid future errors (Hellered, 2010).

2.10.3 The systems of the organisation

The immediate availability of the critical knowledge to the project is one of key characteristics of project management maturity level of a mature organisation (Hellered, 2010). Integration of the project information is made possible with the project management system (Miklosik, 2015). Organisations require the project management system to be able to manage their project data, to report the status of the project, and to communicate effectively with the project stakeholders (De Fazio, 2017). The accumulated project management knowledge of the organisation is stored in the organisation's project management system (Hellered, 2010). The storage of the strategic information should be effective, safe and be easily organised (Hellered, 2010).

Organisations at level one possess no project management practices and processes, and a development methodology is not available. There is no collection of data as the organisation is continuing with existing project management processes. Organisations planning to advance from maturity level one to maturity level two should develop more disciplined project management processes and systems (Crawford, 2002; Kwak and Ibbs, 2002; Tahri and Drissi-Kaitouni, 2015). Organisations at level two have basic project management processes (informally defined processes) for single or individual projects and informal data collection. Organisations planning to move from level two to three must have policies and plans in place that indicate that the organisation will perform the project management process, and the organisation has been disciplined

by establishing sound project management. (Crawford, 2002; Kwak and Ibbs, 2002; Tahri and Drissi-Kaitouni, 2015);

Organisations at level three have an enhanced coordination of the project management process. There are systematic project planning and control processes and systems in place. Organisations that intend to advance from level three to level four must display standard processes and these processes are consistent and defined in line with the organisation's strategy and goals. (Crawford, 2002; Kwak and Ibbs, 2002; Tahri and Drissi-Kaitouni, 2015). Organisations at level four (managed) have a controlled quantitative project management process in place. There is an integration of project processes and project data and use of quantitative analysis of project data. The organisation must also show that improvements in standard processes and project management processes are consistent (Babatunde, Perera and Zhou, 2016).

In maturity level five, the organisations have learned from the past experiences and documented the lessons, and with acquired lessons, adjust to the current situations by implementing the lessons learned (Hellered, 2010). No governance and control of an organisation are normally the consequences of the organisation initiating projects purely on local needs not focusing on the long-term goals, rendering it to be an immature organisation (Hellered, 2010).

2.10.4 Culture of the organisation

Organisational culture is the set of behaviour characteristics which involves values, principles and beliefs that act as a basis for the project management system and leadership practices (Cooke-Davies and Arzymanow, 2003). Changing the behaviour, attitude and habits of the organisation's employees is very difficult, even if employees expect changes (Crawford, 2006).

Motivating the project management, employees can align a continuous improvement culture with the organisation strategy (Alzahrani, 2015). The importance of the organisation's culture to influence, encourage and motivate the people are crucial to the effective project delivery (Alzahrani, 2015)

The organisation's culture has a significant influence on all the organisation's project employees (Cooke-Davies and Arzymanow, 2003). The organisation's culture has a

significant influence on all organisation project employees (Cooke-Davies and Arzymanow, 2003). Organisational culture must be adjustable and easily adaptable to each and every organisation as the organisations are different (Alzahrani, 2015).
The organisations performing on the highest maturity levels have an organisational culture which takes into consideration, bi-directional communication as well as stakeholder relationships (Hellered, 2010).

Project management culture maturity levels and the characteristics of each maturity level are as follows.
In level one, there is no project management culture evident within the organisation. In level two, the employees are not aware of the project management methodology and are unwilling to change, accept the project management methodology and possess a culture resistant culture. In level three, project management is utilised but only on specific projects and employees see it as just a beneficial causes. In level four, the organisation has put a project management policy in place and employees obey. There are rewards and benefits for employees; their commitment to the projects has increased. In level five, there is a project management culture from the senior management to the employees and project management is motivated (Hillson, 2001). The culture was a major obstruction to create a knowledge-based organisation (Mårtensson, 2000).

Conclusion paragraph on organisational factors.
The researcher was able to discuss the elements of organisational strategy and structures, organisational culture and people, and strategic goals and confirm their influence on the maturity level of organisations.

2.11 Improvement in capability

2.11.1 Introduction of improvement in capability

An organisation has to define both generic and specific goals and to implement both generic and specific practices if it wants to reach any of the higher maturity levels (Miklosik and Janovska, 2015).

2.11.2 Improvements at different levels

Organisations on level one possess no project management practices and processes, and a development methodology is not defined. There is no collection of data as the organisation is continuing with existing project management processes (Crawford, 2002; Kwak & Ibbs, 2002; Tahri & Drissi-Kaitouni, 2015).

Organisations planning to advance from project management maturity level one to maturity level two should develop a disciplined process and display the basic project management processes. Organisations on level two are distinguished by the presence of basic project management processes (informally defined processes) for single projects that are repeatable in the organisation and an informal data collection (Crawford, 2002; Kwak & Ibbs, 2002; Tahri & Drissi-Kaitouni, 2015). Organisations planning to move from level two to three must have an individual project plan. Organisations advancing from project management maturity level three to level four must display systematic project planning and control. The organisation's planning to advance from project management maturity level four to level five must focus on continuous improvement. Organisations on project management maturity level five should be assessing its project management process maturity continuously (Kwak & Ibbs, 2002).

Organisations planning to move from level two to three have in place, policies and plans that indicate that the organisation will perform the required processes. The organisation performs the process, and the organisation has establishing sound project management. Organisations on level three have an enhanced coordination of the project management process, with improvement activities in place and formal control systems management (Crawford, 2002; Kwak & Ibbs, 2002; Tahri & Drissi-Kaitouni, 2015).Organisations advancing from project management maturity level three to level four display standard processes. Processes are consistent and defined.

Organisations on level four (managed) are distinguished by having a controlled quantitative project management process in place. There is an integration of project processes and project data and quantitative analysis of project data is done (Crawford, 2002; Kwak & Ibbs, 2002; Tahri & Drissi-Kaitouni, 2015);Organisations planning to advance from project management maturity level four to level five must focus on

performance advancement. Organisations must utilise statistical methods to analyse the feedback and improve its processes. Organisations on project management maturity level five have continuous performance management and process improvement and are using statistical methods to analyse the results. Organisations on level five must test new technologies. The improvement of project management processes is continuous, understanding of the project management processes is increased, and project management data are consistent (Crawford, 2002; Kwak and Ibbs, 2002; Tahri & Drissi-Kaitouni, 2015).

2.11.3 Conclusion

It is not necessary to assess the maturity level of all process areas to search for improvements. Organisations may identify and select process improvement areas with the aim of improving their maturity level (Hellered, 2010).

2.12 The Applicable project management maturity model

Even though PMMMs were developed by various academics. Their objectives are the same: the PMM improvement of the organisations (De Souza & Gomes, 2015).
When the organisations plan to improve their projects, by adopting and incorporating the Applicable PMMM in their organisation's strategy and setup, can attain that goal (Hellered, 2010). Any particular PMMM may be relevant for one organisation but not for another organisation (Tahri & Drissi-Kaitouni, 2015). Albrecht & Spang (2016) propose in their recommendations that a distinction in future research be made between a generic PMMM and a contingency approach in which a PMMM is developed for each organisation. This research takes a step in the latter direction as a PMMM will be developed for a specific organisation namely Eskom.

In this section, the Applicable project management maturity model is presented. The Applicable project management maturity model will be defined and discussed.

2.12.1 The Applicable project management maturity model

Torres (2014) argues that there are only three primary objectives of the PMMMs: to evaluate the project management maturity level; to provide a roadmap to reach a

higher project management maturity level; and to benchmark with other organisations (Görög, 2016). Maturity models are deeply rooted in the project management body of knowledge of project management (PMBoK). PMBoK is one of the references for project management process groups, process areas, and tools and practices (PMI, 2013; De Carvalho, Patah & De Souza Bido, 2015).

There are disparities in the conceptualisation of PMMMs: their definition of project management maturity; their scope; and the project management key process areas (Brookes & Clark, 2009). In a previous paragraph it was discussed that some of the PMMMs were built on the project management processes, and others on organisational related factors.

2.12.2 Selection of the Applicable project management maturity model

This section uses all the project management maturity models to compile an applicable project management maturity model for Eskom.

To select the most suitable maturity model the fit between the organisation and the applicable PMMM concept model, is evaluated in Figure 2.6. The organisation projects are fed into the Applicable project management maturity model, which takes into consideration, the project structures and systems, the organisation projects, strategic goals, the organisational culture and the competency of the people. All these factors influence the project performance through its impact on the PMMM. The projects' performance is gathered and therefore scored to evaluate the project management maturity level.

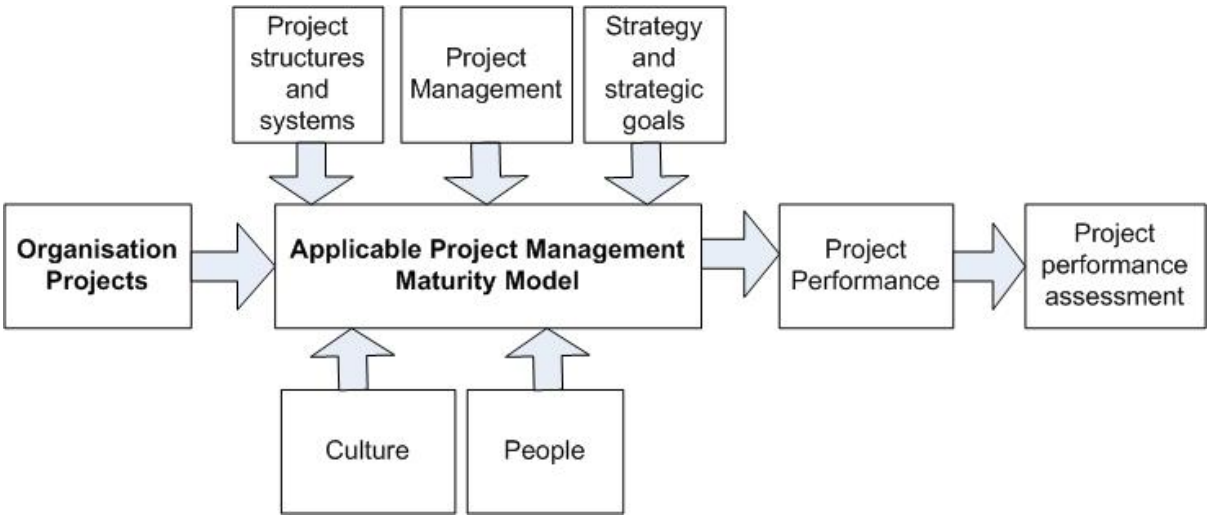

Figure 2.6: The Applicable PMMM concept (adapted from Alzahrani (2015))

The selection of the applicable PMMM in this study was based on the model depicted in Figure 2.6 and Table 5.1 on the Khoshgoftar & Osman (2009) criterion to compare PMMMs and select the relevant one.

Khoshgoftar & Osman (2009) compiled a list of comparison factors, which can be used to compare the various PMMMs, as shown in Table 5.1. .The scope of the PMMM, each of the PMMM has a varying scope of framework. Some of the PMMMs' main focus is on the business processes, whereas some are more focused on the whole organisation (Brookes & Clark, 2009). The maturity levels of the PMMMs are different but generally have five maturity levels (Demir & Kocabaş, 2010). The assessed maturity levels that the organisation attains in the project management processes are averaged to calculate the overall maturity level (Christoph & Konrad, 2014). The Capability maturity model was developed based on the quality and process management (Christoph & Konrad, 2014).

Thousands of PMMMs have been developed since the year 1995 (Cooke-Davies & Arzymanow, 2003). The PMMMs should be able to evaluate the maturity of the integration of the strategies and process of the business (Alzahrani, 2015). A PMMM should be capable of identifying strong and weak areas so that corrections and improvements may be made to achieve the higher maturity level (Alzahrani, 2015).

A PMMM must be easy to deploy and use, it should have a straightforward framework that is applicable to any organisation (Simangunsong & Da Silva, 2016).

The PMMM's culture assessment: the organisational culture of the organisation can determine if the project will be successful or not. It was researched in the 1990 world congress on project management. If the project management culture is not important, the effects of it should be considered until the project end (Cooke-Davies & Arzymanow, 2003).

2.12.3 Project management culture maturity levels

Culture is one of the most crucial factors in personnel motivation, as to how personnel work towards attaining the business goals and objectives (Alzahrani, 2015).

Project management culture maturity level one

There is no project management culture identified or in place (Loh, 2009).

Project management culture maturity level two

There is an absence of project management benefits awareness. The organisation is not willing to accept change and tends to be comfortable with existing process (Hillson, 2001).

Project management culture maturity level three

The organisation still considers the project management to be just a beneficial overhead and it is not adopted for the entire organisation (Hillson, 2001).

Project management culture maturity level four

There is a project management policy in place, with defined and identified benefits and the organisation has allocated resources to reap the rewards (Hillson, 2001).

Project management culture maturity level five

The organisation management leads by example and there is a reward and encouragement for project management (Hillson, 2001).

The successful project managers and leaders were found to be the ones who created the best culture for their personnel thereby compensating their contributions appropriately and treated them equally (Alzahrani, 2015).

2.12.4 Structure and systems

The joint venture of smart meters, big data and networks imply that an ongoing process improvement will be in place, thereby improving the performance. The Eskom systems integration will touch all the electrical networks; capability of adaptation to changes will

be immediate, by the intensive system analysis (Jahed, Amra, Mnguni & Mohamed, 2017). Integration of very wide geographical places connected by a digital network will assist Eskom tremendously to detect changes and respond effectively to the challenge (Jahed, Amra, Mnguni & Mohamed, 2017). The operations of the power plant, distribution and transmission systems have a significant impact on the financial flow of the organisation by changing and affecting the cost structure.

2.13 Conclusion

Due to the ever-changing circumstances, organisations are expected to perform better; compare themselves to other players in the industry and the continuous evaluation of their project management key process areas. The organisations are expected to perform a project management maturity analysis of its key process areas continuously and timeously. In this chapter, literature was reviewed, the different PMMMs were identified, analysed, compared and empirical study relating to the PMMMs was described. The prescribed journals, relevant textbooks, articles, previously researched project management maturity documents were included in the literature review.

Chapter 3 : Eskom South Africa

3.1 Introduction

This chapter provides an overview on the electrical utility Eskom of South Africa. History and background of Eskom is presented. Three business units of Eskom are distinguished. Challenges, strategies, advantages and disadvantages of Eskom are presented. There is a conclusion on the problems encountered by Eskom for delivering the projects.

3.2 Background on Eskom

In the early 1920s, South Africa wanted to increase its power capacity but the absence of standardised power industry hindered the process (Eberhard & Mtepa, 2003). South Africa formed the Electricity Act of 1922, which created the Electricity supply commission then known as Escom (Newbery & Eberhard, 2008). Escom commenced the new power plants construction projects, which bore larger coal – fired power plants (Eberhard & Mtepa, 2003). Eskom was created with the aim of fulfilling the electrical requirements of mining, industrial and refinery (Jahed, Amra, Mnguni & Mohamed, 2017). Eskom ensured a less costly coal supply by using cost plus contracts emphasised by the construction of coal mines near coal fired power stations in question (Jahed, Amra, Mnguni & Mohamed, 2017). Eskom changed its name from Escom to the current name, in 1987 after the revision of the Electricity Act and the introduction of the Eskom Act (Jahed, Amra, Mnguni & Mohamed, 2017).

There are three main stages of electricity delivery namely, generation, transmission and distribution (Sciences, 2016). Eskom has a legal obligation for the generation, transmission and distribution of the electricity in South Africa (Rambe & Modise, 2016). Eskom utilises its number of high-voltage sub-stations and its transmission power lines as its power network for efficient power transmission (Rambe & Modise, 2016). Electricity cannot be harvested from the earth but rather be manufactured (Sciences, 2016). There are currently three hundred electricity distributors in South Africa that are managed by Eskom and municipalities (Report, 2014a). Eskom experienced difficulties between 1979 and 1982 due to the increased demand of electricity, this affected maintenance of power plants thus leading to load shedding (Jahed, Amra,

Mnguni & Mohamed, 2017). Since 1994, power was provided to rural and informal settlements but Eskom failed to foresee the electricity crisis in the near future by failing to implement power plants expansion projects, and maintain old power plants (Thabane and Deventer, 2018).

Coal constitutes approximately fifty percent (50%) of Eskom's energy source (Pooe & Mathu, 2016). South African government is striving to ensure the electricity supply is sufficient for the increasing rate of demand (Khembo, 2015). Eskom provides power to over five million households with municipalities running their own power programmes (Blom, 2017). Eskom has increased its generating capability from 37 636 Megawatt to 41 995 Megawatt from 1994 to 2014 (Report, 2014b).

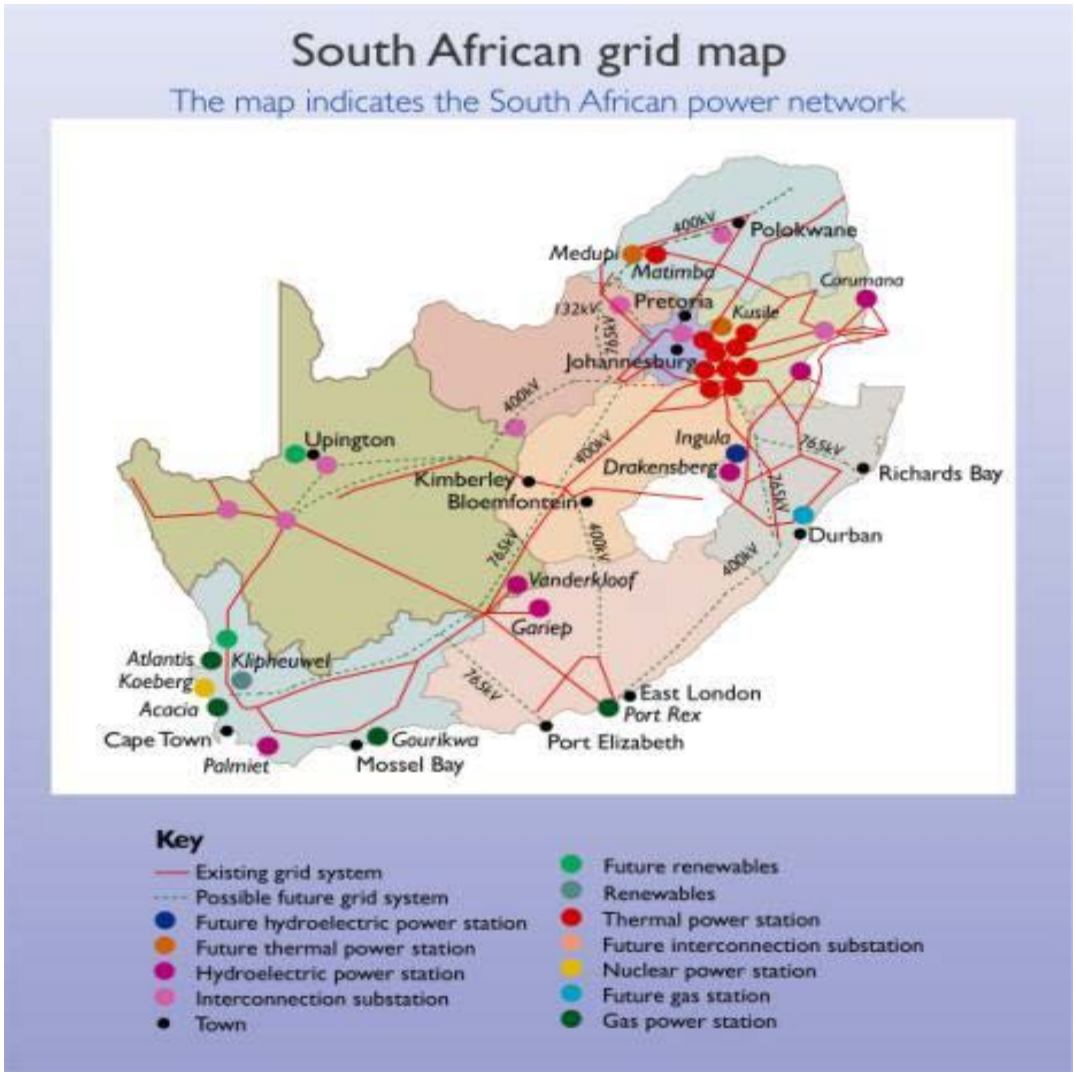

Figure 3.1: Eskom power grid lines (source (Report, 2014b)*)*

The transmission of the electricity generated at Eskom power stations, is carried out by power lines that are visible along the roads throughout South Africa (Figure 3.1)

(Sciences, 2016). Eskom is an affiliated member of the World Association of Nuclear Operators as well as Institute of Nuclear Power Operations, these links makes it possible for Eskom to assess its maturity in terms of its performances, standards and practices (Eskom, 2014a). In 1996, Eskom warned South Africa that there will be a power shortage due to few power plants and the growing demand of power (Styan, 2016). Eskom requested that new power plants development projects be undertaken but the government refused (Styan, 2016). South African government implemented a policy in between 1995 and 2000 that there can be power suppliers competing with Eskom, and Eskom should not construct new power plants (Joffe, 2012). The were no policies and regulations implemented with the aim of attracting investors in the electricity industry (Joffe, 2012).

South Africa changed the game plan in 2004, and instructed Eskom to construct the new power generating plants, however, it was late, as the electricity demand was exceeding the supply already (Joffe, 2012). Eskom implemented Load shedding due to electricity connection to townships and rural villages not previously connected and lately connected which overloaded the power grid (Ntshangase, 2017). In the year 2008, Eskom commenced with the new power plants construction and existing power plants refurbishment projects to alleviate the power shortage in South Africa (Joffe, 2012). The power plants of Eskom operate in unfavourable conditions, which often leads to unplanned power outage and later load shedding as there is less time to maintain and construct new power plants (Hlophe & Visser, 2018).

Eskom has invested about R400 billion for its expansion projects over 2017 – 2022 to ensure uninterrupted power supply and thereby increasing its electricity capacity by over 28% by the year 2025 (Amrit Nakarmi, 2013).

3.3 Eskom business units

In this section, Eskom business units are discussed.

3.3.1 Generation unit

In 2004, Eskom received instruction by the government to construct new power stations, with the assistance of private sector providing about thirty percent (30%)

generation capacity, but no effort was taken by Eskom until the electricity crisis in the year 2008 (Joffe, 2012). Electricity price was the main hinder of the progress even though South Africa required a significant power generation investment (Joffe, 2012). With the current rate of power generation plants constructions, the electricity demand will outrun electricity supply in the future (Jeffrey, 2005). Eskom has a mandate to improve power generation to decrease carbon emissions by utilising renewable energy sources (Shaun and Marais, 2014). The generation unit, as presented in Eskom (2014) has twenty-seven operational power stations with combined power capacity of 41 995 Megawatts made up of:

- 35 726 Megawatts of coal-fired power stations;
- 1 860 Megawatts of Nuclear power;
- 2 409 Megawatts of gas fired;
- 2000 Megawatts hydro and pumped storage stations
- Three Megawatts wind farm.

However, for 14 hours, power load shedding was put in place to meet the high electricity demand on the sixth of March 2014 (Eskom, 2014a). It is imperative to achieve the target goal of eight to ten target performance bases in the next five years, starting in the 2014 financial year, this will enforce the Generation unit's sustainable performance (Eskom, 2014a). 11 of 13 Eskom generation plants are situated in Mpumalanga province, namely: Kendal, Camden, Komati, Grootvlei, Matla, Hendrina, Camden, Majuba, Arnot, Tutuka and Duvha (Styan, 2016). There are two solar power generation plants of 30 Megawatts and 28 Megawatts commissioned at Witkop and Tabor substation respectively in the Limpopo province (Styan, 2016).

3.3.1.2 Challenges of Generation unit

In this section, the challenges of the Generation unit are briefly discussed.

Duvha power station has an estimated 3600 Megawatt but only generating 2400 megawatt due to the damage of its two generation systems (Blom, 2017).

3.3.2 Transmission

The risk to import electricity is still inherent due to the challenges associated with the high-voltage direct-current transmission line's reliability (Report, 2014a). Neighbouring countries which entered into an electricity supply with Eskom are delaying to develop

new electricity generation plants and this puts a strain on the already strained transmission lines of Eskom (Report, 2014a). The Transmission unit has put in place, a plan to sustain a business system compliance certification (ISO, 9001, 14001) (Eskom, 2014a).

Eskom transmission business unit took part in the International Transmission Operations and Maintenance study, which concentrated primarily on the performance and maintenance of the plant, with twenty-seven international transmission companies participating. The study was to benchmark maintenance performance against worldwide transmission best practices. Eskom's transmission unit's score was in the first quartile for electrical transformers and extra high-voltage switchgears but below average in the compensation and overhead line assessments (Eskom, not dated.) The Eskom distribution unit took part in the 2007 study, conducted by an international consulting independent company, operating in America. However, the assessment could not assess Eskom appropriately as the PMMM used was not applicable for Eskom's operating conditions (Eskom, 2014a).

3.3.2.1 Challenges of Transmission unit

In this section, challenges of the Transmission unit are presented.

Road accidents (vehicles crashes) pose a serious hindrance and a serious challenge to on time response within the Transmission unit (Report, 2014a). Most of Transmission unit assets have passed their duration date and cannot function effectively (Eskom Ltd., 2013).

3.3.3 Distribution

The decreasing rate of system average interruption frequency index performance is of serious concern to the distribution unit as it is caused by poor scope, time and costs management.

The Distribution unit has listed the following as their future plans according to Report (2014):

- Ongoing concentration on business sustainability;
- Supplying electricity connections through Distribution programmes;

Developing skills within the unit.

3.3.2.1 Challenges of Distribution unit

In this section, challenges of the Distribution unit are presented.

The wellbeing and the security of the Distribution unit employees is still a call of concern (Eskom Ltd., 2013). Contractor and workers safety and injuries are serious challenges for Distribution unit (Eskom Ltd., 2013).

3.4 Eskom Projects

In this section, the Eskom projects are presented.

3.4.1 Nuclear projects

Eskom has implemented a maintenance project on its nuclear power plant, to replace old power generators at Koeberg power plant which shall be finished by 2019 (Svensson, Tronvoll & Slåtten, 2008).

3.4.2 Coal projects

The decommission of all coal powered plants is expected by 2050, the half of coal fired power plants only expected by 2035 (Svensson, Tronvoll & Slåtten, 2008). Eskom has started the construction projects of Medupi located in Matimba and Kusile situated in Mpumalanga (Svensson, Tronvoll & Slåtten, 2008).

3.4.3 Hydropower projects

Eskom has commenced the renovation project for its Drakensberg hydropower plant in 2016 and expected to be finished by end of 2019 (Svensson, Tronvoll & Slåtten, 2008). In 2013, Eskom entered into a contract with Democratic Republic of Congo for the power supply generated by Inga power plant project which should commence in 2024 (Svensson, Tronvoll & Slåtten, 2008).

3.4.4 Solar power projects

Eskom has implemented the solar power projects to generate about 400 Megawatt to be decommissioned by 2019 (Svensson, Tronvoll & Slåtten, 2008). The 1500

Megawatt solar power project located in Northern Cape will commence in 2026 to 2028 (Svensson, Tronvoll & Slåtten, 2008).

3.4.5 Wind power projects

Eskom completed 17 wind projects, these included the Copperton project, which is capable of producing 102 Megawatts of power (Svensson, Tronvoll & Slåtten, 2008).

3.4.6 Transmission projects

Eskom has started the nine-year duration project of developing the transmission lines by the addition of over 2 100 kilometres of 765 kilovolts transmission lines and about 7500 kilometres of 400 kilovolts transmission lines (Svensson, Tronvoll & Slåtten, 2008).

3.4.7 Storage project

Eskom implemented the project for power storage utilising batteries and power storage systems capable of storing about 360 Megawatts (Svensson, Tronvoll & Slåtten, 2008). The battery energy storage systems replaced the Kiwano power storage project as this is crucial for power provision during the peak time when the demand is high (Svensson, Tronvoll & Slåtten, 2008).

Conclusion on Eskom projects

Eskom has about 28 projects under construction: the Komati water scheme (1 000 MW), the Camden (1 520 MW), the Grootvlei (1 180 MW), Medupi (4764 MW), Kusile (4 800), Ankerlig (1 338.3 MW), Gourikwa (746 MW), Ingula (1 332 MW), and Sere (100 MW), amongst others. Eskom also has air quality and refurbishment projects in Mpumalanga. Eskom makes sure the projects are delivered on time, within the budget and with the right quality (Eskom Ltd., 2013).

3.5 The strategic goals of Eskom

In this section, the strategic goals of Eskom are presented.

Eskom has set eight strategic dimensions to deliver its mandate (Pooe & Mathu, 2016):

- Financial sustainability - to balance the cost of capital and the rate of return on assets;
- Operational sustainability – the effective implementation of the generation strategy, improvement of its performance level and to effectively manage Eskom;
- Sustainable asset creation - to deliver projects on time more especially those expanding the capital, with the right quality and on time;
- Environmental and climate change sustainability – it integrates the organisation environmental management with the business operations;
- Revenue and customer sustainability – to achieve a growth in the market and be loyal to the customers;
- Sustainable human capital – to employ, develop and retain highly skilled, experienced workers;
- Transformation and social sustainability – to assist with the South African economic growth and transformation;

Building a solid reputation – to position itself as the engine behind the growth of economy of South Africa.

3.6 Eskom challenges

In this section, the challenges faced by Eskom are presented.

Eskom generates and provides power to about 95% of South Africans yet it is struggling with its capacity to provide uninterruptable power (Thabane & Deventer, 2018). The incapacity to provide electricity was caused by failure to maintain its power plants and inability to implement expansion projects of its power plants to keep up with the ever increasing power demand (Thabane & Deventer, 2018). Eskom implemented load shedding in January 2008 due to the power generation failure and demand exceeding the supply. The consequences of this load shedding being financial loss of income to private and public sector (Blom, 2017). Two of Eskom newly built power plants, Medupi and Kusile power plants had to be operational by the end of 2014, but failed, with only a single power generating unit of Medupi operating (Thabane & Deventer, 2018). The construction programme for Medupi and Kusile coal power stations have experienced cost – over runs and delays for their delivery (Eskom,

2017). Eskom started the estimated R80 million Medupi construction project in 2007, with the first power unit expected to join the grid in 2015 (Maize, 2016). However, by 2016, the cost estimate was around R105 billion and the project about ten years behind schedule (Maize, 2016).

Eskom embarked on another power plant construction project of a coal-fired Kusile that was expected to deliver about 4800 megawatts, with cost estimate inflated to around R119 billion and significant schedule delays (Maize, 2016). Eskom commenced the Ingula hydro pumped storage power plant project in 2007, however, eight years later, it was more than R27 billion over estimated and about four years behind schedule (Maize, 2016). Eskom is experiencing a high costs caused by old, worn out and not environmental friendly coal power plants that are in need of regular maintenance and require high costs to be certified compliant (Meridian Economics, 2017).

Eskom failed to procure sufficient coal, resulting in coal shortages forcing the Eskom to procure lowest grade coal resulting in load shedding (Blom, 2017). Eskom is constructing power stations at the slow rate and this will adversely affect the power supply as the power demand would have exceeded the demand in four years (Report, 2014b). Coal shortage was a consequence of improper coal procurement system (Blom, 2017). Above contractual obligations export of power by Eskom to foreign states caused it to fail to meet the demand (Blom, 2017). Increases in project costs and project delays put Eskom under a financial pressure to the point whereby South African Minister of Finance deemed Eskom to be a financial risk to the growing economy (Eskom Ltd., 2013). Eskom failed for over twenty years to implement key projects to deal with the growing demand of power and to manage key projects such as Kusile and Medupi to ensure their on-time completion (Thabane & Deventer, 2018). The technical issues at Majuba and Koeberg power plants may disrupt the efficiency of the power supply at Eskom (Amrit Nakarmi, 2013). Medupi power plant only added 166 Megawatt between 2010 and 2015 March (Teljeur, Sheik Dasarath, Kolobe & Da Costa, 2016). Medupi would have added 2 888 Megawatt to the power grid but the construction delays affected the completion (Teljeur, Sheik Dasarath, Kolobe & Da Costa, 2016).

Eskom's inability to control project cost management has resulted in construction costs overrun (Teljeur, Sheik Dasarath, Kolobe & Da Costa, 2016). The increased projects costs compelled Eskom to require more funding from either power sales or bank loans to complete its power plants construction projects (Teljeur, Sheik Dasarath, Kolobe & Da Costa, 2016). The cost overruns caused by the new power plants construction projects delays because of no project planning and execution key process competent was exaggerated by customers protests for the electricity tariffs increase, load shedding and households appliances damages caused by electricity cut offs (Rambe & Modise, 2016).

3.7 Eskom summary

In this section, the summary on Eskom is presented.

Eskom failed to forecast the future demand and did not put in an effort to service old generation plants and neither constructed new generation plants in time. Eskom did not put in a co-generation programme in place in preparation of the forecasted increased power demand. Eskom did not enforce plants maintenance strategy resulting in a significant decrease of plant operation of up to ninety percent (90%). Eskom did not plan and maintain its old plants adequately. There are great possibilities of manipulation of procurement processes due to their different natures. Eskom should implement outage management as one of its strategy to utilise to maintain its power plants by shutting down some power plants to repair then later switching them on (Hlophe & Visser, 2018).

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Chapter 4 : Research methodology

4.1 Introduction

This chapter gives an overview of the research methodology the researcher used to address the aims and objectives of the study. The researcher discussed the research design, population of the study, sample and sampling methods, data collection instruments, data analysis methods, reliability and validity and limitations of the study.

4.1.1 Research philosophy

Positivism is grounded in a Quantitative study carried out with a use of a self-constructed questionnaire for the study (Alzahrani, 2015). Positivism is based on objectivity, search for truth, verifiable, testable and quantifiable essentials (Masoga, 2013). Positivism emphasises that the scientific objectivity of the study is crucial in forming impartial and independent conclusions, thereby significantly contributing to the knowledge about a particular topic (Alzahrani, 2015). Scientific methodology and the capability of questionnaire utilisation contributed to the choice of this research philosophy, the positivism philosophy (Mateen, 2015).

4.1.2 Research approach

There are two general research approaches: inductive and deductive approaches (Mateen, 2015). Inductive approach is normally selected where there is personal observation and preliminary theory involved (Joslin & Müller, 2015). Deductive approach is grounded on creating hypotheses or research questions, definition of constructs and testing hypotheses or answering research questions (Alzahrani, 2015). Deductive approach is referred to when a quantitative study is being conducted on the case for the purpose of research (Mateen, 2015).

4.1.3 Study area

Primary respondents of the study are those people directly related to the research being carried out (Habib, Pathik & Maryam, 2014). Primary respondents were Eskom project management personnel employed at Eskom MegaWatt Park, Johannesburg Headquarters.

There are three focus areas that are the basis of the Applicable PMMM and these focus areas formed the basis of the questionnaire responses by the Eskom project management personnel:

- Project management maturity level
- Project management culture maturity
- Organisational strategy

Each of these variables were critical for gathering of data and analysis.

4.2 Research design

Most of the researches in natural sciences utilise the quantitative research methods to research the natural phenomena whereas qualitative research methods are mainly utilised in social sciences due to their capabilities to analyse cultural and social phenomena (Thomas, 2010). The quantitative research study utilises statistical outcomes backed by statistical data (Thomas, 2010). This study utilised the quantitative research methods. A Quantitative study utilises questionnaires, and/ or surveys to collect data presented as numbers and therefore statistically analysed to form a basis for the arguments (Joslin & Müller, 2015). Quantitative study utilises effect statistics (correlations, means, etc.) to compute variables on selected samples, and effectively presents their relationship amongst variables to test the theory (Thomas, 2010).

The research design is the logical plan of the research that gives direction as to how the research will be carried out, taking note of the study population, sample and statistical methods to answer the research questions (Thomas, 2010). The study is descriptive with a quantitative design. The requirements of a quantitative study is that there must be a distinct reality which can be assessed by a particular instrument, procedures should be in place, the researcher should not be a participant but just an objective observer and the study should be context-free from generalisation (Thomas, 2010). The study is quantitative research as it made use of questionnaires to gather data, which was then coded into numbers, which made statistical analyses possible (Thomas, 2010).

The quantitative design was chosen as the data can be coded into numbers, which in turn enable descriptive and inferential statistical analysis (Jiang, Klein, Hwang, Huang & Hung, 2004).

4.3 Population of the study

The population of the study was project personnel from the Transmission, Distribution and Generation units in the Eskom head office.

For the purpose of the study, three Eskom projects were identified, each from an Eskom business unit as shown below in Table 4.1.

There were 200 project management personnel involved and employed by Eskom in the selected three departments. The following groups of Eskom project management employees constituted the population:

- Executives or Senior project managers
- Project managers
- Project management personnel.

The researcher asked the senior manager to indicate who should participate in the study. However, the researcher selected purposive sampling to base the study. This study will be however limited to Eskom only.

Data saturation is when the researcher terminates the interview process of further respondents due to the fact that the other interviews do not bring new information to book when compared to the already conducted interviews (Mtsweni & Maveterra, 2018). The researcher did not consider the concept of saturation when distributing the questionnaires.

Table 4.1: Eskom business units' personnel

Eskom Units		Frequency
Transmission	Project management personnel	29
	Project manager	11
	Executive or Senior manager	4
Distribution	Project management personnel	33
	Project manager	9
	Executive or Senior manager	3
Generation	Project management personnel	31
	Project manager	10
	Executive or Senior manager	3

4.4 Sample and sampling methods

Purposive sampling is the process of specifically identifying and selecting study participants based purely on their experience and knowledge of the study (Rosenthal, 2016). The researcher selected this type of sampling to ensure that the gathered data are reliable thereby increasing its quality.

A sample size for this study was determined using the Yamane (1967) formula. To allow for non-return of some questionnaires were distributed to 200 potential respondents employed by Eskom in the project management department. 200 questionnaires were distributed to the Eskom business units, namely Distribution, Generation and Transmission project management employees. Surveys were emailed to the respective project management personnel with the help of the senior manager.

N = population of the study
K = constant (1)
e = degree of error expected
n = sample size

$$n = \frac{N}{K + N\,(e)^2}$$

$$n = \frac{200}{1 + 200\,(0.05)^2}$$

n = 133

Therefore, 133 respondents will be acceptable for a confidence level of 95%. 133 questionnaires were received back. This is a response rate of 66 per cent, which was deemed acceptable.

Table 4.2: Eskom units' statistics

Eskom Units		Frequency
Transmission	Executive or Senior manager	4
	Project manager	11

	Project management personnel	29
Distribution	Executive or Senior manager	3
	Project manager	9
	Project management personnel	33
Generation	Executive or Senior manager	3
	Project manager	10
	Project management personnel	31

4.5 Data collection instruments

The survey questionnaire measure is a data collection tool used by programme evaluators. A questionnaire according to Kuada (2012) is the most conventional data collection instrument utilised in surveys.

An applicable project management maturity model questionnaire was developed to assess the maturity level of project management.

Self-constructed questionnaires, which encompass the proposed PMMM, were utilised in this study. A structured questionnaire with responses which require a choice to be made, made it easy to be coded into numbers to perform statistical analyses (Sumerson, 2014).

This questionnaire (Appendix 1) comprises of four sections as listed below:

i. General information (Part A)
ii. The Applicable project management maturity model (Part B) aimed at assessing the project management maturity level of Eskom;
iii. The organisational culture maturity questionnaire (Part C) aimed at evaluating the maturity of the organisational culture;
iv. The organisational strategy maturity questionnaire (Part D) aimed at assessing the maturity of the organisational strategy;

The researcher used a self-constructed questionnaire as the data collection tool (Spaulding, 2014).

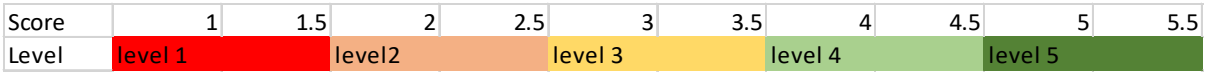

Figure 4.1: Applicable project management maturity model score interpretation

As shown in Figure 4.1, the key process areas are scored from score one (1) to score five (5), and relevant maturity level will be interpreted based on the score. For an example, if a certain key process area scores two comma three (2.3), then it will be in maturity level two (2).

Table 4.3 below illustrates the research question number and the appropriate question number, key process area being studied, the type of the question and the relevant chapter in the literature review chapter.

Research question 1: What is the applicable PMMM to assess the project management maturity level of the core business units of Eskom?

This research question was answered by comparing different PMMMs and selecting an applicable one

Research question 2: What is the current project management maturity level of Eskom's core business units?

Table 4.3: Research questions breakdown

Question number	Process area	Questions
B1. to B.5	Project scope management	How accurate is your scope planning process? How well documented is the scope definition? Is your work breakdown structure accurately prepared? Is your project scope verification done timeously and effectively? Is your change control process implemented correctly?
C.1 to C.6	Project time management	How effective is your activity definition process? Is the activity sequencing process accurately and effectively implemented? Is the activity resource estimation process undertaken correctly? Is the activity duration estimating process performed accurately and effectively? Is the schedule development process timeously and effectively done? How effective is the Schedule control process implemented?

D.1 to D.4	Project cost management	Is the cost estimating process performed effectively and timeously? How is the cost budgeting process performed? Is the cost change control process accurately and effectively implemented?
E.1 to E.3	Project integration management	Is the plan development process effectively and timeously carried out? How is the execution process performed? Is the integrated change control process accurately and effectively implemented?
F.1 to F.3	Project quality management	Is your quality planning processes effectively performed? Are quality assurance processes continuously incorporated? Does your organisation take quality control as the KPA?
G.1 to G.3	Project human resource management	How would you rate your organisational planning process? Is your staff acquisition processes effectively done? Is there a team development process in place?
H.1 to H.4	Project communication management	How accurate is your communication planning process? How effective is the information distribution process? Is performance reporting of the project in order? Is there an administrative closure?
I.1 to I.6	Project risk management	Is risk management planning done accurately and timeously? Does the organisation have risk identification in place? Is Qualitative risk analysis process performed on all projects? Is qualitative risk analysis process encouraged for all the projects? Does the project team undertake risk response planning? How effective is the risk monitoring and control process?
J.1 to J.7	Project procurement management	Is procurement planning effectively and timeously implemented? Is there solicitation planning process in place? Does the organisation have a solicitation process in place? How accurate is your source selection process? Is there a process for contract administration? Is Contract close-out intensively reviewed? Has the organisation developed its risk monitoring and control process?

Research question 3: What is the current project management culture maturity level of Eskom's core business units?

K.1 to K.6	Project management culture maturity	The relationship between the project team members. The degree of trust amongst the team members, project managers and senior management. Rewarding model has an impact on project management personnel performance. Project risks incorporated in everyday duration of the project. Project major changes are authorised by senior management first before implemented. There is project success commitment amongst project team members.

Research question 4: How do the maturity levels of organisational strategy and processes influence the project management maturity level?

Question number	Process area	Questions
L.1 to L.7	Project management organisational maturity	How aware are you of your organisation's business strategy? Are the projects' goals clearly aligned to the organisation's strategic goal? Do project teams have a clear understanding of the value that the projects add to the organisation? Did the project core team take part in creation of the project goal statement? Were intensive and consistent selection criteria utilised to choose this project? Do you understand the link between the organisation's projects to achieve the organisation's strategy? Was the project chosen based on the contribution to the organisation comparing the priority ranks?

4.6 Data collection procedures

The questionnaires were distributed to project management personnel with the help of the personnel who collected them as well. The participants of the survey were Eskom personnel, working on the projects initiated by Eskom. There are three units within Eskom: the Distribution, Generation and the Transmission.

4.7 Data analysis methods

The data analysis is performed in this section and it is based on the literature review. In this chapter, the researcher presents the applicable project management maturity model as a framework to assess the project management maturity of the Eskom. The analysis of data was computed such as that the answers of the study questions were in a logical sequence as to the literature review and the study questions.

Data analysis is the process whereby data collected are systematically organised in such a way that patterns can be studied from it (Thomas, 2010). Thomas (2010) argues that the data analysis process starts with classifying, categorising and organising the data in such a way that critical themes, conclusive meanings and patterns can emerge from the gathered data. The gathered data were analysed with the use of the SPSS statistical software package version 24. The data analysis was performed using inferential and descriptive statistics. The researcher had the aim of investigating the applicability of the Applicable PMMM by formulating the research questions.

Research question one: What is the applicable PMMM to assess the project management maturity level of the core business of Eskom?

To address this research question, a comprehensive literature review was performed, as presented in chapter two. Existing literature written about the project management maturity models was critically interrogated and reviewed. The emphasis on processes and systems, business strategy and culture.

Research question two: What is the current project management maturity level of Eskom's core business units?

Research question three: What is the current project management culture maturity level of Eskom's core business units?

To address research question two and three, and evaluate the project management maturity levels for both the questions, the questionnaire was constructed with the view of associating variables to gather empirical data. The IBM SPSS version 24 (frequencies, means, Cronbach Alpha's, Kurtosis, Skewness, standard deviation) was utilised for this.

Research question four: How do the maturity levels of organisational strategy and processes influence the project management maturity level?
Research question five: What processes and best practices improvement stages do Eskom have to go through in order to improve its project management maturity?

To address research questions four and five, literature was reviewed based on the findings from the study.

4.8 Reliability and validity

Reliability simply means that the possibility of the gathered data to be exactly or more or less the same each time of collection (Moutinho, Hutcheson & Salkind, 2014). The capability of the survey to present same or similar outcomes under similar setting refers to the reliability (Vergopia, 2008). Internal validity refers to the extent to which the outcomes of the survey are attributable to the variable which is independent and no other explanation is expected to differ (Moutinho, Hutcheson & Salkind, 2014). Internal validity shows a causal interlink between certain circumstances and other circumstances (Alami, Bouksour & Beidouri, 2015). Alami, Bouksour & Beidouri (2015) argue that integrating the current and emerging literature with the literature already existing, enhances the internal validity. External validity refers to the degree to which the survey outcomes can be generalised (Moutinho, Hutcheson & Salkind, 2014).

The reliability of the questionnaire was tested by calculating the Cronbach's Alpha value; if it is above 0.70, it indicates a high internal consistency above (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017). The Cronbach's values from the survey were calculated and found to be above 0.70. The validity was ensured with the help of the theoretical PMMMs and adjusting them for this study. Statistical validations were used (Caillaud, Rose & Goepp, 2016). This indicated high consistency. The research variables were extracted from the literature review to study the applicability of the project management maturity of Eskom and to investigate the impact of organisational strategy and culture. This improved validity as it is generally accepted information.

Ethical considerations

The researcher is obliged to take into consideration and in the process, respect the rights, beliefs, values, and needs of the research participants (Thomas, 2010).
Researchers should bear in mind that in the course of their research, are limiting the private space of their research participants (Thomas, 2010). Amongst other ethical considerations, the researcher has to take into consideration, informed consent, research harm, honesty, confidentiality of the respondents and interventions must be taken into consideration (Thomas, 2010). Cultural sensitivity, as an aspect, is also an important ethical issue that requires a careful approach (Thomas, 2010). Spaulding (2016) concludes that ethics in studies refer to ensuring that the action of the researcher no way causes harm or potential harm to programme participants, vested stakeholders, or the greater community.

Ethical clearance was obtained from the Turfloop Research Ethics Committee. The researcher complied with all the requirements of the Turfloop Research Ethics Committee.
The data collected from the participants were treated as confidential, none of their information will be disclosed and will not be forced to participate. Participants of this survey were informed of the purpose of this study. This relationship was based on trust between the researcher and the respondents.

4.9 Limitations of the study

This study could successfully assess the project management maturity of Eskom. The subjective of the judgemental sampling technique limited the inference made to the entire employees complement of Eskom project management.

4.10 Conclusion

In this chapter, the different research methodologies were discussed and the researcher identified and selected the appropriate and relevant one for this study. The research design selected was based on the Applicable PMMM.

Chapter 5 : Data analysis and discussions

5.1 Introduction

In Chapter 5, the selection of an applicable PMM model is firstly discussed and then the gathered data from the respondents are examined and analysed

The framework for analysis is shown below as Figure 5.1.

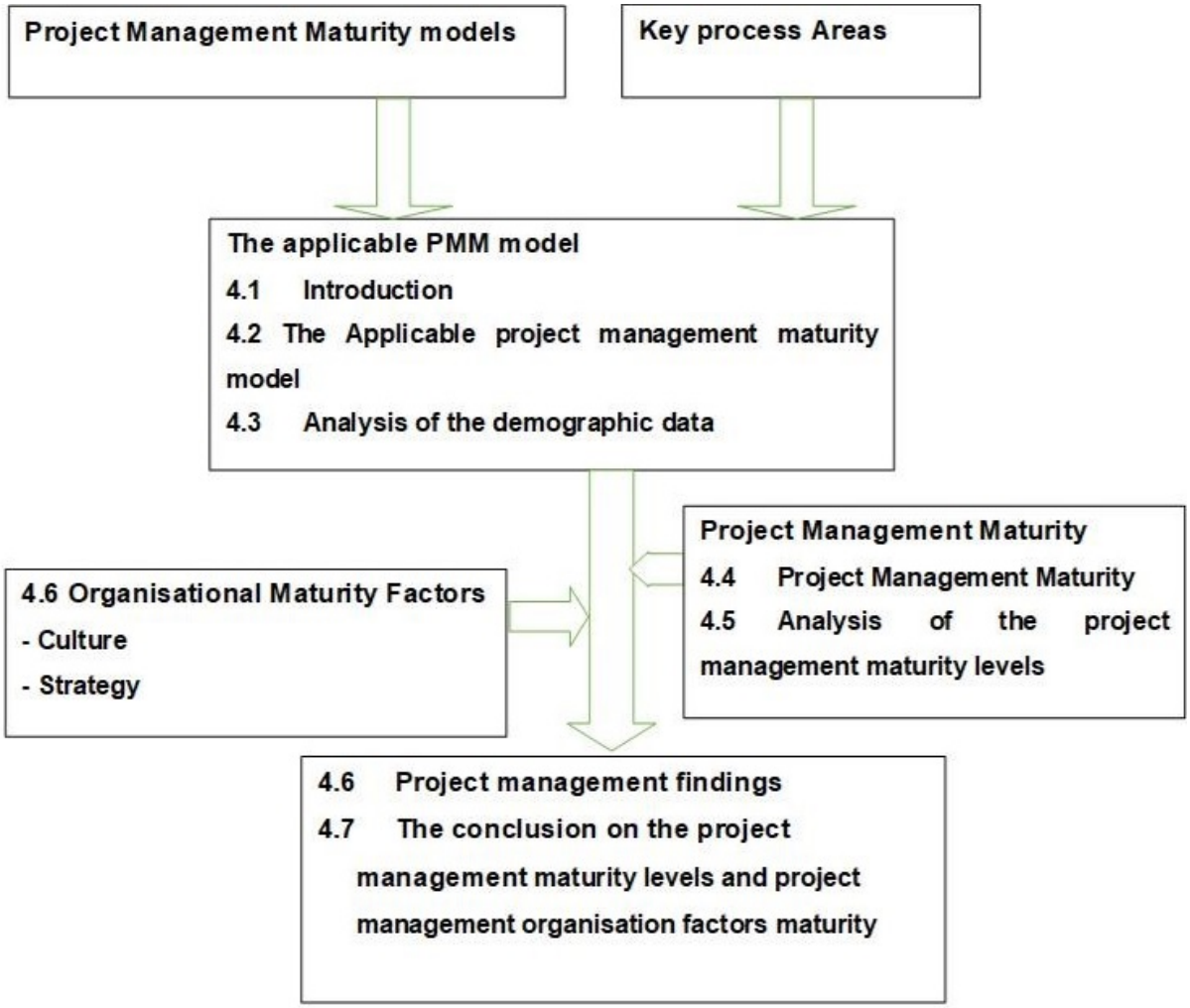

Figure 5.1: The framework for analysis: data analysis (Source researcher)

Figure 5.1 shows the comparison of the project management maturity models against one another to identify the most suitable PMMM, with key process areas critically analysed, to form the Applicable project management maturity model

5.2 The applicable project management maturity model

The Applicable project management maturity model has the following steps: analysis of responses, profiles of respondents, determination of the levels of maturity of the

project management maturity. The organisational maturity factors (cultural and business strategy) are considered. The relationship between the organisational maturity and project management maturity forms the basis of the evaluation, and improvements for the project management maturity are suggested.

All three project management maturity models discussed in the literature review are compared with each other in the table below (Table 5.1) to determine the most suitable project management maturity model for the study.

Table 5.1: Applicability framework outcomes (source: researcher)

project management maturity model	**Capability Maturity Model**	**Kwak and Ibbs Project Management process Maturity Model**	**Crawford project management maturity model**
Covering area or scope of the PMMM	One department or very small projects	Few departments and or medium projects	Entire organisation or large projects
project management maturity model levels	Five	Five	Five
Date issues	1989	1997	2006
Project Management Maturity definition	Irrelevant	Relevant	Relevant
Integration with business strategy and operations	No integration	No integration	Integration
PMMMs easiness or simplicity to use	Difficult	Fairly easy	Easy
Project management framework used by the PMMM	No specification	PMBoK integrated with project processes	PMBoK integrated with project lifecycles
PMMM ability to identify weak or strong areas	Selected areas	Depends	Yes
PMMMs committed to continuous improvement	No, very old	Yes, but very slow	Yes

Table 5.1 reflects that for the scope of the PMMMs, the Crawford PMMM covered the entire organisation and large projects, Capability covered only one project or one unit, while Kwak and Ibbs' project management process maturity model covered few units or medium projects.

The Capability maturity model, Kwak and Ibbs project management process maturity model and Crawford project management maturity model all have five levels of maturity. The newest model amongst the three is Crawford project management maturity model, issued in the year two thousand and seven (2007). The project management maturity definition of Capability maturity model was irrelevant whereas

that of Kwak and Ibbs' project management process maturity model and Crawford project management maturity model were relevant to the study. Capability maturity model and Kwak and Ibbs' project management process maturity models had no integration of business strategy and operations, but Crawford's project management maturity model had fair integration of business strategy and operations.

Crawford's project management maturity model was the easiest of the three to use. The Capability maturity model had no specified project management framework, Kwak and Ibbs' project management process maturity used PMBoK but integrated with project processes, whereas the Crawford project management maturity model utilised PMBoK integrated with the project lifecycles. The Capability maturity model only identify the weak or strong project management point on selected areas. Kwak and Ibbs project management process maturity identify the strong or weak points when only when it depends on the areas being assessed and when is the assessment. The Crawford project management maturity model can identify weak and strong points every time. The Capability maturity model is not committed for continuous improvement. The Kwak and Ibbs project management process maturity shows a slow commitment for continuous improvement while Crawford has a strong commitment for continuous improvement.

Capability maturity model and Kwak and Ibbs project management process maturity model does not assess project management culture while Crawford project management maturity model does. The Crawford PMMM was identified as the most applicable PMMM, used to assess the project management maturity. In addition, to assess the effect of the organisational strategy and organisational culture of Eskom business units on the PMMM. The Crawford project management maturity model uses the framework comprised of the Project Management Book of Key process areas integrated with the project lifecycle. The Crawford project management maturity model will be used as a base to construct a more applicable PMMM for the study.

Khoshgoftar & Osman (2009) compiled a list of comparison factors, which can be used to compare the various PMMMs, as shown in Table 5.1. .The scope of the PMMM, each of the PMMM has a varying scope of framework. Some of the PMMMs' main

focus is on the business processes, whereas some are more focused on the whole organisation (Brookes & Clark, 2009). The maturity levels of the PMMMs are different but generally have five maturity levels (Demir & Kocabaş, 2010). The assessed maturity levels that the organisation attains in the project management processes are averaged to calculate the overall maturity level (Christoph & Konrad, 2014). The Capability maturity model was developed based on the quality and process management (Christoph & Konrad, 2014).

The Applicable PMMM will be presented below (Table 5.2) with their maturity levels, key process areas and the key process groups.

Table 5.2: The Applicable project management maturity levels and their description

Levels number	**The Applicable project management maturity model**
Level one: Ad Hoc	Informal project management processes and practices; No firm support.
Level two: Defined	Basic project management processes for repeating projects; Project team's formation; Informal project management.
Level three: Managed at firm level	Project management awareness; Project management team's development; Project management systems introduced and managed at firm level.
Level four: Managed at corporate level	A controlled project management system in place; project management systems introduced and managed at corporate level (integrated with firm's project management system); Experienced project management personnel.
Level five: Continuous improvement	Continuous project management practices and processes improvement; Business strategy goals and vision assessment.
Key Process Areas	project cost management; project scope management; project time management; project procurement management; project quality management; project human resource management; project communications management; project integration management; project risk management;
Process Groups	Initiating, planning, executing, controlling and closing.

The applicable project management maturity model (Table 5.2) has five maturity levels being: ad-hoc, defined, managed at organisation level, managed at corporate level and the continuous improvement.

Table 5.3: The Applicable project management maturity model in detail (as adapted by the researcher from source: (Willis, 1995)*)*

Project Management Maturity Levels	**Initial**	**Repeatable**	**Defined**	**Managed**	**Optimising**
Project Management Knowledge Areas	**Initiating**	**Planning**		**Executing**	**Monitoring and controlling**	**Closing**
Project Scope Management	Initiation	Scope planning	Scope definition	Create WBS		Scope verification	Scope control	
Project Time Management		Activity definition	Activity sequencing	Activity resource estimating	Activity duration estimating	Schedule development		Schedule control	
Project Cost Management		Cost estimating		Cost budgeting			Cost control	
Project Integration Management		Plan development				Execution	Integrated change control	
Project Quality Management		Quality planning				Quality assurance	Quality control	
Project Communication Management		communications planning				Information distribution	Performance reporting	Administrative closure
Project Risk Management		Risk management planning	Risk identification	Quantitative risk analysis	Qualitative risk analysis	Risk response planning		Risk monitoring and control	
Project Procurement Management		Procurement planning		Solicitation planning		Solicitation	Source selection	Contract administration	Contract closeout
Project Human Resource Management		Organisational planning		Solicitation staff acquisition		Team development			

The Applicable project management maturity model (Table 5.3) was created on the main components consisting of the following variables:

a) Project management Maturity;
b) Organisational strategy and goals;
c) The organisation culture and people;

The above figure (Table 5.3) presents nine project management process areas of the Applicable PMMM, the key process areas groups and the project management maturity level. The organisation must show that the improvement in standard processes and project management processes are consistent. (Babatunde, Perera & Zhou, 2016).

As shown in Table 5.3, the project scope management process area has six key process areas: initiation, scope planning, scope definition, WBS creation, scope verification and scope control. Project time management process area has six key process areas: activity definition, activity sequencing, activity resource estimation, activity duration estimating, schedule development and schedule control. Project cost management has three key process areas: cost estimating, cost budgeting and cost control. Project integration management has three key process areas, namely: plan development, execution and integrated change control. Project quality management has three key process areas, namely: quality planning, quality assurance and quality control. Project communication management has four key process areas, namely: communications planning, information distribution, performance reporting and administrative closure.

Project risk management has six key process areas, namely: risk management, risk identification, quantitative risk analysis, qualitative risk analysis, risk response planning and risk monitoring and control. Project procurement management has six key process areas: procurement planning, solicitation planning, solicitation, source selection, contract administration and contract closeout. Project human resource management has three key process areas: organisational planning, solicitation staff acquisition and team development.

The process groups, as depicted in Table 5.4, entails:

- **Initiating** - definition and acceptance of the project: in this process group, the initiation of the project to be undertaken is defined and signed;

- **Planning** – definition of project objectives and the planning of the project, including the scope: it includes key process areas concerned with the planning of the project and presenting all the project objectives and goals;
- **Executing** – integration of organisation resources to perform the project: the organisation resources are integrated to undertake and produce the project;
- **Controlling** – project progress evaluation and corrections to faults: the status of the project is evaluated and immediate rectifications are performed for identified faults;
- **Closing** – the end and delivery of the project: the stoppage of the project and hand over process.

Table 5.4: The Applicable project management maturity model

	Initiating	**Planning**	**Executing**	**Controlling**	**Closing**
project management maturity model levels	**Business strategy and goals**	**People and culture**	**Project management processes**		**Project management systems**
Level five: Continuous improvement	Business strategy continuous improvement based on project management maturity results.	Project management knowledge freely flows throughout the whole firm.	Close link of frim practices and processes.		Integration of project management system with firm processes.
Level four: Managed at firm level	Project management assigned project leaders and department.	Scattering of project management. Project management groups emerge.	Project management processes formalisation, and integration of business processes and practices into firm operations.		Cross-enterprise of project management possible.
Level three	Project management and business strategy importance identified but lack of project leaders or department	Project management knowledge reuse encouraged by rewards or benefits. Learning is a firm's norm.	Integration of project management processes and practices into the business with limitation to business processes.		Limited presence of project management systems.
Level two	Project management and business strategy importance identified but excluded in	Personnel with limited project management knowledge and skills. Lack of project management culture.	Limited Project management processes introduced, with restricted knowledge access.		Basic Project management systems.

	business strategy.			
Level one: Ad Hoc	Business strategy absent.	Lack of project management knowledge. Change resistant culture.	Lack of Project management processes.	Lack of Project management system.

Conclusions as to the Applicable project management maturity model

Even though the PMMMs were developed by different sources, their objectives are the same, the PMM improvement of the organisations (De Souza and Gomes, 2015).
The organisations that are planning to improve their projects, the adoption and incorporation of the Applicable PMMM in their organisation's strategy and setup can make that improvement possible.

5.3 Analysis of demographic data

The demographical analysis of the study participants is presented in the section below, as to the sequence of the questionnaire.

5.3.1 Number of respondents of the research

The table below (Table 5.5) presents the frequency of the respondents and their various units.

Table 5.5: Number of respondents

Statistics			
Eskom Units			
Transmission	N	Valid	44
		Missing	0
Distribution	N	Valid	45
		Missing	0
Generation	N	Valid	44
		Missing	0

The respondents included 133 Eskom project management personnel, 44 from the Transmission unit, 45 from the Distribution unit and 44 from the Generation unit. The sample size for this study was determined using the Joskow & Yamane (1965) formula. The sampling size was calculated to be 133 for a confidence level of 95%.

5.3.2 Gender

In this section, the gender of the respondents is presented.

Table 5.6: Gender of the respondents

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	58	43.6	43.6	43.6
	Female	75	56.4	56.4	100.0
	Total	133	100.0	100.0	

Table 5.6 shows there were 58 males who constituted 43.6% and 75% females who constituted 56.3% female Eskom project management employees.

5.3.3 Age of the respondents

In the section below, the ages of the respondents are presented and discussed.

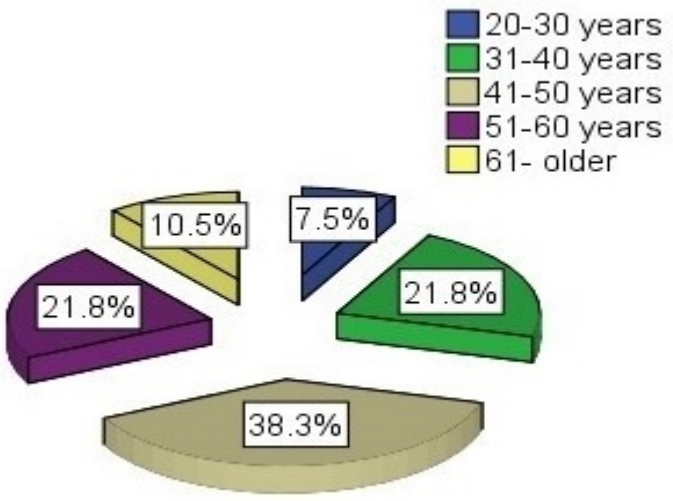

Figure 5.2: Age demographics

Figure 5.2 indicates the ages of the respondents to the study. The highest age group was 41 – 50 years, with 38.3%. The lowest was 20 – 30 years, with seven comma five per cent (7.5%).
The project management personnel had enormous experience among them and have worked for long time in the project management section.

5.3.4 Project management experience

In the section below, the project management experience of the respondents are presented.

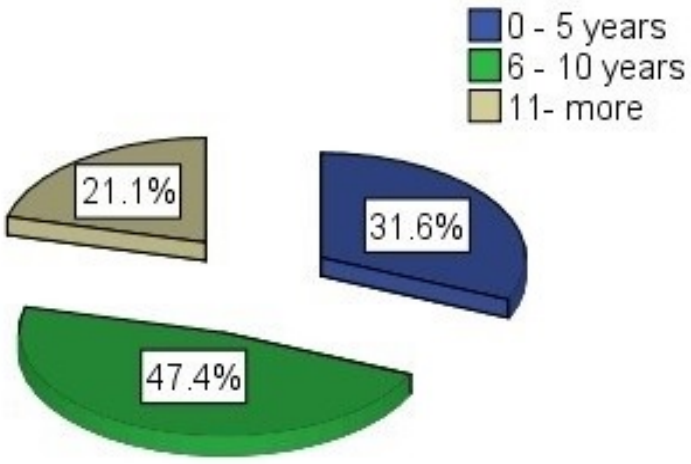

Figure 5.3: Years of experience demographics

Figure 5.3 indicates the project management experience of the Eskom business unit. The highest group in is 6 – 10 years with 47.4%. This is to investigate their project management experience within Eskom to give conclusive responses. The majority of the respondents had between 6 – 10 years' experience in all the units. The respondents had enough experience among them to give acceptable answers. This shows that the majority of the respondents had enough experience to be fully aware of the project management processes in Eskom.

5.3.5 Highest qualification attained

In this section, the educational level, in respect of the highest qualification attained by the respondents, is presented.

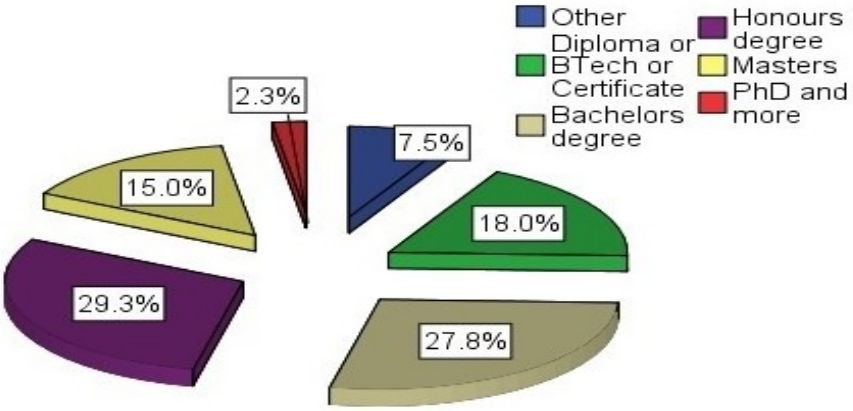

Figure 5.4: Highest level of training demographics

Figure 5.4 indicates that the qualification of Honours degrees was the highest with 29.3%, followed by Bachelor's degrees with 27.8%.

This question was asked to investigate their educational background in respect to project management.

5.4 The Project Management Maturity analysis

This section answer the research question as to what is the Applicable PMMM to assess the project management maturity level of the core business of Eskom.

The Applicable PMMM is utilised to assess the project management maturity level of the core business of Eskom.

5.5 Analysis of the Project Management maturity levels

In this section, the analysis of the data is performed to answer the question as to what is the current project management maturity level of the project management.

The Cronbach Alpha analysis was computed to analyse the reliability of the data collected. The Cronbach's Alpha value was calculated for the analysis internal consistency, taking note that values above 0.70 indicated a high internal consistency (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

5.5.1 Project scope management

In this section, the project management maturity level of project scope management is analysed and presented.

5.5.1.1 Reliability test of the project scope management questions

In this section, the reliability of the answers to the project scope management questions is presented and discussed.

The validity was ensured with the help of the theoretical PMMMs and adjusting them for this study. Statistical validations were used (Caillaud, Rose & Goepp, 2016).

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project scope management section questionnaire in a consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.7: Project scope management reliability statistics

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Scope planning process	14.56	5.824	.591	.388	.794
Scope definition	14.77	5.498	.704	.528	.756
Work Breakdown Structure accuracy	14.48	6.100	.671	.538	.769
Scope verification effectiveness	14.29	6.418	.615	.454	.785
Scope change control	14.45	6.901	.502	.366	.815

Table 5.7 illustrates that the Cronbach's Alpha of the project scope management is more than 0.7, which indicates the internal consistency of the questions that measure project scope management, therefore the results are deemed reliable and consistent. No item was deleted and the results are deemed satisfactory.

5.5.1.2 Project scope management maturity analysis

Project scope management is concerned with all the processes and work necessary for the successful implementation and delivery of the project.

The maturity levels of the key process areas (Table 5.8), of the project scope management process area are presented.

Table 5.8: Project scope management maturity levels

Statistics						
Eskom Units		Scope planning process	Scope definition	Work Breakdown Structure accuracy	Scope verification effectiveness	Scope change control
Transmission	Valid	44	44	44	44	44
	Missing	0	0	0	0	0
	Maturity	**3.6**	**3.4**	**3.5**	**3.8**	**3.7**
	Std. Deviation	.967	.917	.952	.711	.499
	Skewness	-.163	.139	.101	-.045	-.456
	Std. Error of Skewness	.357	.357	.357	.357	.357
	Kurtosis	-.877	-.725	-.868	-.232	-.460
	Std. Error of Kurtosis	.702	.702	.702	.702	.702
Distribution	Valid	45	45	45	45	45
	Missing	0	0	0	0	0
	Maturity	**3.8**	**3.8**	**3.8**	**3.9**	**3.7**
	Std. Deviation	.802	.743	.636	.694	.688
	Skewness	-.349	.433	-.338	.184	-.037
	Std. Error of Skewness	.354	.354	.354	.354	.354
	Kurtosis	-.115	-1.045	.514	-.848	-.144
	Std. Error of Kurtosis	.695	.695	.695	.695	.695
Generation	Valid	44	44	44	44	44
	Missing	0	0	0	0	0
	Maturity	**3.3**	**3.0**	**3.7**	**3.9**	**3.6**
	Std. Deviation	.888	.821	.645	.772	.844
	Skewness	.091	.307	-.088	-.157	.187
	Std. Error of Skewness	.357	.357	.357	.357	.357
	Kurtosis	-.671	-.775	-.035	-.540	-.611

	Std. Error of Kurtosis	.702	.702	.702	.702	.702

Table 5.8 illustrates that in the Generation unit, the scope planning process is scored to be three comma three (3.3), which means it is assessed to be in maturity level three. In the Transmission and Distribution units, the scores are three comma six (3.6) and three comma eight (3.8) respectively, which mean are all evaluated to be in maturity level four.

The scope definition processes of the Transmission and Generation units score three comma four (3.4) and three (3), and are assessed to be in maturity level three. However, the Distribution unit scores the highest with three comma seven (3.7), and is assessed to be in maturity level four.

The work breakdown structure accuracy of the Transmission, Distribution and Generation units are assessed to be in maturity level four as they score three comma five (3.5), three comma eight (3.8) and three comma seven (3.7) respectively.

The scope verification effectiveness processes of the Transmission, Distribution and Generation units are assessed to be in maturity level four as they score three comma eight (3.8), three comma nine (3.9) and three comma nine (3.9) respectively.

The scope change control processes of the Transmission and Distribution units are assessed to be in maturity level four as they both score three comma seven (3.7), whereas, the Generation unit scores three comma seven (3.6) and is assessed to be in maturity level four.

Scope planning and scope definition key process areas of the Generation unit score relatively low maturity levels. This implies that the Generation unit does not plan the project scope effectively and the scope is not appropriately defined. These key process areas need improvement. These key process areas are performing in managed at firm maturity level. The Generation unit must accurately and effectively plan and define its scope processes to attain increased maturity levels.

Table 5.9: Project scope management maturity

	Transmission	Distribution	Generation
Project scope management maturity	3.6	3.8	3.5

In project scope management maturity assessment, the Transmission, Distribution and Generation units score three eight, three comma eight and three comma five respectively, and all are evaluated to be in maturity level four.

5.5.1.3 Findings of the project scope management maturity

Table 5.10: Project scope management statistics

Statistics					
	Scope planning process	Scope definition	Work Breakdown Structure accuracy	Scope verification effectiveness	Scope change control
Valid	133	133	133	133	133
Missing	0	0	0	0	0
Maturity	**3.6**	**3.4**	**3.7**	**3.9**	**3.7**
Std. Deviation	.898	.883	.759	.723	.689
Skewness	-.145	.140	-.168	-.009	-.056
Std. Error of Skewness	.210	.210	.210	.210	.210
Kurtosis	-.708	-.669	-.247	-.564	-.187
Std. Error of Kurtosis	.417	.417	.417	.417	.417

Table 5.10 reflects that scope planning key process area of Eskom scores three comma five six, and is evaluated to be maturity level four (Managed at corporate level). Scope definition key process area scores three comma three four and is evaluated to be in maturity level three (Managed at organisational level). Work breakdown structure key process area scores three comma seven, is evaluated to be in maturity level four (Managed at corporate level). The Scope verification key process area scores three comma nine, is evaluated to be in maturity level four (Managed at corporate level). The Scope change control key process area scores three comma seven, is evaluated to be in maturity level four (Managed at corporate level).

5.5.1.4 Conclusion of project scope management maturity

In this section, project scope management maturity will be concluded.

Table 5.11: Project scope management maturity level

Project scope management maturity	3.7

As reflected in Table 5.11, Eskom scores three comma seven in its project scope management maturity and is evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is integration with the firm's project management system. There are experienced project management personnel.

5.5.2 Project time management

In this section, the project time management maturity analysis is presented and discussed.

5.5.2.1 Reliability test of the project time management questions

In this section, the reliability of the answers to the project time management questions are discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project time management questions in a consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.12: Project time management reliability statistics

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Activity definition	14.27	21.108	.545	.373	.875
Activity sequencing	14.56	18.945	.734	.567	.845
Activity resource estimation	14.64	20.248	.671	.488	.856

Activity duration estimation	14.55	18.492	.718	.562	.847
Schedule development	14.62	18.299	.745	.624	.842
Schedule control	14.58	19.276	.667	.531	.856

Table 5.12 shows that the respondents have answered the project time questions in the consistent way, with a Cronbach Alpha analysis of higher than 0.7; the results are deemed reliable and acceptable.

5.5.2.2 Project time management maturity per division

In this section, the project time management maturity of Eskom units is presented and discussed.

Table 5.13: Project time management maturity levels

Statistics							
Eskom Units		Activity definition	Activity sequencing	Activity resource estimation	Activity duration estimation	Schedule development	Schedule control
Transmission	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	**3.6**	**3.4**	**3.3**	**3.3**	**3.5**	**3.5**
	Std. Deviation	.923	.948	.805	.914	.821	.762
	Skewness	-.187	-.584	-.432	-.174	-.849	-.905
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	-.712	-.326	-.831	-.964	-.518	-.117
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702
Distribution	Valid	45	45	45	45	45	45
	Missing	0	0	0	0	0	0
	Maturity	3.3	3.2	3.0	3.4	3.1	3.0
	Std. Deviation	.953	1.042	.953	1.195	1.136	1.097
	Skewness	-.567	-.470	-.659	-.673	-.428	-.370

	Std. Error of Skewness	.354	.354	.354	.354	.354	.354
	Kurtosis	.104	-.397	-.442	-.278	-.926	-1.156
	Std. Error of Kurtosis	.695	.695	.695	.695	.695	.695
Generation	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	2.6	2.0	2.1	1.9	1.9	2.0
	Std. Deviation	.923	.747	.759	.789	.998	1.011
	Skewness	.185	.000	.552	.421	.730	.756
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	-.873	-1.161	.446	-.428	-.578	-.410
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702

As shown in Table 5.13, the activity definition key process area of the Transmission unit scores three comma six (3.6) and is evaluated to be in maturity level four. Activity definition key process areas of the Distribution and Generation unit score three comma three and two comma six respectively, and both are assessed to be in maturity level three. The Activity sequencing key process areas of the Transmission and Distribution units score three comma four and three comma two respectively, and are evaluated to be in maturity level three. In the Generation unit, the activity sequencing scores two and evaluated to be in maturity level two. The Activity resource estimation key process areas of the Transmission and Distribution units score three comma three and three and are evaluated to be in maturity level three, whereas the Generation unit scores two comma one and is evaluated to be in maturity level two.

Activity duration estimation key process areas of the Transmission and Distribution score three comma three and three comma four and are evaluated to be in maturity level three, whereas the Generation unit scores one comma nine and is evaluated to be in maturity level two. The Schedule development key process area of the Transmission unit scores three comma five and evaluated to be in maturity level four. That of the Distribution unit scores three comma one and evaluated to be in maturity

level three, whereas the Generation scores one comma nine, and evaluated to be in maturity level two in this regard. The Schedule control key process area of the Transmission unit scores three comma five and evaluated to be in maturity level four. That of the Distribution unit scores three and evaluated to be in maturity level three, whereas the Generation unit scores two, and evaluated to be in maturity level two in this regard. This implies the Generation unit does not effectively sequence its activities; does not effectively estimate its activity resources and the activity durations.

These are the key process areas within the project scope management process area that performed in maturity level three, managed at firm level, which means there is project management awareness, project teams are developed and project management systems are introduced and managed at firm level. Activity sequencing, activity resource estimation, schedule development and schedule control of the Generation unit scored the lowest levels of maturity. This implies that the Generation unit lacks the ability to effectively and with accuracy sequence the project activities, estimate the resource activities and activity duration. This is considering the relatively high key process areas' maturity levels of activity definition, schedule development and schedule control. It is evident that Eskom spends a considerable time on project time planning at the beginning, but fails to maintain that level during the course of the project. However, it attempts to control the project time management as shown but most of the time late; the projects are not delivered on time.

Table 5.14: Project time management maturity

	Transmission	Distribution	Generation
Project time management maturity	3.4	3.2	2.1

The Distribution and Generation units score three comma four and three comma two respectively, and both are assessed to be in maturity level three. The Transmission unit scores the lowest with two comma one and assessed to be in maturity level two.

5.5.2.3 Findings of the project time management

Table 5.15: Eskom project time management statistics

Statistics						
	Activity definition	Activity sequencing	Activity resource estimation	Activity duration estimation	Schedule development	Schedule control
Valid	133	133	133	133	133	133
Missing	0	0	0	0	0	0
Maturity	**3.2**	**2.9**	**2.8**	**2.9**	**2.8**	**2.9**
Std. Deviation	1.019	1.108	.996	1.189	1.184	1.140
Skewness	-.180	-.098	-.158	-.041	-.243	-.260
Std. Error of Skewness	.210	.210	.210	.210	.210	.210
Kurtosis	-.675	-.937	-.990	-1.006	-1.280	-1.286
Std. Error of Kurtosis	.417	.417	.417	.417	.417	.417

Table 4-13 illustrates that the activity definition key process area of Eskom scores three comma two and evaluated to be in maturity level three. Activity sequencing, activity duration estimation and schedule control key process areas, all score two comma nine, and evaluated to be in maturity level three. Activity resource estimation and schedule development key process areas score two comma eight, and assessed to be in maturity level three.

5.5.2.4 Project time management maturity conclusion

In this section, the project time management maturity is concluded.

Table 5.16: Project time management maturity level

Project time management maturity	2.9

As reflected in Table 5.16, Eskom project time management maturity scores two comma nine, and evaluated to be in maturity level three (Managed at organisational level). This implies there is an awareness of the project time management. The Project teams are developed and lastly, the introduction of the Project time management systems is taking place.

5.5.3 Project cost management

In this section, the project cost management maturity level is analysed and discussed

5.5.3.1 Reliability test of the project cost management questions

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project cost management questions in a consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.17: Project cost management reliability statistics

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Cost estimating	4.39	1.285	.561	.315	.706
Cost budgeting	4.41	1.304	.615	.381	.640
Cost change control	4.38	1.403	.585	.349	.676

Table 5.17 demonstrates a Cronbach Alpha analysis of more than 0.7, which is obtained if the cost estimating key process area item is deleted. It was deleted to obtain consistency among the project cost management questions.

5.5.3.2 Project cost management maturity results

In this section, the project scope management maturity level of Eskom is presented and discussed.

Table 5.18: Project cost management maturity levels

Statistics			
Eskom Units		Cost budgeting	Cost change control
Transmission	Valid	44	44
	Missing	0	0
	Maturity	**2.0**	**2.3**
	Std. Deviation	.608	.518
	Skewness	-.019	.274

	Std. Error of Skewness	.357	.357
	Kurtosis	-.128	-.793
	Std. Error of Kurtosis	.702	.702
Distribution	Valid	45	45
	Missing	0	0
	Maturity	**2.5**	**2.4**
	Std. Deviation	.661	.684
	Skewness	.623	.688
	Std. Error of Skewness	.354	.354
	Kurtosis	.025	.414
	Std. Error of Kurtosis	.695	.695
Generation	Valid	44	44
	Missing	0	0
	Maturity	**2.0**	**1.9**
	Std. Deviation	.628	.587
	Skewness	-.016	.005
	Std. Error of Skewness	.357	.357
	Kurtosis	-.312	.076
	Std. Error of Kurtosis	.702	.702

Table 5.18 illustrates the Transmission and Generation units score two (2) and are evaluated to be in maturity level two. The Distribution unit scores two comma five (2.5) and is evaluated to be in maturity level three in this regard. The cost change control key process areas of the Transmission, Distribution and Generation units score two comma three, two comma four and one comma nine, respectively, and evaluated to be in maturity level two. If the project costs are not budgeted appropriately, there will either be a serious shortage of funds, which will greatly affect the project, delaying the project delivery. The Cost change control process is also in trouble for the Generation unit as the unit struggles to control or turnaround the situation in terms of project cost. The Applicable project management maturity model attempts to alleviate these identified problems in the project cost management of Eskom to ensure the maximum effectiveness.

Table 5.19: Project cost management maturity

	Transmission	Distribution	Generation
Project cost management maturity	2.2	2.5	2.0

The Transmission and Generation units score two comma two and two respectively, and assessed to be in maturity level two (Defined level). The Distribution unit scores the highest with two comma five and assessed to be in maturity level three (Managed at organisational level).

5.5.3.3 Findings of the project cost management maturity

Table 5.20: Project cost management statistics

Statistics		
	Cost budgeting	Cost change control
Valid	133	133
Missing	0	0
Maturity	**2.2**	**2.2**
Std. Deviation	.661	.628
Skewness	.266	.368
Std. Error of Skewness	.210	.210
Kurtosis	.228	.487
Std. Error of Kurtosis	.417	.417

Table 5.20 illustrates that cost budgeting and cost change control key process areas of Eskom score two comma two and all evaluated to be in maturity level two.

5.5.3.4 Project cost management conclusion

In this section, the project cost management maturity of Eskom is concluded.

Table 5.21: Project cost management maturity level

Project cost management maturity	2.2

As reflected in Table 5.21, Project cost management maturity of Eskom scores two comma two and is evaluated to be in maturity level two (Defined level). This implies

there is a basic project management process for repeating projects. There are project teams and informal project cost management established.

5.5.4 Project integration management

In this section, project integration management maturity level is presented and analysed.

5.5.4.1 Reliability test of the project integration management questions

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project integration management questions in the consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.22: Project integration management reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Plan development process	7.88	1.895	.810	.668	.784
Execution process	8.02	1.613	.780	.643	.808
Integrated change control process	7.90	1.922	.700	.495	.873

Table 5.22 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project quality management questions in the consistent way.

5.5.4.2 Project integration management maturity per division

In this section, the project integration management maturity level of Eskom is presented and discussed.

Table 5.23: Project integration management maturity

Statistics				
Eskom Units		Plan development process	Execution process	Integrated change control process
Transmission	Valid	44	44	44
	Missing	0	0	0
	Maturity	**4.0**	**4.0**	**4.2**
	Std. Deviation	.664	.776	.756
	Skewness	-.973	-.545	-.997
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	2.528	.298	1.532
	Std. Error of Kurtosis	.702	.702	.702
Distribution	Valid	45	45	45
	Missing	0	0	0
	Maturity	**4.4**	**4.4**	**4.2**
	Std. Deviation	.490	.484	.490
	Skewness	.522	.625	.425
	Std. Error of Skewness	.354	.354	.354
	Kurtosis	-1.810	-1.687	.594
	Std. Error of Kurtosis	.695	.695	.695
Generation	Valid	44	44	44
	Missing	0	0	0
	Maturity	**3.7**	**3.3**	**3.6**
	Std. Deviation	.668	.740	.750
	Skewness	-1.055	-.234	-.318
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	1.278	-.528	-.005
	Std. Error of Kurtosis	.702	.702	.702

Table 5.23 illustrates that the plan development processes of the Transmission, Distribution and Generation units score four, four and three comma seven respectively, and evaluated to be in maturity level four.

The Execution processes of the Transmission and Distribution units score four, four comma four respectively, and are evaluated to be in maturity level four. The Generation unit scores three comma three, and evaluated to be in maturity level three in this regard.

The Integrated change control processes of the Transmission, Distribution and Generation units score four comma two, four comma four comma two and three comma six respectively, and all are evaluated to be in maturity level four.
The execution key process area scored a relatively low maturity level. This implies that Eskom cannot execute its project integration processes effectively. The accurate execution of integration processes will enhance the maturity levels.

Table 5.24: Project integration management maturity

	Transmission	Distribution	Generation
Project integration management maturity	4.1	4.3	3.5

The Transmission, Distribution and Generation units score four comma one, four comma three and three comma five respectively, and are assessed to be in maturity level four (Managed at corporate level). This implies in all units, there is a controlled project management system in place. Project management systems are in place. There is integration with the firm's project management system. There are experienced project management personnel.

5.5.4.3 Findings of the project integration management maturity

Table 5.25: Project integration management statistics

Statistics			
	Plan development process	Execution process	Integrated change control process
Valid	133	133	133
Missing	0	0	0
Maturity	**4.0**	**3.9**	**4.0**
Std. Deviation	.668	.798	.718
Skewness	-.799	-.506	-.624
Std. Error of Skewness	.210	.210	.210
Kurtosis	1.768	.030	.755
Std. Error of Kurtosis	.417	.417	.417

Table 5.25 illustrates that plan development and integrated change control key process areas all score four whereas, the execution key process area scores three comma nine and all are evaluated to be in maturity level four (Managed at corporate level).

5.5.4.4 Project integration management conclusion

In this section, the project integration management maturity of Eskom will be concluded.

Table 5.26: Project integration management maturity level

Project integration management maturity	4.0

Project integration management maturity scores four and is evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.5 Project quality management

In this section, the project quality management maturity level is analysed and discussed

5.5.5.1 Reliability test of the project quality management questions

In this section, the reliability of the project quality management questions are presented and discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project quality management questions in the consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.27: Project quality management reliability statistics

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Quality planning effectiveness	8.38	1.585	.859	.745	.830
Quality assurance	8.38	1.723	.777	.611	.900
Quality control	8.32	1.796	.816	.692	.869

Table 5.27 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project quality management questions in the consistent way.

Therefore, no project quality management item was deleted.

5.5.5.2 Project quality management maturity results

In this section, the project quality management maturity of Eskom is presented and discussed.

Table 5.28: Project quality management maturity levels

Statistics				
Eskom Units		Quality planning effectiveness	Quality assurance	Quality control
Transmission	Valid	44	44	44
	Missing	0	0	0
	Maturity	**4.3**	**4.3**	**4.3**
	Std. Deviation	.758	.740	.674
	Skewness	-1.180	-1.316	-.483
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	1.935	2.585	-.710
	Std. Error of Kurtosis	.702	.702	.702
Distribution	Valid	45	45	45
	Missing	0	0	0
	Maturity	**4.4**	**4.4**	**4.4**
	Std. Deviation	.495	.484	.503
	Skewness	.422	.625	.231
	Std. Error of Skewness	.354	.354	.354
	Kurtosis	-1.908	-1.687	-2.039

	Std. Error of Kurtosis	.695	.695	.695
Generation	Valid	44	44	44
	Missing	0	0	0
	Maturity	**3.8**	**3.8**	**3.9**
	Std. Deviation	.756	.734	.655
	Skewness	-.359	-.395	-.404
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	.100	.269	.774
	Std. Error of Kurtosis	.702	.702	.702

Table 5.28 illustrates that in the Transmission, Distribution and Generation units, quality planning effectiveness score four comma three, four comma four and three comma eight respectively and assessed to be in maturity level four.

The Quality assurance key process areas of the Transmission, Distribution and Generation units score four comma three, four comma four and three comma eight respectively, and all assessed to be in maturity level four.

Quality control key process areas of the Transmission, Distribution and Generation units score four comma three, four comma four and three comma nine and all assessed to be in maturity level four, managed at corporate level.

This implies that there is no quality compromise of the project, even though there is still room for improvement.

Table 5.29: Project quality management maturity

	Transmission	Distribution	Generation
Project quality management maturity	4.3	4.4	3.8

The Transmission, Distribution and Generation units score four comma three, four comma four and three comma eight respectively, all are assessed to be in maturity level four (Managed at corporate level). This implies that there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.5.3 Findings of the project quality management maturity

Table 5.30: Project quality management statistics

Statistics			
	Quality planning effectiveness	Quality assurance	Quality control
Valid	133	133	133
Missing	0	0	0
Maturity	**4.2**	**4.2**	**4.2**
Std. Deviation	.720	.705	.655
Skewness	-.754	-.759	-.422
Std. Error of Skewness	.210	.210	.210
Kurtosis	.857	1.060	.027
Std. Error of Kurtosis	.417	.417	.417

Table 5.30 illustrates that quality planning effectiveness, quality assurance and quality control key process areas of Eskom score four comma two and evaluated to be in maturity level four (Managed at corporate level) This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.5.4 Project quality management conclusion

In this section, the conclusion of project quality management maturity is presented.

Table 5.31: Project quality management maturity level

Project quality management maturity	4.2

As reflected in Table 5.31, Project quality management maturity of Eskom scores four comma two and is evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.6 Project human resource management

In this section, the project human resource management maturity level is analysed and discussed

5.5.6.1 Reliability test of the project human resource management questions

In this section, the reliability of the project human resource management answers is presented and discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the project human resource management questions in the consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.32: Project human resource management reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Human Resource planning	7.99	1.583	.748	.562	.774
Staff acquisition	8.02	1.469	.733	.544	.789
Team development	7.90	1.649	.696	.486	.821

Table 5.32 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project human resource management questions in the consistent way.
In conclusion, no project human resource management item was deleted.

5.5.6.2 Project human resource management maturity

In this section, the project human resource management maturity level of Eskom is presented and discussed.

Table 5.33: Project human resource management maturity level

Statistics				
Eskom Units		Human Resource planning	Staff acquisition	Team development
Transmission	Valid	44	44	44
	Missing	0	0	0
	Maturity	**3.9**	**4.0**	**4.1**
	Std. Deviation	.795	.778	.676
	Skewness	-.328	-.311	-.583
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	-.193	-.442	1.101
	Std. Error of Kurtosis	.702	.702	.702
Distribution	Valid	45	45	45
	Missing	0	0	0
	Maturity	**4.2**	**3.9**	**4.3**
	Std. Deviation	.548	.780	.654
	Skewness	.104	-.181	-.332
	Std. Error of Skewness	.354	.354	.354
	Kurtosis	.021	-.596	-.661
	Std. Error of Kurtosis	.695	.695	.695
Generation	Valid	44	44	44
	Missing	0	0	0
	Maturity	**3.8**	**3.9**	**3.8**
	Std. Deviation	.582	.618	.594
	Skewness	.025	.069	.079
	Std. Error of Skewness	.357	.357	.357
	Kurtosis	-.134	-.287	-.279
	Std. Error of Kurtosis	.702	.702	.702

Table 5.33 illustrates that the human resource planning key process area of the Transmission, Distribution and Generation units score three comma nine, four comma two and three comma eight respectively, and are assessed to be in maturity level four. The staff acquisition key process areas of the Transmission, Distribution and Generation units score four, three comma nine and three comma nine respectively, and are evaluated to be in maturity level four. Team development key process areas of the Transmission, Distribution and Generation units score four comma one, four comma three and three comma eight respectively, and are evaluated to be in maturity level four. This implies that there seldom was a shortage of human resources for the project. Eskom can make effective use of the Applicable PMMM to enhance its project human resource process, and get the right professionals for the right work at the right time.

Table 5.34: Project human resource management maturity

	Transmission	Distribution	Generation
Project human resource management maturity	4	4.1	3.8

The Transmission, Distribution and Generation units score four, four comma one and three comma eight respectively and are evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.6.3 Findings of the project human resource management maturity

Table 5.35: Project human resource management statistics

Statistics			
	Human Resource planning	Staff acquisition	Team development
Valid	133	133	133
Missing	0	0	0
Maturity	**4.0**	**3.9**	**4.1**
Std. Deviation	.667	.726	.666
Skewness	-.268	-.149	-.215

Std. Error of Skewness	.210	.210	.210
Kurtosis	.163	-.477	-.186
Std. Error of Kurtosis	.417	.417	.417

Table 5.35 illustrates that human resource planning, staff acquisition and team development key process areas scored four, three comma nine and four comma one respectively, and all evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.6.4 Project human resource management conclusion

In this section, the conclusion of project human resource management maturity is presented.

Table 5.36: Project human resource management maturity level

Project human resource management maturity	4

As reflected in Table 5.36, project human resource management maturity of Eskom scores four and is assessed to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.7 Project communication management

In this section, the project communication management maturity level is presented and discussed.

5.5.7.1 Reliability test of the project communication management questions.

In this section, the reliability of the project communication management maturity answers are presented and discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the questionnaire in the consistent way (Passos, Silva, Pitangui, Oliveira, Lima & Araújo, 2017).

Table 5.37: Project communication management reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Communication planning	12.19	3.078	.515	.301	.874
Information distribution	12.20	2.845	.772	.611	.761
Performance reporting	12.43	2.762	.702	.567	.790
Administration closure	12.24	2.911	.751	.637	.772

Table 5.37 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project communication management questions in the consistent way.
In conclusion, no project communication management item was deleted.

5.5.7.2 Project communication management maturity per division

In this section, the project communication management maturity level is presented and discussed.

Table 5.38: Project communication management maturity levels

Statistics					
Eskom Units		Communication planning	Information distribution	Performance reporting	Administration closure
Transmission	Valid	44	44	44	44
	Missing	0	0	0	0
	Maturity	**4.1**	**4.2**	**4.3**	**4.4**
	Std. Deviation	.728	.605	.518	.574

	Skewness	-.106	-.137	.274	-.204
	Std. Error of Skewness	.357	.357	.357	.357
	Kurtosis	-1.050	-.396	-.793	-.692
	Std. Error of Kurtosis	.702	.702	.702	.702
Distribution	Valid	45	45	45	45
	Missing	0	0	0	0
	Maturity	**4.3**	**4.3**	**3.9**	**4.2**
	Std. Deviation	.633	.514	.726	.535
	Skewness	-.358	.310	.210	.162
	Std. Error of Skewness	.354	.354	.354	.354
	Kurtosis	-.610	-.759	-1.031	.237
	Std. Error of Kurtosis	.695	.695	.695	.695
Generation	Valid	44	44	44	44
	Missing	0	0	0	0
	Maturity	**4.1**	**3.9**	**3.6**	**3.8**
	Std. Deviation	.784	.709	.658	.632
	Skewness	-.509	-.278	-.351	-.396
	Std. Error of Skewness	.357	.357	.357	.357
	Kurtosis	-.283	.100	.098	.686
	Std. Error of Kurtosis	.702	.702	.702	.702

Table 5.38 illustrates that communication planning key process areas of the Transmission, Distribution and Generation units score four comma one, four comma three and four comma one respectively and evaluated to be in maturity level four. The Information distribution key process areas of the Transmission, Distribution and Generation units score four comma two, four comma three and three comma nine respectively and are evaluated to be in maturity level four.

The Performance reporting key process areas of The Transmission, Distribution and Generation units score four comma three, three comma nine and three comma six respectively, and are assessed to be in maturity level four.

The Administration closure key process areas of the Transmission, Distribution and Generation units score four comma four, four comma two and three comma eight respectively, and evaluated to be in maturity level four. All of the project communication management processes are evaluated to be in maturity level four, Managed at corporate level. This implies that the communication amongst the project personnel and the technologies used for communication are appropriate and relevant, however, there is still a room for improvement by identifying ways to enhance the maturity level with the use of the Applicable PMMM.

Table 5.39: Project communication management maturity

	Transmission	Distribution	Generation
Project communication management maturity	4.3	4.2	3.9

The Transmission, Distribution and Generation units of Eskom score four comma three, four comma two and three comma nine respectively and are assessed to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.7.3 Findings of project communication management maturity level

Table 5.40: Project communication management statistics

Statistics				
	Communication planning	Information distribution	Performance reporting	Administration closure
Valid	133	133	133	133
Missing	0	0	0	0
Maturity	**4.2**	**4.2**	**3.9**	**4.1**
Std. Deviation	.720	.634	.703	.623
Skewness	-.382	-.313	-.160	-.271
Std. Error of Skewness	.210	.210	.210	.210
Kurtosis	-.559	.225	-.292	.337
Std. Error of Kurtosis	.417	.417	.417	.417

Table 5.40 illustrates that communication planning, information distribution, performance reporting and administration closure key process areas score four comma two, four comma two, three comma nine, four comma one respectively, and assessed to be in maturity level four.

5.5.7.4 Project communication management maturity conclusion

In this section, the project communication management maturity of Eskom is concluded.

Table 5.41: Project communication management maturity level

Project communication management maturity	4.1

As reflected in Table 5.41, the Project communication management maturity of Eskom scores four and is evaluated to be in maturity level of four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

5.5.8 Project risk Management

In this section, the project risk management maturity level is presented and discussed.

5.5.8.1 Reliability test of the project risk management questions.

In this section, the reliability of the answers to the project risk management questions is presented and discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the questionnaire in the consistent way.

Table 5.42: Project risk management reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted

Risk planning accuracy	18.47	13.554	.803	.722	.906
Risk identification	18.45	12.977	.755	.706	.914
Qualitative risk analysis performed	18.31	13.988	.825	.724	.905
Qualitative risk analysis encouraged	18.24	13.927	.752	.689	.913
Risk response planning	18.31	13.594	.781	.673	.909
Risk control effective	18.29	12.982	.789	.650	.909

Table 5.42 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project risk management questions in the consistent way.

In conclusion, no project risk management item was deleted.

5.5.8.2 Project risk management maturity per division

In this section, the project risk management maturity of Eskom divisions is presented and discussed.

Table 5.43: Project risk management maturity levels

Statistics							
Eskom Units		Risk planning accuracy	Risk identification	Qualitative risk analysis performed	Qualitative risk analysis encouraged	Risk response planning	Risk control effective
Transmission	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	**3.6**	**3.4**	**4.0**	**4.1**	**3.9**	**3.8**
	Std. Deviation	.865	1.123	.549	.618	.818	1.040
	Skewness	-.330	-.056	.017	-.069	-.938	-1.176
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357

	Kurtosis	.738	-1.050	.580	-.287	2.410	1.690
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702
Distribution	Valid	45	45	45	45	45	45
	Missing	0	0	0	0	0	0
	Maturity	**3.9**	**4.2**	**4.0**	**4.1**	**4.1**	**4.2**
	Std. Deviation	.654	.638	.522	.668	.647	.650
	Skewness	.066	-.140	.000	-.101	-.106	-.187
	Std. Error of Skewness	.354	.354	.354	.354	.354	.354
	Kurtosis	-.547	-.493	.987	-.665	-.523	-.590
	Std. Error of Kurtosis	.695	.695	.695	.695	.695	.695
Generation	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	**3.0**	**3.2**	**3.1**	**3.1**	**3.1**	**3.2**
	Std. Deviation	.714	.776	.741	.722	.661	.776
	Skewness	-.066	.024	-.148	.213	-.072	.024
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	-.965	-.658	-1.121	-.101	-.603	-.658
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702

Table 5.43 illustrates that the risk planning accuracy key process areas of the Transmission, and Distribution units score three comma six and three comma nine respectively and evaluated to be in maturity level four, while the Generation unit scores three and is assessed to be in maturity level three. Risk identification key process areas of the Transmission and Generation units score three comma four and three comma two respectively, and evaluated to be in maturity level three, while the Distribution unit scores four comma two and assessed to be in maturity level four. The Qualitative risk analysis performed key process areas of the Transmission and Distribution both score four and are evaluated to be in maturity level four, while the Generation unit scores three comma one and is assessed to be in maturity level three. The Qualitative risk analysis encouraged key process areas of the Transmission and

Distribution both score four comma one and are evaluated to be in maturity level four, while the Generation unit scores three comma one and is assessed to be in maturity level three. The Risk response planning key process areas of the Transmission and Distribution score three comma nine and four comma one respectively, and are evaluated to be in maturity level four, while the Generation unit scores three comma one and is assessed to be in maturity level three.

The Risk control effective key process areas of the Transmission and Distribution units score three comma eight and four comma two respectively, and are evaluated to be in maturity level four, while the Generation unit scores three comma two and is assessed to be in maturity level three. The Risk planning accuracy, risk identification, qualitative risk analysis performed, qualitative risk analysis encouraged, risk response planning and risk control effective score relatively low maturity levels. More especially in the Generation unit. There is poor risk planning accuracy, there is no plan for the unexpected. No identification of unexpected circumstances, as the risk identification scored low. There is hardly any qualitative risk analysis performed and not encouraged. There is no plan to respond to the unexpected situations, hence, low risk response maturity level. The control to these unexpected situations was not effective.

Table 5.44: Project risk management maturity

	Transmission	Distribution	Generation
Project risk management maturity	3.8	4.1	3.1

The Transmission and Distribution units score three comma eight and four comma one respectively and are evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

The Generation unit scores the least of the three, with three comma one, and is evaluated to be in maturity level three (Managed at organisational level) – there is an awareness of the project management; project teams are being developed and Project management systems are introduced.

5.5.8.3 Findings of the project risk management maturity level

Table 5.45: Project risk management statistics

Statistics						
	Risk planning accuracy	Risk identification	Qualitative risk analysis performed	Qualitative risk analysis encouraged	Risk response planning	Risk control effective
Valid	133	133	133	133	133	133
Missing	0	0	0	0	0	0
Maturity	**3.5**	**3.6**	**3.7**	**3.8**	**3.7**	**3.7**
Std. Deviation	.830	.964	.747	.813	.842	.932
Skewness	-.174	-.261	-.572	-.250	-.327	-.611
Std. Error of Skewness	.210	.210	.210	.210	.210	.210
Kurtosis	-.093	-.665	.243	-.396	-.008	.325
Std. Error of Kurtosis	.417	.417	.417	.417	.417	.417

Table 5.45 illustrates that risk planning accuracy and risk identification key process areas of Eskom, score three comma five and three comma six respectively and are assessed to be in maturity level four (Managed at corporate level). Qualitative risk analysis performed, Risk response planning and Risk control effective key process areas of Eskom all score three comma seven, and are assessed to be in maturity level four (Managed at corporate level). Qualitative risk analysis encouraged key process area of Eskom scores three comma eight, and is assessed to be in maturity level four (Managed at corporate level).

5.5.8.4 Project risk management maturity conclusion

In this section, the project risk management maturity conclusion is presented.

Table 5.46: Project risk management maturity level

Project risk management maturity	3.7

As illustrated in Table 5.46, project risk management maturity of Eskom scores three comma seven, and is evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project risk management system in place.

Project risk management systems are in place. There is an integration with the firm's project management system. There are experienced project risk management personnel.

5.5.9 Project procurement management

In this section, the project procurement management maturity level is presented and discussed.

5.5.9.1 Reliability test of the project procurement management questions.

In this section, the reliability test of the project procurement management questions is conducted to determine the reliability of the answers.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the questionnaire in the consistent way.

Table 5.47: Project procurement management reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Procurement planning effectiveness	17.05	19.937	.854	.779	.949
Solicitation planning in place	17.08	19.758	.874	.802	.947
Solicitation process	17.11	19.510	.896	.816	.944
Source selection accuracy	17.11	20.692	.867	.814	.948
Contract administration	16.91	20.158	.869	.820	.947
Contract close-out review	16.95	20.589	.819	.686	.953

Table 5.47 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project risk management questions in the consistent way.
In conclusion, no project risk management item was deleted.

5.5.9.2 Project procurement management maturity

In this section, the project procurement management maturity of Eskom divisions is presented and discussed.

Table 5.48: Project procurement management maturity levels

Statistics							
Eskom Units		Procurement planning effectiveness	Solicitation planning in place	Solicitation process	Source selection accuracy	Contract administration	Contract close-out review
Transmission	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	**4.0**	**3.8**	**3.9**	**3.9**	**4.3**	**3.9**
	Std. Deviation	.821	.914	.930	.884	.651	.905
	Skewness	-.571	-.246	-.263	-.239	-.297	-.313
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	-.036	-.817	-.893	-.868	-.644	-.710
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702
Distribution	Valid	45	45	45	45	45	45
	Missing	0	0	0	0	0	0
	Maturity	**3.5**	**3.5**	**3.5**	**3.2**	**3.4**	**3.6**
	Std. Deviation	.968	1.036	.991	.777	.965	1.011
	Skewness	-.046	.035	-.096	-.022	-.008	-.153
	Std. Error of Skewness	.354	.354	.354	.354	.354	.354
	Kurtosis	-.912	-1.127	-.972	-.701	-.926	-1.016
	Std. Error of Kurtosis	.695	.695	.695	.695	.695	.695
Generation	Valid	44	44	44	44	44	44
	Missing	0	0	0	0	0	0
	Maturity	**2.7**	**2.7**	**2.6**	**2.9**	**2.9**	**3.0**
	Std. Deviation	.771	.734	.693	.772	.789	.792
	Skewness	.309	.164	.318	-.157	-.174	-.335
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357

	Kurtosis	-.689	-.485	-.302	-.540	-.653	-.535
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702

Table 5.48 illustrates procurement planning effectiveness key process areas of the Transmission and Distribution units score four and three comma five respectively, and are evaluated to be in maturity level four, while, that of the Generation unit scores two comma seven, and is assessed to be in maturity level three. The Solicitation planning in place key process areas of the Transmission and Distribution units score three comma eight and three comma five, respectively, and are evaluated to be in maturity level four, while, that of the Generation unit scores two comma seven, and is evaluated to be in maturity level three.

The Solicitation processes of the Transmission and Distribution units score three comma nine and three comma five, respectively, and are evaluated to be in maturity level four, while, that of the Generation unit scores two comma six, and is evaluated to be in maturity level three. The Source selection accuracy key process area of the Transmission unit scores three comma nine and is evaluated to be in maturity level four, while that of the Distribution and Generation units score three comma two and two comma nine respectively, and are evaluated to be in maturity three. The Contract administration key process area of the Transmission unit scores four comma three and is evaluated to be in maturity level four, while that of the Distribution and Generation score three comma four and two comma nine respectively, and are evaluated to be in maturity three.

The Contract close-out review key process areas of the Transmission and Distribution units score three comma nine and three comma six, respectively, and are evaluated to be in maturity level four, while, that of the Generation unit scores three, and is evaluated to be in maturity level three. Procurement planning effectiveness, solicitation planning in place, solicitation process, source selection accuracy, contract close-out review key process areas are evaluated to be in a relatively low maturity level, Managed at firm level. This resulted in delayed project delivery, as there was a significant shortage of equipment or resources applicable for the project development.

There was no timeous procurement of required resources and this affected the project progress, as it had to stop or delay the delivery of resources for the project to progress.

Table 5.49: Project procurement management maturity

	Transmission	Distribution	Generation
Project procurement management maturity	4	3.5	2.8

The Transmission unit scores four, evaluated to be in maturity level four (Managed at corporate level). The Distribution unit scores three comma five, evaluated to be in maturity level four (Managed at corporate level). The Generation unit scores two comma eight, evaluated to be in maturity level three (Managed at organisational level) – there is an awareness of the project management; project teams are being developed and Project management systems are introduced.

5.5.9.3 Findings of the project procurement management maturity level

Table 5.50: Project procurement management statistics

Statistics						
	Procurement planning effectiveness	Solicitation planning in place	Solicitation process	Source selection accuracy	Contract administration	Contract close-out review
Valid	133	133	133	133	133	133
Missing	0	0	0	0	0	0
Maturity	**3.4**	**3.4**	**3.3**	**3.3**	**3.5**	**3.5**
Std. Deviation	1.015	1.018	1.028	.911	.974	.966
Skewness	-.028	.144	.147	.087	-.197	-.096
Std. Error of Skewness	.210	.210	.210	.210	.210	.210
Kurtosis	-.957	-.907	-.957	-.541	-.733	-.734
Std. Error of Kurtosis	.417	.417	.417	.417	.417	.417

Table 5.50 illustrates that procurement planning effectiveness and solicitation planning in place key process areas both score three comma four, and are evaluated to be in maturity level three (Managed at organisational level). Solicitation process and source selection accuracy key process areas both score three comma three, and are

evaluated to be in maturity level three (Managed at organisational level). Contract close – out review and contract administration key process areas both score three comma five, and are evaluated to be in maturity level four (Managed at corporate level).

5.5.9.4 Project procurement management maturity conclusion

In this section, the conclusion on project procurement management maturity is presented.

Table 5.51: Project procurement management maturity level

Project procurement management maturity	3.4

As illustrated in Table 5.51, project procurement management maturity of Eskom scores three comma four (Managed at organisational level) – there is an awareness of the project procurement management; project procurement teams are being developed and Project procurement management systems are introduced.

5.6 Project management organisation factors maturity

In this section, the project management organisation factors maturity levels are analysed and presented.

5.6.1 Project management organisation culture maturity.

In this section, the project management organisation culture maturity is presented.

5.6.1.1 Reliability test of the project management organisation culture maturity questions.

In this section, the reliability test of Eskom project management organisation culture maturity questions is conducted and presented.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the questionnaire in the consistent way.

Table 5.52: Project management organisation culture maturity reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
The relationship between the project team members	16.68	15.657	.619	.451	.934
The degree of trust amongst the team members, project managers and senior management	16.60	14.514	.780	.642	.915
Rewarding model has an impact on project management personnel performance	16.58	14.276	.848	.763	.906
Project risks incorporated in everyday duration of the project.	16.58	13.776	.865	.781	.903
Project major changes are authorised by senior management first before implemented	16.53	14.009	.853	.784	.905
There is project success commitment amongst project team members	16.50	14.706	.766	.714	.916

Table 5.52 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project quality management questions in the consistent way.

5.6.1.2 Project management organisation culture maturity per division

Table 5.53: Project management organisation culture maturity report

Eskom Units		The relationship between the project team members	The degree of trust amongst the team members, project managers and senior management	Rewarding model has an impact on project management personnel performance	Project risks incorporated in everyday duration of the project.	Project major changes are authorised by senior management first before implemented	There is project success commitment amongst project team members
Transmission	**Maturity**	**3.5**	**3.9**	**3.7**	**3.9**	**4.0**	**3.8**
	Std. Deviation	.664	.462	.660	.545	.569	.657
	Skewness	-1.084	-3.489	-.151	-.055	-.013	.205
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	.057	11.588	.085	.566	.308	-.633
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702
Distribution	Valid	45	45	45	45	45	45
	Maturity	**3.3**	**3.4**	**3.6**	**3.6**	**3.6**	**3.6**
	Std. Deviation	.953	.986	.841	.867	.812	.802
	Skewness	.585	.292	-.183	-.069	-.129	-.358
	Std. Error of Skewness	.354	.354	.354	.354	.354	.354
	Kurtosis	-.526	-.877	-.441	-.565	-.353	-.149
	Std. Error of Kurtosis	.695	.695	.695	.695	.695	.695
Generation	Valid	44	44	44	44	44	44
	Maturity	**2.8**	**2.6**	**2.7**	**2.5**	**2.6**	**2.7**
	Std. Deviation	.743	.618	.680	.589	.661	.701
	Skewness	.398	.473	.549	.899	.750	.486
	Std. Error of Skewness	.357	.357	.357	.357	.357	.357
	Kurtosis	-1.060	-.587	-.696	-.122	-.450	-.822
	Std. Error of Kurtosis	.702	.702	.702	.702	.702	.702

Table 5.53 illustrates the relationship between the project team members of the Transmission unit scores three comma five and evaluated to be in maturity level four. The relationship between the project team members of the Distribution and Generation units score three comma three and two comma eight and evaluated to be in maturity level three. The degree of trust amongst the team members, project managers and senior management of the Transmission unit scores three comma nine and evaluated to be in maturity level four. The degree of trust amongst the team members, project managers and senior management of the Distribution and Generation unit score three comma four and two comma six and evaluated to be in maturity level three. The Rewarding model has an impact on project management personnel performance of the Transmission and Distribution units and score three comma seven and three comma six respectively and are evaluated to be in maturity level four. The Rewarding model has an impact on project management personnel performance of the Generation unit and scores two comma seven and is evaluated to be in maturity level three.

Project risks incorporated in everyday duration of the project of the Transmission and Distribution units score three comma nine and three comma six respectively and are evaluated to be in maturity level four. The Project risks incorporated in everyday duration of the project of the Generation unit scores two comma five and evaluated to be in maturity level three. Project major changes are authorised by senior management first before implemented of the Transmission and Distribution unit score four and three comma six respectively and are evaluated to be in maturity level four. Project major changes are authorised by senior management first before implemented of the Generation unit scores two comma six and is evaluated to be in maturity level three. There is project success commitment amongst project team members of the Transmission and Distribution units and score three comma eight and three comma six respectively and are evaluated to be in maturity level four. There is project success commitment amongst project team members of the Generation unit, which scores two comma seven and evaluated to be in maturity level three.

Table 5.54: Project culture management maturity

	Transmission	Distribution	Generation

Project culture management maturity	3.8	3.5	2.2

The Transmission and Distribution units score three comma eight and three comma five respectively, and are evaluated to be in maturity level four (Managed at corporate level). The Generation unit scores the least of the three, with two comma two, and evaluated to be in maturity level two (defined level).

5.6.1.3 Findings of the project management organisation culture maturity level

Table 5.55: Project management organisation culture maturity

Statistics						
	The relationship between the project team members	The degree of trust amongst the team members, project managers and senior management	Rewarding model has an impact on project management personnel performance	Project risks incorporated in everyday duration of the project.	Project major changes are authorised by senior management first before implemented	There is project success commitment amongst project team members
Valid	133	133	133	133	133	133
Missing	0	0	0	0	0	0
Maturity	**3.2**	**3.3**	**3.3**	**3.3**	**3.4**	**3.4**
Std. Deviation	.853	.886	.865	.924	.900	.869
Skewness	.174	-.083	-.021	-.029	-.104	-.080
Std. Error of Skewness	.210	.210	.210	.210	.210	.210
Kurtosis	-.671	-.940	-.777	-.972	-.872	-.731
Std. Error of Kurtosis	.417	.417	.417	.417	.417	.417

Table 5.55 illustrates the relationship between the project team members of Eskom that scores three comma two and evaluated to be in maturity level three.

The degree of trust amongst the team members, project managers and senior management of Eskom scores three comma three and evaluated to be in maturity level three. The Rewarding model has an impact on project management personnel

performance of Eskom and scores three comma three and is evaluated to be in maturity level three. The Project risks incorporated in everyday duration of the project of Eskom scores three comma three and evaluated to be in maturity level three. The Project major changes are authorised by senior management first before implemented of Eskom scores three comma four and is evaluated to be in maturity level three. There is project success commitment amongst project team members of Eskom scoring three comma four and is evaluated to be in maturity level three.

5.6.1.4 Project management organisation culture maturity conclusion

In this section, the conclusion of project management organisation culture maturity is presented.

Table 5.56: Project management organisation culture maturity level

Project culture management maturity	3.3

Project management organisational culture maturity scores three comma three and is evaluated to be in maturity level three (Managed at organisational level). This implies there is a selective trust amongst project management team members. There is a selective project management commitment culture. There is an informal project risk management culture in place. Authority to change and implement the project changes authorisation is informal, even though partly regulated.

5.6.2 Project Management Organisation Strategy Maturity

In this section, the project management organisation strategy maturity level of the organisation is analysed and presented.

5.6.2.1 Reliability test of the project management organisation strategy questions.

In this section, the reliability of the answers to the project management organisation strategy are presented and discussed.

A Cronbach Alpha analysis of 0.7 or higher indicates that the respondents have answered the questionnaire in the consistent way.

Table 5.57: Project management organisation strategy reliability

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
How aware are you of your organisation's business strategy?	20.47	23.251	.600	.611	.861
Are the projects goal clearly aligned to the organisation's strategic goal?	20.56	22.537	.752	.718	.843
Do project teams have a clear understanding of the value that the projects add to the organisation?	20.71	21.872	.665	.518	.853
Did the project core team take part in creation of the project goal statement?	20.77	22.237	.613	.443	.860
Were intensive and consistent selection criteria utilised to choose this project?	20.80	22.598	.657	.478	.854

Do you understand the link between the organisation's projects to achieve the organisation's strategy?	20.74	22.029	.666	.507	.852
Was the project chosen based on the contribution to the organisation comparing the priority ranks?	20.80	22.492	.621	.437	.859

Table 5.57 demonstrates that a Cronbach Alpha analysis of more than 0.7 indicates that the respondents have answered the project management organisation strategy maturity questions in the consistent way.

In conclusion, no project management organisation strategy maturity item was deleted.

5.6.2.2 Project management organisation strategy maturity per division

In this section, the project management organisation strategy maturity of Eskom divisions are presented and discussed.

The analysis and discussions are based on the logical sequence of the questions.

I. How aware are you of your organisation's business strategy?

Table 5.58: How aware are you of your organisation's business strategy?

How aware are you of your organisation's business strategy?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Strongly Disagree	2	4.5	4.5	4.5
	Disagree	3	6.8	6.8	11.4
	Neither Disagree Nor Agree	9	20.5	20.5	31.8

	Agree	24	54.5	54.5	86.4
	Strongly Agree	6	13.6	13.6	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	1	2.2	2.2	2.2
	Neither Disagree Nor Agree	8	17.8	17.8	20.0
	Agree	23	51.1	51.1	71.1
	Strongly Agree	13	28.9	28.9	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	3	6.8	6.8	6.8
	Disagree	7	15.9	15.9	22.7
	Neither Disagree Nor Agree	12	27.3	27.3	50.0
	Agree	18	40.9	40.9	90.9
	Strongly Agree	4	9.1	9.1	100.0
	Total	44	100.0	100.0	

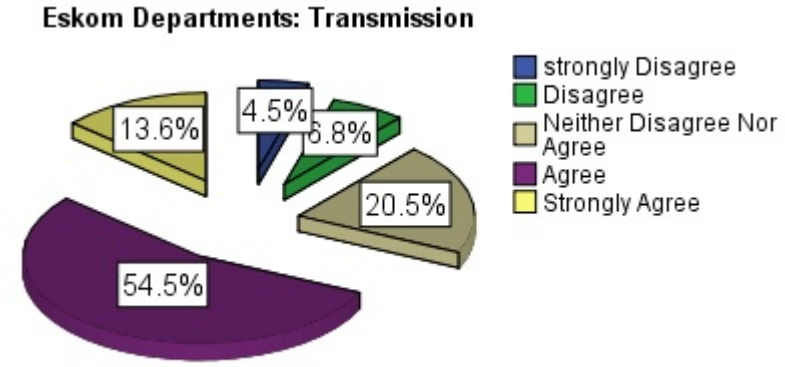

Figure 5.5: Organisation's business strategy – Transmission

Table 5.58 and Figure 5.5 illustrate that in the Transmission unit, four comma five percent (4.5%) strongly disagree, six comma eight percent (6.8%) disagree, and twenty comma five percent (20.5%) neither disagree nor agree they are aware of their organisation's business strategy. Fifty- four comma five percent (54.5%) agree, while thirteen comma six percent (13.6%) strongly agree; they are aware of their organisation's business strategy. Therefore, the Transmission unit's members are aware of their organisation's business strategy.

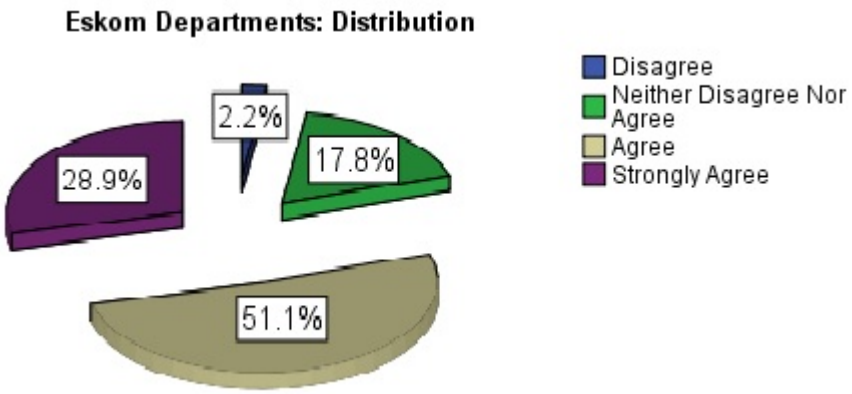

Figure 5.6: Organisation strategy awareness- Distribution

Table 5.58 and Figure 5.6 illustrate that in the Distribution unit, two comma two percent (2.2%) disagree, seventeen comma eight percent (17.8%) neither disagree nor agree. They are aware of their organisation's business strategy. Fifty-one percent (51.1%) agree, while twenty-eight comma nine percent (28.9%) strongly agree; they are aware of their organisation's business strategy. Therefore, the Distribution unit's members agree that they are aware of their organisation's business strategy.

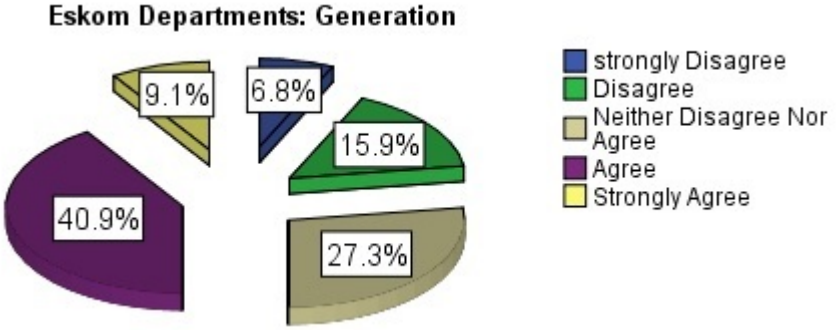

Figure 5.7: Organisation strategy awareness - Generation

Table 5.58 and Figure 5.7 illustrate that in the Generation unit, six comma eight percent (6.8%) strongly disagree, fifteen comma nine percent (15.9%) disagree, twenty-seven comma three percent (27.3%) neither disagree nor agree, forty comma nine percent (40.9%) agree while nine comma one percent (9.1%) strongly agree that they are aware of their organisation's business strategy. Therefore, the Generation unit's members agree that they are aware of their organisation's business strategy.

II. Are the projects goals clearly aligned to the organisation's strategic goal?

Table 5.59: Projects goals aligned with organisation strategy

Are the projects goals clearly aligned to the organisation's strategic goal?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Disagree	5	11.4	11.4	11.4
	Neither Disagree Nor Agree	13	29.5	29.5	40.9
	Agree	21	47.7	47.7	88.6
	Strongly Agree	5	11.4	11.4	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	2	4.4	4.4	4.4
	Neither Disagree Nor Agree	13	28.9	28.9	33.3
	Agree	20	44.4	44.4	77.8
	Strongly Agree	10	22.2	22.2	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	2	4.5	4.5	4.5
	Disagree	8	18.2	18.2	22.7
	Neither Disagree Nor Agree	11	25.0	25.0	47.7
	Agree	20	45.5	45.5	93.2
	Strongly Agree	3	6.8	6.8	100.0
	Total	44	100.0	100.0	

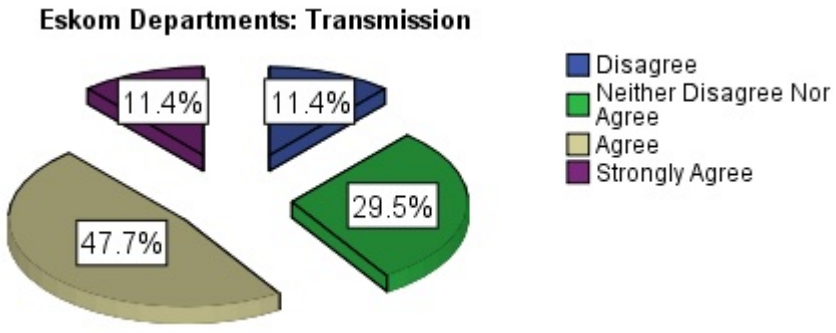

Figure 5.8: Projects goals aligned with organisation strategy- Transmission

Table 5.59 and Figure 5.8 illustrate that in the Transmission unit, eleven comma four percent (11.4%) disagree, twenty-nine comma five percent (28.5%) neither disagree

nor agree, forty-seven comma seven percent (47.7%) agree, while eleven comma four percent (11.4%) strongly agree that the project goals are clearly aligned to the organisation's strategic goals. Therefore, the Transmission unit's members agree the project goals are clearly aligned to the organisation strategic goals.

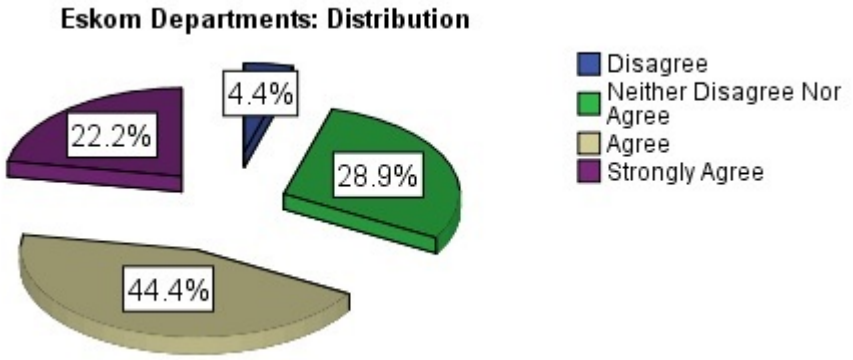

Figure 5.9: Project goals alignment - Distribution

Table 5.59 and Figure 5.9 illustrate that in the Distribution unit, four comma four percent (4.4%) disagree, twenty-eight comma nine percent (28.9%) neither disagree nor agree, forty-four comma four percent (44.4%) agree, while twenty-two comma two percent (22.2%) agree the project goals are aligned clearly to the organisation's strategic goals.

Therefore, the Distribution unit's members agree the project goals are clearly aligned to the organisation strategic goals.

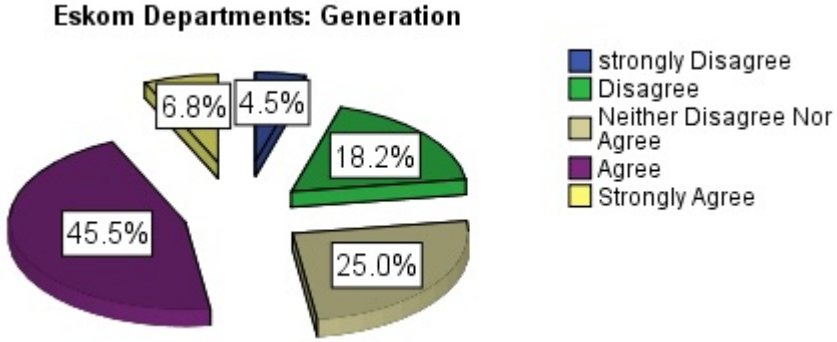

Figure 5.10: Project goals alignment -Generation

Table 5.59 and Figure 5.10 illustrate that in the Generation unit, four comma five percent (4.5%) strongly disagree, eighteen comma two percent (18.2%) disagree, twenty-five comma four percent (25%) neither disagree nor agree, forty-five comma five percent (45.5%) agree, while six comma eight percent (6.8%) strongly agree the

project goals are clearly aligned to the organisation strategic goals. Therefore, the Generation unit's members agree the project goals are clearly aligned to the organisation strategic goals.

III. Do project teams have a clear understanding of the value that the projects add to the organisation?

Table 5.60: Projects value understanding

Do project teams have a clear understanding of the value that the projects add to the organisation?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Strongly Disagree	1	2.3	2.3	2.3
	Disagree	6	13.6	13.6	15.9
	Neither Disagree Nor Agree	13	29.5	29.5	45.5
	Agree	16	36.4	36.4	81.8
	Strongly Agree	8	18.2	18.2	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	5	11.1	11.1	11.1
	Neither Disagree Nor Agree	11	24.4	24.4	35.6
	Agree	19	42.2	42.2	77.8
	Strongly Agree	10	22.2	22.2	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	5	11.4	11.4	11.4
	Disagree	12	27.3	27.3	38.6
	Neither Disagree Nor Agree	10	22.7	22.7	61.4
	Agree	13	29.5	29.5	90.9
	Strongly Agree	4	9.1	9.1	100.0
	Total	44	100.0	100.0	

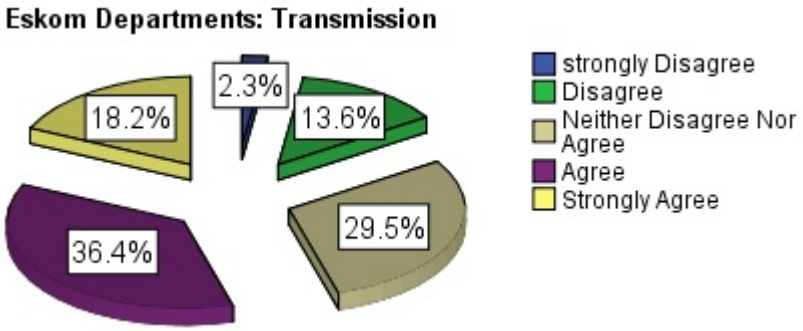

Figure 5.11: Projects value understanding - Transmission

Table 5.60 and Figure 5.11 illustrate that in the Transmission unit, two comma three percent (2.3%) strongly disagree, thirteen comma six (13.6%) disagree the project teams have a clear understanding of the value that the projects add to the organisation. Twenty-nine comma five percent (29.5%) neither disagree nor agree, thirty-six comma four percent (36.4%) agree, while eighteen comma two percent (18.2%) strongly agree that the project teams have a clear understanding of the value that the projects add to the organisation. Therefore, the Transmission unit's members agree that the project teams have a clear understanding of the value that the projects add to the organisation.

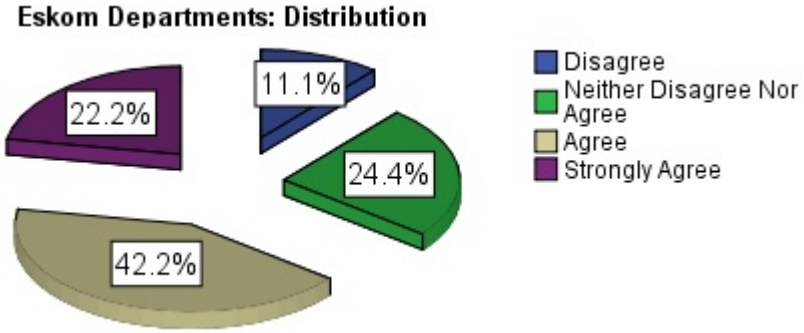

Figure 5.12: Projects value understanding – Distribution

Table 5.60 and Figure 5.12 illustrate that in the Distribution unit, eleven comma one percent (11.1%) disagree, twenty-four comma four percent (24.4%) neither disagree nor agree the project teams have a clear understanding of the value that the projects add to the organisation. Forty-two comma two percent (42.2%) agree, while twenty-two comma two percent (22.2%) strongly agree the project teams have a clear understanding of the value that the projects add to the organisation.

Therefore, the Distribution unit's members agree the project teams have a clear understanding of the value that the projects add to the organisation.

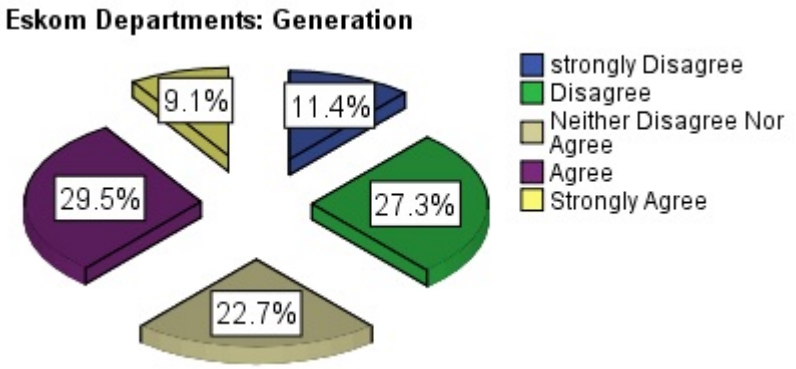

Figure 5.13: Projects value understanding – Generation

Table 5.60 and Figure 5.13 illustrate that in the Generation unit, eleven comma four percent (11.4%) strongly disagree, twenty-seven comma three percent (27.3%) disagree, twenty-two comma seven percent (22.7%) neither disagree nor agree the project teams have a clear understanding of the value that the projects add to the organisation. Twenty-nine comma five percent (29.5%) agree, while nine comma one percent (9.1%) strongly agree the project teams have a clear understanding of the value that the projects add to the organisation.

Therefore, the Generation unit's members disagree that the project teams have a clear understanding of the value that the projects add to the organisation.

IV. Did the project core team take part in creation of the project goal statement?

Table 5.61: Project goal statement creation

Did the project core team take part in creation of the project goal statement?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Strongly Disagree	2	4.5	4.5	4.5
	Disagree	7	15.9	15.9	20.5
	Neither Disagree Nor Agree	11	25.0	25.0	45.5
	Agree	16	36.4	36.4	81.8
	Strongly Agree	8	18.2	18.2	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	7	15.6	15.6	15.6

	Neither Disagree Nor Agree	9	20.0	20.0	35.6
	Agree	20	44.4	44.4	80.0
	Strongly Agree	9	20.0	20.0	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	4	9.1	9.1	9.1
	Disagree	12	27.3	27.3	36.4
	Neither Disagree Nor Agree	16	36.4	36.4	72.7
	Agree	7	15.9	15.9	88.6
	Strongly Agree	5	11.4	11.4	100.0
	Total	44	100.0	100.0	

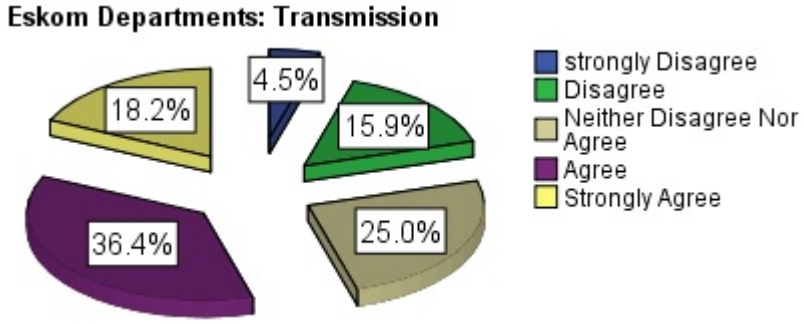

Figure 5.14: Project goal statement creation – Transmission

Table 5.61 and Figure 5.14 illustrate that in the Transmission unit, four comma five percent (4.5%) strongly disagree, fifteen comma nine percent (15.9%) disagree, and twenty-five percent (25%) neither disagree nor agree that the project core team takes part in creation of the project goal statement. Thirty-six comma four percent (36.4%) agree, while eighteen comma two percent (18.2%) strongly agree the project core team takes part in creation of the project goal statement.

Therefore, the Transmission unit's members agree the project core team takes part in creation of the project goal statement.

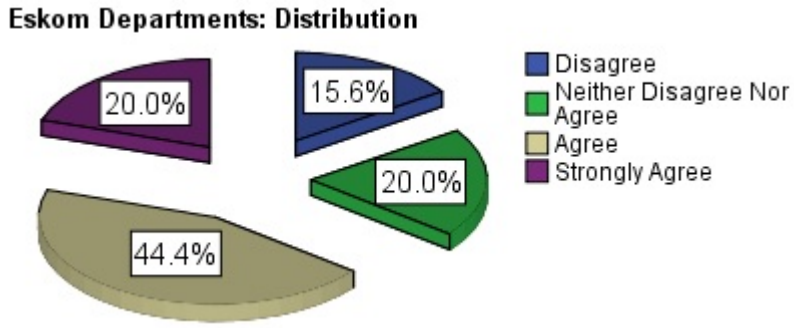

Figure 5.15: Project goal statement creation - Distribution

Table 5.61 and Figure 5.15 illustrate that in the Distribution unit, fifteen comma six percent (15.6%) disagree, and twenty percent (20%) neither disagree nor agree the project core team takes part in creation of the project goal statement. Forty-four comma four percent (44.4%) agree, while twenty percent (20%) strongly agree the project core team takes part in creation of the project goal statement.

Therefore, the Distribution unit agrees the project core team takes part in creation of the project goal statement.

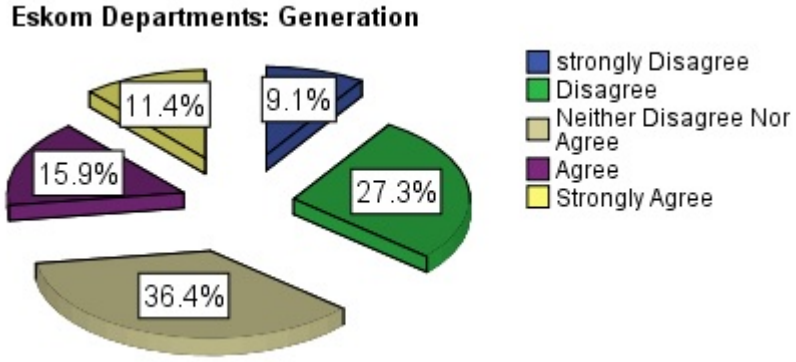

Figure 5.16: Project goal statement creation - Generation

Table 5.61 and Figure 5.16 illustrate that in the Generation unit, nine comma one percent (9.1%) strongly disagree, twenty-seven comma three percent (27.3%) disagree, thirty-six comma four percent (36.4%) neither disagree nor agree the project core team takes part in creation of the project goal statement. Fifteen comma nine percent (15.9%) agree, while eleven comma four percent (11.4%) strongly agree the project core team takes part in creation of the project goal statement.

Therefore, the Generation unit disagrees the project core team takes part in the creation of the project goal statement.

V. Were intensive and consistent selection criteria utilised to choose this project?

Table 5.62: Project selection criteria consistency

Were intensive and consistent selection criteria utilised to choose this project?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Disagree	9	20.5	20.5	20.5
	Neither Disagree Nor Agree	11	25.0	25.0	45.5
	Agree	19	43.2	43.2	88.6
	Strongly Agree	5	11.4	11.4	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	5	11.1	11.1	11.1
	Neither Disagree Nor Agree	15	33.3	33.3	44.4
	Agree	15	33.3	33.3	77.8
	Strongly Agree	10	22.2	22.2	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	2	4.5	4.5	4.5
	Disagree	16	36.4	36.4	40.9
	Neither Disagree Nor Agree	12	27.3	27.3	68.2
	Agree	13	29.5	29.5	97.7
	Strongly Agree	1	2.3	2.3	100.0
	Total	44	100.0	100.0	

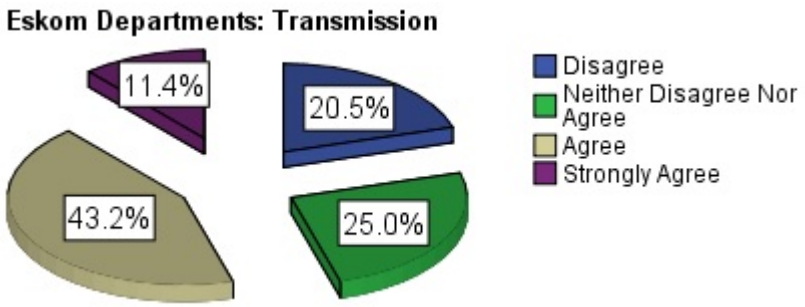

Figure 5.17: Project selection criteria consistency – Transmission

Table 5.62 and Figure 5.17 illustrate that in the Transmission unit, twenty comma five percent (20.5%) disagree, twenty-five percent (25%) neither disagree nor agree the intensive and consistent selection criteria were utilised to choose the projects. Forty-three comma two percent (43.2%) agree, while eleven comma four percent (11.4%) strongly agree that the intensive and consistent selection criteria were utilised to choose the projects.

Therefore, the Transmission unit agrees that the intensive and consistent selection criteria were utilised to choose the projects.

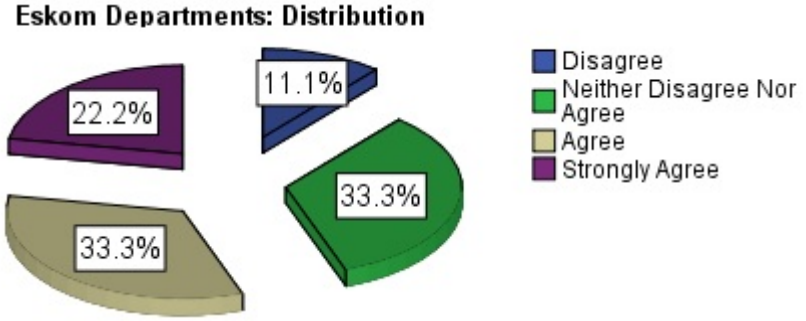

Figure 5.18: Project selection criteria consistency - Distribution

Table 5.62 and Figure 5.18 illustrate in the Distribution unit, eleven comma one percent (11.1%) disagree, thirty-three comma three percent (33.3%) neither disagree nor agree that the intensive and consistent selection criteria were utilised to choose the projects. Thirty-three comma three percent (33.3%) agree, while twenty-two comma two percent (22.2%) strongly agree that the intensive and consistent selection criteria were utilised to choose the projects. Therefore, the Distribution unit agrees that intensive and consistent selection criteria were utilised to choose the projects.

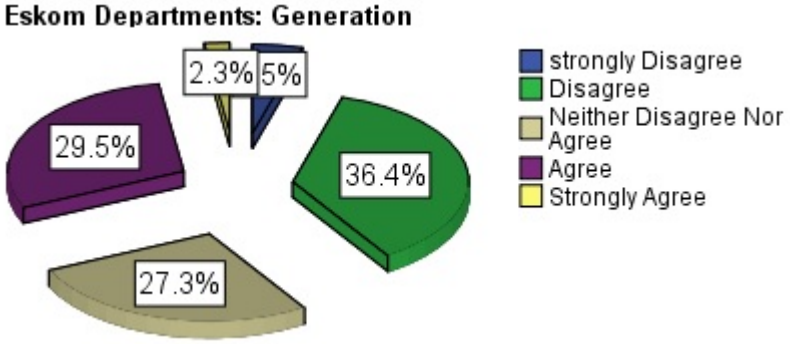

Figure 5.19: Project selection criteria consistency - Generation

Table 5.62 and Figure 5.19 illustrate that in the Generation unit, five percent (5%) strongly disagree, thirty-six comma four percent (36.4%) disagree, twenty-seven

comma three percent (27.3%) neither disagree nor agree that the intensive and consistent selection criteria were utilised to choose the projects. Twenty – nine comma five percent (29.5%) agree, while two comma three percent (2.3%) strongly agree the intensive and consistent selection criteria were utilised to choose the projects. Therefore, the Generation unit disagrees that intensive and consistent selection criteria were utilised to choose the projects.

VI. Do you understand the link between the organisation's projects to achieve the organisation's strategy?

Table 5.63: Project link with strategy understanding

Do you understand the link between the organisation's projects to achieve the organisation's strategy?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Strongly Disagree	1	2.3	2.3	2.3
	Disagree	10	22.7	22.7	25.0
	Neither Disagree Nor Agree	8	18.2	18.2	43.2
	Agree	18	40.9	40.9	84.1
	Strongly Agree	7	15.9	15.9	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	6	13.3	13.3	13.3
	Neither Disagree Nor Agree	10	22.2	22.2	35.6
	Agree	20	44.4	44.4	80.0
	Strongly Agree	9	20.0	20.0	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	3	6.8	6.8	6.8
	Disagree	12	27.3	27.3	34.1
	Neither Disagree Nor Agree	13	29.5	29.5	63.6
	Agree	12	27.3	27.3	90.9
	Strongly Agree	4	9.1	9.1	100.0
	Total	44	100.0	100.0	

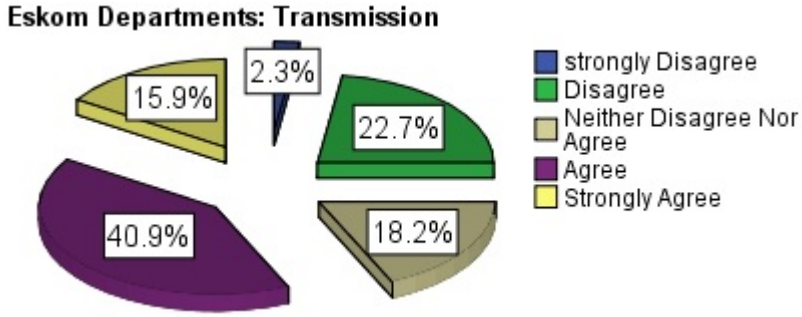

Figure 5.20: Project link with strategy understanding - Transmission

Table 5.63 and Figure 5.20 illustrate that in the Transmission unit, two comma three percent (2.3%) strongly disagree, twenty-two comma seven percent (22.7%) disagree, eighteen comma two percent (18.2%) neither disagree nor agree; they understand the link between the organisation's projects to achieve the organisation's strategy. Forty comma nine percent (40.9%) agree, while fifteen comma nine percent (15.9%) strongly agree they understand the link between the organisation's projects to achieve the organisation's strategy.

Therefore, the Transmission unit's members agree they understand the link between the organisation's projects to achieve the organisation's strategy.

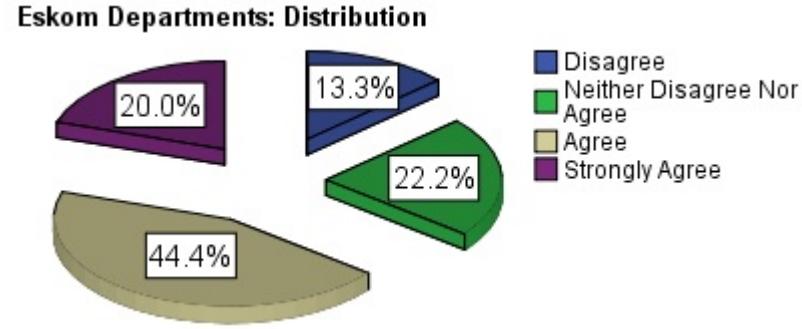

Figure 5.21: Project link with strategy understanding - Distribution

Table 5.63 and Figure 5.21 illustrate in the Distribution unit, thirteen comma three percent (13.3%) disagree, twenty-two comma two percent (22.2%) neither disagree nor agree; they understand the link between the organisation's projects to achieve the organisation's strategy. Forty-four comma four percent (44.4%) agree, while twenty percent (20%) strongly agree; they understand the link between the organisation's projects to achieve the organisation's strategy.

Therefore, the Distribution unit's members agrees they understand the link between the organisation projects to achieve the organisation strategy.

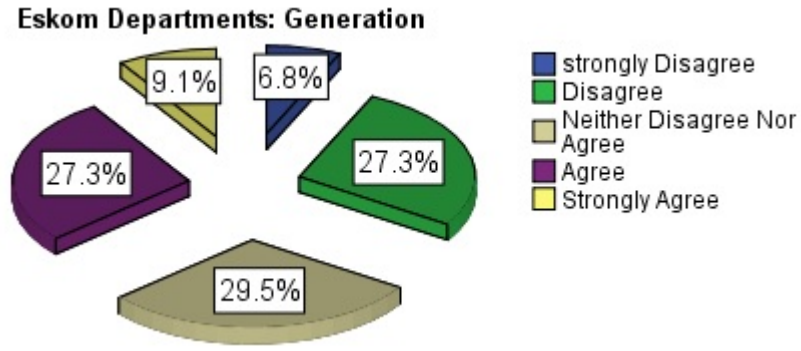

Figure 5.22: Project link with strategy understanding - Generation

Table 5.63 and Figure 5.22 illustrate in the Generation unit, six comma eight percent (6.8%) strongly disagree, twenty-seven comma three percent (27.3%) disagree, twenty-nine comma five percent (29.5%) neither disagree nor agree. They understand the link between the organisation's projects to achieve the organisation's strategy. Twenty-seven comma three percent (27.3%) agree, while nine comma one percent (9.1%) strongly agree. They understand the link between the organisation's projects to achieve the organisation's strategy.

Therefore, the Generation unit agree they understand the link between the organisation's projects to achieve the organisation's strategy.

VII. Was the project chosen based on the contribution to the organisation comparing the priority ranks?

Table 5.64: Project chosen solely on contribution

Was the project chosen based on the contribution to the organisation comparing the priority ranks?					
Eskom Units		Frequency	Percent	Valid Percent	Cumulative Percent
Transmission	Strongly Disagree	3	6.8	6.8	6.8
	Disagree	5	11.4	11.4	18.2
	Neither Disagree Nor Agree	12	27.3	27.3	45.5

	Agree	16	36.4	36.4	81.8
	Strongly Agree	8	18.2	18.2	100.0
	Total	44	100.0	100.0	
Distribution	Disagree	3	6.7	6.7	6.7
	Neither Disagree Nor Agree	17	37.8	37.8	44.4
	Agree	18	40.0	40.0	84.4
	Strongly Agree	7	15.6	15.6	100.0
	Total	45	100.0	100.0	
Generation	Strongly Disagree	4	9.1	9.1	9.1
	Disagree	13	29.5	29.5	38.6
	Neither Disagree Nor Agree	14	31.8	31.8	70.5
	Agree	10	22.7	22.7	93.2
	Strongly Agree	3	6.8	6.8	100.0
	Total	44	100.0	100.0	

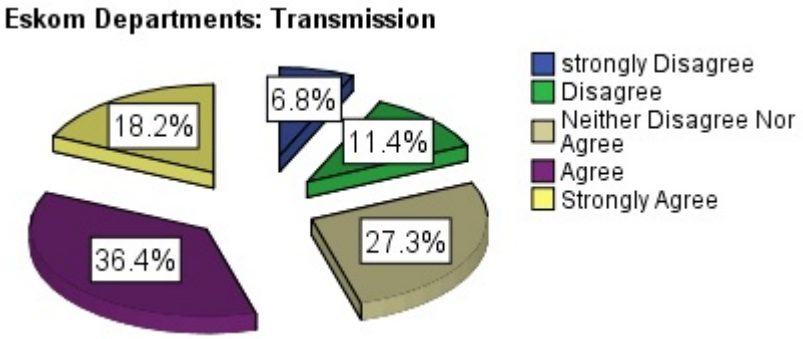

Figure 5.23: Project chosen solely on contribution - Transmission

Table 5.64 and Figure 5.23 illustrate in the Transmission unit, six comma eight percent (6.8%) strongly disagree, eleven comma four percent (11.4%) disagree, twenty-seven comma three percent (27.3%) neither disagree nor agree the project was chosen based on the contribution to the organisation's comparing the priority ranks. Thirty-six comma four percent (36.4%) agree, while eighteen comma two percent (18.2%) strongly agree the project was chosen based on the contribution to the organisation's comparing the priority ranks.

Therefore, the Transmission unit agrees the project was chosen based on the contribution to the organisation's comparing the priority ranks.

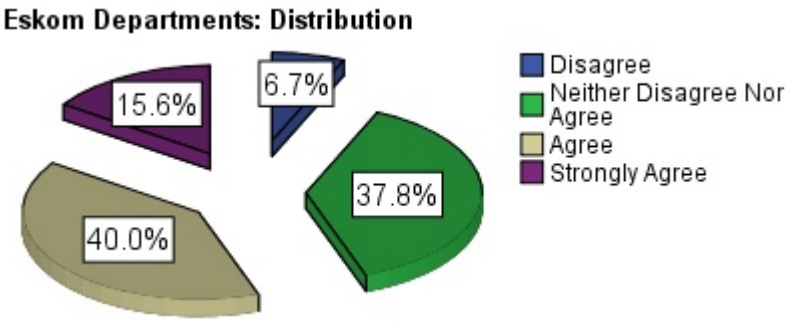

Figure 5.24: Project chosen solely on contribution - Distribution

Table 5.64 and Figure 5.24 illustrate that in the Distribution unit, six comma seven percent (6.7%) disagree, thirty-seven comma eight percent (37.8%) neither disagree nor agree the project was chosen based on the contribution to the organisation's comparing the priority ranks. Forty percent (40%) agree, while fifteen comma six percent (15.6%) strongly agree the project was chosen based on the contribution to the organisation's comparing the priority ranks.

Therefore, the Distribution unit agrees the project was chosen based on the contribution to the organisation's comparing the priority ranks.

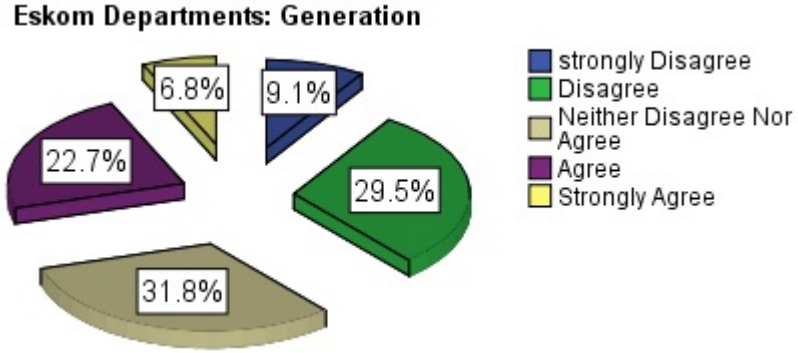

Figure 5.25: Project chosen solely on contribution - Generation

Table 5.64 and Figure 5.25 illustrate in the Generation unit, nine comma one percent (9.1%) strongly disagree, twenty-nine comma five percent (29.5%) disagree, thirty-one comma eight percent (31.8%) neither disagree nor agree the project was chosen based on the contribution to the organisation's comparing the priority ranks. Twenty-two comma seven percent (22.7%) agree, while six comma eight percent (6.8%) strongly agree the project was chosen based on the contribution to the organisation's comparing the priority ranks.

Therefore, the Generation unit disagrees the project was chosen based on the contribution to the organisation's comparing the priority ranks.

Table 5.65: Project management strategy maturity of units

	Transmission	Distribution	Generation
Project management strategy maturity level	3.6	3.7	3.0

Table 5.65 illustrates that the Transmission and Distribution units score three comma six (3.6) and three comma seven (3.7) respectively and are evaluated to be in maturity level four. The Generation unit however scores the least of the three with only three (3) and is evaluated to be in maturity level three.

5.6.2.3 Findings of the project management organisation strategy maturity conclusion

In this section, the conclusion on project management organisation strategy maturity is presented.

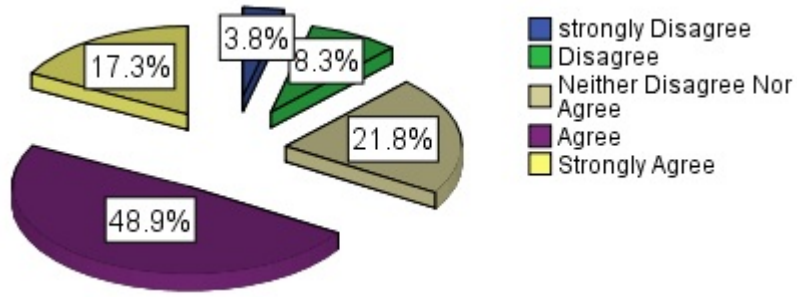

Figure 5.26: Eskom business strategy awareness

As illustrated in Figure 5.26, three comma eight percent (3.8%) strongly disagree, eight comma three percent (8.3%) disagree, twenty-one comma eight percent (21.8%) neither disagree nor agree, forty – eight comma nine percent (48.9%) agree while seventeen comma three percent (17.3%) strongly agree that they are aware of their organisation's business strategy.

Therefore, Eskom members agree they are aware of their organisation's business strategy.

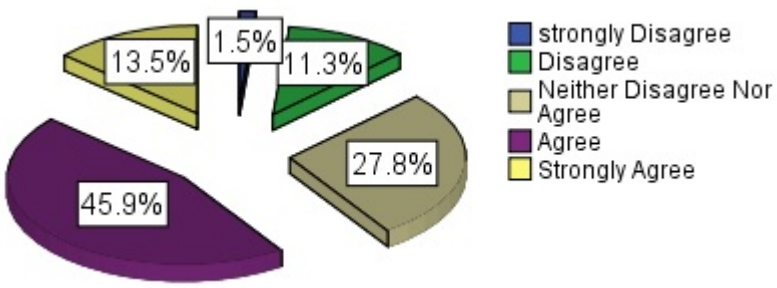

Figure 5.27: Projects goals clearly aligned to organisational strategy

Figure 5.27 illustrates one comma five percent (1.5%) strongly disagree, eleven comma three percent (11.3%) disagree, twenty-seven comma eight percent (27.8%) neither disagree nor agree, forty-five comma nine percent (45.9%) agree, while thirteen comma five percent (13.5%) strongly agree the project goals are clearly aligned to the organisation's strategic goals.

Therefore, Eskom agrees the project goals are clearly aligned to the organisation's strategic goals.

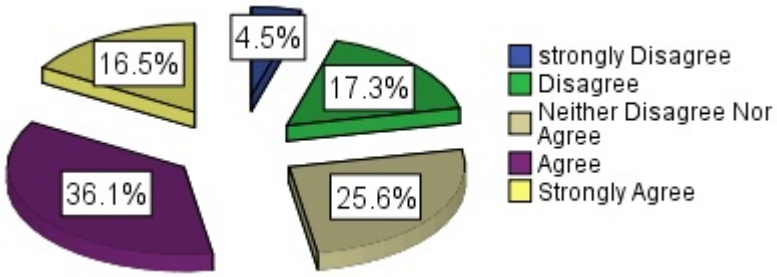

Figure 5.28: Project teams understanding of the project value to business

Figure 5.28 illustrates four comma five percent (4.5%) strongly disagree, seventeen comma three (17.3%) disagree the project teams have a clear understanding of the value that the projects add to the organisation. Twenty-five comma six percent (25.6%) neither disagree nor agree, thirty-six comma one percent (36.1%) agree, while sixteen comma five percent (16.5%) strongly agree the project teams have a clear understanding of the value that the projects add to the organisation.

Therefore, Eskom agrees the project teams have a clear understanding of the value that the projects add to the organisation.

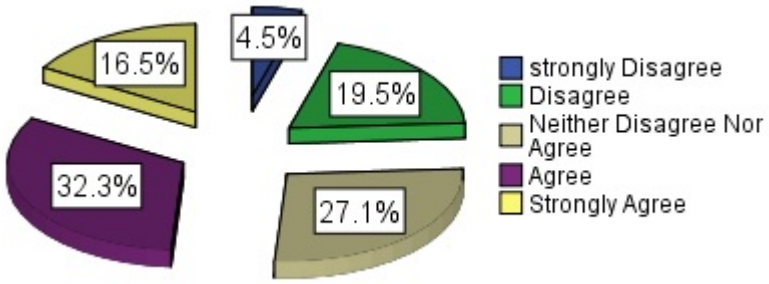

Figure 5.29: Project core team took part in project goal statement

Figure 5.29 illustrates four comma five percent (4.5%) strongly disagree. Nineteen comma five percent (19.5%) disagree, twenty-seven comma one percent (27.1%) neither disagree nor agree the project core team takes part in creation of the project goal statement. Thirty – two comma three percent (32.3%) agree, while sixteen comma five percent (16.5%) strongly agree the project core team takes part in creation of the project goal statement.

Therefore, Eskom agreed the project core team takes part in creation of the project goal statement.

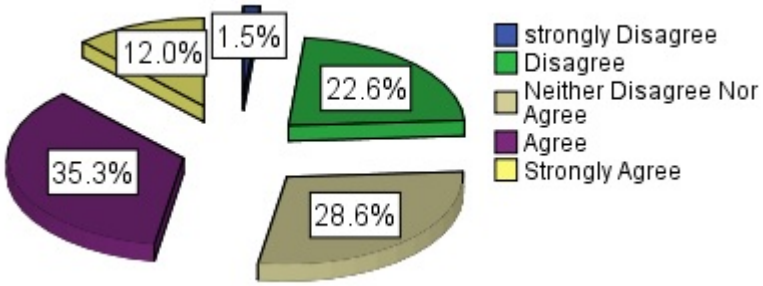

Figure 5.30: Intensive and consistent selection criteria used

Figure 5.30 illustrates Eskom one comma five percent (1.5%) strongly disagree. Twenty – two comma six percent (22.6%) disagree, twenty-eight comma six percent (28.6%) neither disagree nor agree that the intensive and consistent selection criteria were utilised to choose the projects. Thirty – five comma three percent (35.3%) agree, while twelve percent (11.4%) strongly agree that the intensive and consistent selection criteria were utilised to choose the projects.

Therefore, Eskom agrees that the intensive and consistent selection criteria were utilised to choose the projects.

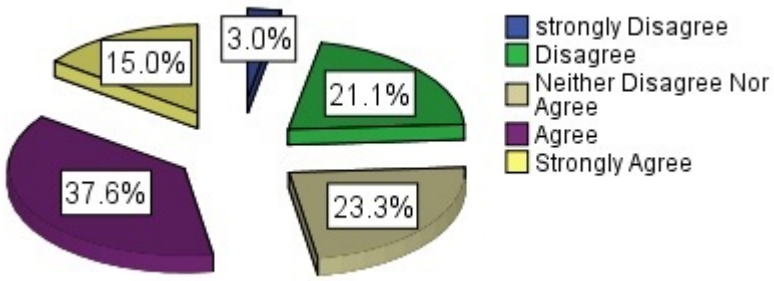

Figure 5.31: Understanding of the link between the organisation's projects to achieve the organisation's strategy

Figure 5.31 illustrated three percent (3%) strongly disagree. Twenty – one comma one percent (21.1%) disagree, twenty – three comma three percent (23.3%) neither disagree nor agree they understand the link between the organisation's projects to achieve the organisation strategy. Thirty – seven comma six percent (37.6%) agree, while fifteen percent (15%) strongly agree they understand the link between the organisation projects to achieve the organisation's strategy.

Therefore, the Eskom agree they understand the link between the organisation's projects to achieve the organisation's strategy.

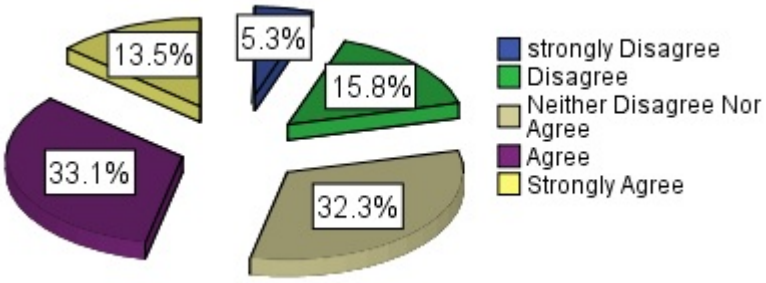

Figure 5.32: Project chosen based on the contribution to the organisation comparing the priority ranks

Figure 5.32 illustrated five comma three percent (5.3%) strongly disagree. Fifteen comma eight percent (15.8%) disagree, thirty-two comma three percent (32.3%) neither disagree nor agree the project are chosen based on the contribution to the organisation's comparing the priority ranks. Thirty- three comma one percent (33.1%) agree, while thirteen comma five percent (13.5%) strongly agree the project are chosen based on the contribution to the organisation's comparing the priority ranks.

Therefore, Transmission unit agree the project are chosen based on the contribution to the organisation's comparing the priority ranks.

5.6.2.4 Conclusion on the project management organisation strategy maturity

Table 5.66: Project management strategy maturity level

Project management strategy maturity level	3.4

As illustrated in Table 5.66, Project management strategy maturity level of Eskom scored three comma four and evaluated to be in maturity level three.

5.7 Project management maturity findings

In this section, the project management maturity findings are presented.

5.7.1 Project management maturity levels findings

In this section, the project management maturity levels of the Eskom business units are discussed.

Table 5.67: Project management unit maturity levels

	Transmission	Distribution	Generation
Project scope management maturity	3.6	3.8	3.5
Project time management maturity	3.4	3.2	2.1
Project cost management maturity	2.2	2.5	2.0
Project integration management maturity	4.1	4.3	3.5
Project quality management maturity	4.3	4.4	3.8
Project human resource management maturity	4	4.1	3.8
Project communication management maturity	4.3	4.2	3.9
Project risk management maturity	3.8	4.1	3.1
Project procurement management maturity	4	3.5	2.8

Units maturity level	**3.7**	**3.8**	**3.1**

As illustrated in Table 5.67, the Transmission and Distribution units perform in maturity level four, while the Generation unit performs the lowest in maturity level three.

All Eskom units have difficulties with project time management and project cost management, which were well below their respective average project management maturities. The Distribution and Generation units were however struggling with project procurement management.

The Transmission unit is found to have a high project management maturity amongst the three units, with the Distribution in the middle, while the Generation unit is struggling with the project management maturity.

Table 5.68: Eskom project management knowledge processes maturity levels

Project scope management maturity	3.7
Project time management maturity	2.9
Project cost management maturity	2.2
Project integration management maturity	4.0
Project quality management maturity	4.2
Project human resource management maturity	4
Project communication management maturity	4.1
Project risk management maturity	3.7
Project procurement management maturity	3.4
Average project management maturity	**3.6**

Table 5.68 illustrates that Eskom is struggling with three project management process areas: project time management, project cost management and project procurement management. These mentioned process areas are found to be below the average maturity level of three comma six (3.6).

This implies there is a controlled project management system in place, and integrated with the organisation's project management system and there are experienced project management personnel currently employed by Eskom.

5.7.2 Project management culture maturity levels findings

In this section, the project management maturity levels of the Eskom's business units are discussed.

Table 5.69: Project culture management maturity

	Transmission	Distribution	Generation	Average
Project management culture maturity	3.8	3.5	2.2	3.3

Table 5.69 illustrates that the project management culture maturity of the Transmission and Distribution units score three comma eight (3.8) and three comma five (3.5) respectively and are evaluated to be in maturity level four. The Generation unit scores two comma two (2.2) and is evaluated to be in maturity level two. However, project management culture maturity seems to be struggling as it performs under the overall project management maturity level of three comma five. Only identified project risks culture is present. There is an improvement in project management commitment and there is moderate trust amongst project management teams. There is moderate trust amongst project management teams.

5.7.3 Project management strategy maturity levels findings

In this section, the project management strategy maturity levels of the Eskom business units are discussed.

Table 5.70: Project management strategy maturity level

	Transmission	Distribution	Generation	Average
Project management strategy maturity level	3.6	3.7	3.0	3.45

Table 5.70 illustrates that the Transmission and Distribution units score three comma six (3.6) and three comma seven (3.7) respectively and are evaluated to be in project

management strategy maturity level four. The Generation unit scores the lowest with three and is evaluated to be in maturity level three.

Table 5.71: Descriptive statistics

Descriptive Statistics			
	Maturity	Std. Deviation	N
OVERALL MATURITY	3.52	.38324	133
CULTURE	3.32	.75580	133
STRATEGY	3.45	.78110	133

Table 5.71 illustrates the project management overall maturity scores three comma five two (3.52) and is evaluated to be in maturity level four. Project management culture maturity scores three comma three two (3.32) and is assessed to be in maturity level three. The project management strategy maturity scores three comma four five (3.45) and is evaluated to be in maturity level four.

Project management strategy maturity performs well and is equal to the overall project management maturity level of three comma five. This implies the project management strategy was assigned a unit, with project leaders and resources readily available.

5.7.4 Influence of organisational factors on the Project management maturity levels findings

In this section, the influence of organisational factors on project management maturity levels of the Eskom business units are discussed.

Table 5.72: Influence on organisational factors correlations

Correlations				
		OVERALL MATURITY	CULTURE	STRATEGY
Pearson Correlation	OVERALL MATURITY	1.000	.554	.304
	CULTURE	.554	1.000	.208
	STRATEGY	.304	.208	1.000

Sig. (1-tailed)	OVERALL MATURITY	.	.000	.000
	CULTURE	.000	.	.008
	STRATEGY	.000	.008	.
N	OVERALL MATURITY	133	133	133
	CULTURE	133	133	133
	STRATEGY	133	133	133

The Pearson correlation coefficients are given in Table 5.72 above. Both strategy maturity and culture maturity can be accepted to influence overall project maturity, but due to possible interactions between strategy and culture, further analyses including regression analysis were indicated.

Table 5.73: Model summary - regression analysis

Model Summary								
			Std. Error	Change Statistics				
R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
.587[a]	.344	.334	.31277	.344	34.090	2	130	.000
a. Predictors: (Constant), STRATEGY, CULTURE								

Table 5.74: ANOVA regression analysis

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.670	2	3.335	34.090	.000[b]
	Residual	12.717	130	.098		
	Total	19.387	132			
a. Dependent Variable: OVERALL MATURITY						
b. Predictors: (Constant), STRATEGY, CULTURE						

Table 5.73 and Table 5.74 illustrate that the R Square value for the predictors project management strategy maturity and project management culture maturity is thirty-four comma four percent (34.4%). The amount of variation explained is, therefore 34%.

The alpha value is less than 0.05, the F value is large, therefore, the results can be accepted as significant but the coefficient of strategy is not significant.

Table 5.75: Influence coefficients

Coefficients[a]							
	Unstandardised Coefficients		Standardised Coefficients			95.0% Confidence Interval for B	
Model	B	Std. Error	Beta	T	Sig.	Lower Bound	Upper Bound
(Constant)	2.325	.157		14.855	.000	2.015	2.635
CULTURE	.260	.037	.513	7.058	.000	.187	.333
STRATEGY	.097	.036	.198	2.721	.007	.026	.167
a. Dependent Variable: OVERALL MATURITY							

Table 5.75 illustrates that the P values of the project management culture maturity and project management strategy maturity are zero and zero comma zero seven respectively, which mean both have a significant impact on the outcome of the project management overall maturity. If project management culture maturity increases by zero comma zero three seven (0.037), there will be a zero comma two six (0.26) culture maturity increase on the project management overall maturity. If project management strategy maturity increases by zero comma zero three six (0.036), there will be a zero comma one (0.1) increase on the project management overall maturity. There is a ninety-five percent confidence that unstandardised coefficient value of project management culture maturity is between zero comma one nine (0.19) and zero comma three (0.3) and the unstandardised coefficient value of project management strategy maturity is between zero comma three (0.3) and zero comma one seven (0.167).

Table 5.76: Culture maturity model summary

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.554[a]	.307	.301	.32032	.307	57.947	1	131	.000
a. Predictors: (Constant), CULTURE									

Table 5.77: Strategy maturity model summary

Model Summary									
				Std. Error	Change Statistics				
Model	R	R Square	Adjusted R Square	of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.304[a]	.093	.086	.36644	.093	13.379	1	131	.000
a. Predictors: (Constant), STRATEGY									

These results are corroborated by the above analysis. When the coefficients are evaluated separately, it can be seen from Table 5.76 and Table 5.77, culture is correlated but the strategy correlation is very small. Table 5.76 illustrates the alpha figure of the project management culture maturity on the project management overall maturity is less than 0.05. Which means that there is a correlation, and culture contributes thirty percent (30%) to explaining the variation. Table 5.77 illustrates the alpha figure of the project management strategy maturity on the project management overall maturity is less than 0.05. Which means that the there is a correlation and strategy contributes nine comma three percent (9.3%) to explaining the variation.

It can therefore be concluded there is a Significant correlation between the independent variables strategy and culture with the dependent variable overall maturity, but the regression and Anova analyses show that culture is the main contributor and there is insufficient evidence that Strategy has a relationship with overall maturity.

5.8 Conclusions on research questions

In this section, the conclusions on research questions are presented.

What is the applicable PMMM to assess the project management maturity level of the core business of Eskom?

The assessment of the project management maturity level of Eskom business units conducted with the use of the Applicable project management maturity model and the answers to the research questions have verified the study. The effective assessment of the project management maturity of Eskom business units also supports the answer

that indeed the applicable PMMM could assess the project management maturity and give an accurate indication of the project management maturity of Eskom.

The current project management maturity level of Eskom's core business units

Table 5.78: Project management maturity level

Project management maturity	**3.6**

As illustrated in Table 5.78, the average maturity level is computed to be three comma six (3.6) and is evaluated to be in maturity level four (Managed at corporate level).

What is the current project management culture maturity level of Eskom's core business units?

Project management culture maturity of Eskom is assessed to be in maturity level three. This implies that project management is still considered as an overhead expense contributing only on selected projects. Project management is used by Eskom only on selected projects.

What is the current project management strategy maturity level of Eskom's core business units: Transmission, Distribution and Generation?

The average project management strategy is computed to be three comma four (3.4), and is evaluated to be in maturity level three. This implies that the importance of project management strategy is identified and included in the business strategy but there is no project unit.

What is the influence of organisational strategy and culture on the project management maturity level?

There is a Significant correlation between the independent variables strategy and culture with the dependent variable overall maturity, but the regression and Anova analyses show that culture is the main contributor and there is insufficient evidence that Strategy has a relationship with overall maturity.

Papke-Shields and Boyer-Wright (2017) argue that even though many projects have failed, the interest to study the factors that contributed to the failure is still present.

In conclusion, the project management key process areas are very important but are not the guarantee to the project changes immunity (Varajão, Colomo-Palacios & Silva, 2017). Joslin & Müller (2015) argue that if the project management methodology of any organisation is not performing in the acceptable high project management level of maturity, the results would be a low project quality, unfinished projects, financial loss, thereby causing the organisation to suffer beneficial losses.

Among the project management and best practices perceived to have a high impact on project investment success are assigning responsibility for delivering the benefits and reviewing the benefits thereafter (Badewi, 2016). Research indicates that organisations that improve their project management maturity experience cost savings, increased schedule predictability and improved quality (Demir & Kocabaş, 2010).

Chapter 6 : Recommendations

6.1 Introduction

The focus of this chapter is to provide recommendations based on the conclusions reached. The purpose of applying the applicable PMMM was firstly to validate the use of the model and secondly to review the current project management maturity level, identify weak and strong key process areas so as to improve the project management maturity of the organisation (Backlund, Chronéer & Sundqvist, 2014).

Another objective of the study was to evaluate the project management maturity levels of Eskom's core business units. The project management maturity levels of Eskom business units; Transmission and Distribution units were found to be scoring equally and assessed to be in maturity level four, whereas the Generation unit was the poor performing unit, assessed to be in maturity level three, as shown in the previous chapter.

In the next paragraphs the conclusion and recommendations regarding the applicable PMMM and the processes and best practices for improvements that Eskom has to go through in order to improve its project management maturity will be made. The recommendations are based on the findings and conclusions in chapter 4.

6.2 A project management maturity model to assess the project management maturity level of the core business of Eskom

6.2.1 Conclusion

The assessment of the project management maturity level of Eskom business units conducted with the use of the Applicable project management maturity model and the answers to the research questions have verified that the an applicable PMMM can be selected for Eskom. The assessment of the project management maturity of Eskom business units also supports the answer that indeed there is an applicable PMMM that could assess the project management maturity to give an accurate indication of the project management maturity of Eskom.

6.2.2 Recommendations

A considerable time and attention is required to refine and integrate certain aspects of Eskom into the model. The Generation unit should develop major milestones and baselines for the finalisation of an ESKOM PMMM to enable the improvement planning.

6.3 The project management maturity level of Eskom's process areas.

6.3.1 Conclusion

Eskom is struggling with three project management process areas: project time management, project cost management and project procurement management.

Project cost management maturity of Eskom scores two comma two (2.2) and is evaluated to be in maturity level two (Defined level). This implies there are basic project management processes for repeating projects. There are Project teams' formation and informal project cost management.Eskom project time management maturity scores two comma nine (2.9), and is evaluated to be in maturity level three (Managed at organisational level). This implies there is an awareness of the project time management. The Project teams are developed and lastly, introduction of Project time management systems is taking place.

Eskom scores three comma seven (3.7) in its project scope management maturity and is evaluated to be in maturity level four (Managed at corporate level). This implies there is a controlled project management system in place. Project management systems are in place. There is an integration with the firm's project management system. There are experienced project management personnel.

6.3.2 Recommendations:

Eskom must make conclusive process changes that integrate the best of the business key process areas.

6.3.2.1 Project time management:

- Serious attention should be given to the activity sequencing key process area.
- There should be project management technologies and skilled project management personnel who can sequence the activities.
- The sequence of the project activities should be followed, the first activity in the activity sequence should be the first to start.
- Precedence diagramming method should be utilised, schedule networking of project activities and the determination of dependencies diagrams should be used.

6.3.2.2 Project cost management:

- The work breakdown structure should be developed to arrange the project cost estimates to quantify all project tasks.
- Comparable estimating is advisable to estimate the current project after comparing similar previous projects.
- Parametric modelling should be utilised in instances where there are project parameters and mathematical model may be used to quantify the project costs.
- Bottom up estimating method may be utilised where individual project tasks can be quantified then summarising all the tasks then summing up all to accumulate a project total cost.
- Computerised software are also useful to perform the cost estimate accurately and effectively.

6.3.2.3 Project procurement management:

- A Procurement management plan should be documented and strictly adhered to.
- The decision whether to buy, rent, lease, or manufacture should be made after an intensive analysis.
- Expertise acquired from specialised training should be incorporated for procurement decision making.

- The type of procurement contract selected should be appropriate and ideal for the procurement decision of buying or renting or manufacturing;
- There should be an accurate compilation of Statement of work and should be strictly adhered to.

6.4 The current project management culture maturity level of Eskom's core business units?

6.4.1 Conclusion

Project management culture maturity of Eskom is assessed to be in maturity level three. Project management culture maturity seemed to be struggling as it performs under the overall project management maturity level of three comma five.

6.4.2 Recommendations

- There must be a significant awareness as to the project management benefits.
- Eskom must be willing to accept change and change current processes.
- Project management should no longer be classified as an expense.
- Project management should be applied on all projects undertaken by Eskom.
- There should be a project management policy in place.
- Recognition of benefits should be consistent.
- Eskom should allocate its resources for the application of project management.
- Top down dedication and commitment should be encouraged.

6.5 The current project management strategy maturity level of Eskom's core business units: Transmission, Distribution and Generation?

6.5.1 Conclusion

The average project management strategy is computed to be three comma four (3.5), and is evaluated to be in maturity level four. Project management strategy maturity

seemed to have performed well on par with the overall project management maturity level of three comma five.

6.5.2 Recommendations:

To improve the maturity level to the highest, the following recommendations are suggested:

- The project core team should take part in the creation of the project goal statement.
- The intensive and consistent selection criteria should be utilised to select a project.
- The top management must ensure there is a balanced alignment between Eskom projects and business strategy.
- Eskom projects should be chosen based on long-term strategic goals and mission.
- The Eskom project management should be taught to understand the link between the organisation's projects to achieve the organisation's strategy.
- The Eskom projects should be chosen based on the contribution to the organisation's comparing the priority ranks;
- Eskom project management personnel should have a clear understanding of the value that the projects add to the organisation

6.6 The influence of maturity levels of organisational strategy and culture on the project management maturity level.

6.6.1 Conclusion

There is a significant correlation between the independent variables strategy and culture with the dependent variable overall maturity, but the regression and Anova analyses show that culture is the main contributor and there is insufficient evidence that Strategy has a relationship with overall maturity.

6.6.2 Recommendations:

- The project management personnel should be made aware of Eskom's business strategy.
- The project management goals should be aligned clearly with Eskom's strategic goals.
- Project teams should have a clear understanding of the projects' value to Eskom.
- Project core teams should take part in project goal statement formulation.
- Intensive and consistent criteria should be formulated and utilised for projects' selection.
- Project teams should have a clear understanding of the relationship between Eskom's projects and the strategy.
- Priority rankings should be used to compare the projects' contribution to Eskom.

6.7 Integrated conclusion and recommendations

This study established a comprehensive PMMM called the Applicable PMMM, made up of five project management maturity levels, and based on common project management key process areas of academic PMMMs available.
This applicable PMMM is not however limited to Eskom project management maturity assessment only, it is generic; it can be applied to various projects and various organisations, in any environment.

To improve the cost budgeting key process area, the following factors need attention: The methods to be used to allocate enough funds for the project are the same as those used for cost estimating, hence, the budget should not be under nor over budget.
Organisations which aim to benchmark their project management maturity always benefit from improved schedules and budget forecasts, improved project cycled time, improved productivity, higher quality, customer satisfaction, improved employee morale, increased ROI and decreased cost of quality (Demir & Kocabaş, 2010).
The organisation's top management creates the goals to achieve the desired results as stipulated in the organisation's goals and missions statements (Song, Kim, Yu, Lee & Lee, 2012). Outage management or shutdown management should be implement

by Eskom so that the maintenance of old power plants is carried out effectively as it is crucial for Eskom to be reliable and efficient due to its high reliance (Hlophe & Visser, 2018).

6.7.1 Cultural change as an improvement technique

The project management consists of two different dimensions: the people and the technical dimension, built upon the processes. The people dimension has everything to do with employees and their knowledge (Cooke-Davies & Arzymanow, 2003).
The organisation culture comprises of the group of behaviour characteristics made up of values, principles and beliefs, these are the foundation of the project management system (Cooke-Davies & Arzymanow, 2003). In relation to the organisation's culture, changing the attitudes, behaviour and the habits of the organisation's employees are the most important but hard task (Crawford, 2006).

6.7.2 Project Management Maturity Improvement stages

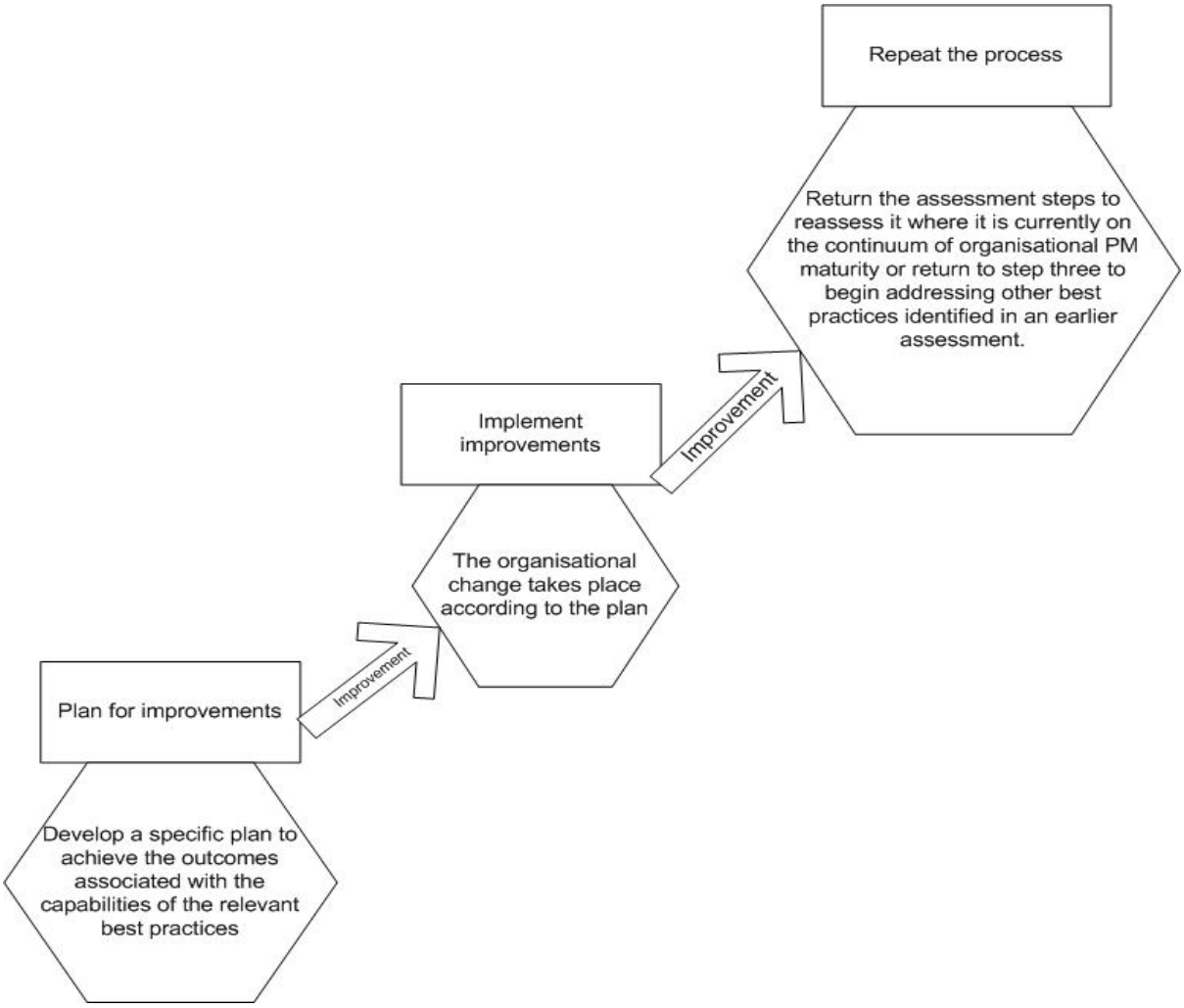

Figure 6.1: Improvement stages of the Project management processes (Hellered, 2010)

As shown in Figure 6.1, there are three improvement stages.

6.7.2.1 Project management improvements planning

Planning for the project management improvements to integrate all the project activities is critical and thus very important for the successful completion of the project (Crawford, 2006).

6.7.2.2 Improvements implementation

Setting up a project management office in organisation to integrate all the project's activities will significantly improve the project management maturity level of that particular organisation (Crawford, 2006).

6.7.2.3 Repeated use as a progress and effectiveness tool

Repetitive usage of the PMMM to assess the project management maturity of the organisation will help the organisation assess its performance improvement as well as attain its goals (Crawford, 2006).

6.8 Lessons learned

- The study provided more insight into project management and revealed an improved project management maturity model applicable to evaluating the project management maturity level of the electrical utility.
- The research has integrated the project management maturity with organisational factors.
- Certain project management concepts were emphasised which provided a better understanding of them.
- A culture is the main contributor to the project management maturity and there is insufficient evidence that Strategy has a relationship with overall maturity.

6.9 Future Research

The Literature review from the referenced sources, greatly helped in the critical evaluation of the PMMMs. It was possible to compare and analyse each project management model.

This study of the applicability of project management capability maturity models in the electricity generation, transmission and distribution industry - the case of Eskom in the Republic of South Africa has revealed areas for further research:

- The review of the implementation of the project management maturity results in Eskom.
- Culture is the main contributor to the project management overall maturity and there is insufficient evidence that Strategy has a relationship with overall maturity. This result is unexpected and requires further research

6.10 Overall Conclusion

The findings of this study support the findings of Badewi & Shehab (2016), that organisations that deliver successful projects have high project management maturity levels. The results are in line with the research performed by Cooke-Davies & Arzymanow (2003), who determined the maturity level score of companies in the telecommunications industry as three comma five (3.5).

Project time management, project cost management, project procurement management, project management strategy and project management culture were found to be performing below the average of Eskom's project management maturity level of four, (3.6) (managed at corporate level). This implies their underperformance and the need for improvement. These imply that that there were controlled project management systems in place, integrated with the organisation's project management system and there are experienced project management personnel currently employed by Eskom.

References

Adeyemi, I., 2013, ‘Effects of Project Management on the Performance of a Construction Firm in Nigeria’, *American International Journal of Contemporary Research*. 3(6), pp. 54–58. Available: www.aijcrnet.com (Accessed: 21 September 2016).

Alami, O.M., Bouksour, O., & Beidouri, Z., 2015, ‘An Intelligent project management maturity model for Moroccan Engineering Companies’, *Vikalpa*. 40(2):191–208. DOI: 10.1177/0256090915590329.

Albrecht, J.C. & Spang, K., 2016, ‘Disassembling & Reassembling Project Management Maturity’, *Project Management Journal*. 47(5):18–35. DOI: 10.1177/875697281604700503.

Alzahrani, S.S., 2015, ‘Developing a Project Management Maturity Model to Initiate Sustainable Project Performance and Modernisation in the Kingdom of Saudi Arabia Thesis submitted by Table of Contents’, *Ph.D*, (March).

Amrit Nakarmi., 2013, ‘energy consumption-- Republica’, *Republica*.

Andersen, E.S., Dyrhaug, Q.X., & Jessen, S.A., 2002. ‘Evaluation of Chinese projects and comparison with Norwegian projects’, *International Journal of Project Management*. 20(8), pp. 601–609. DOI: 10.1016/S0263-7863(02)00011-X.

Angus, C.L., 2010, ‘Chapter 3. Research methodology and study design’, *English as a Lingua Franca in Higher Education*. 3, pp. 291–334. DOI: 10.1515/9783110215519.82.

Babatunde, S.O., Perera, S., & Zhou, L., 2016, ‘Methodology for developing capability maturity levels for PPP stakeholder organisations using critical success factors’, *Construction Innovation*. 16(1), pp. 81–110. DOI: 10.1108/CI-06-2015-0035.

Backlund, F., Chronéer, D., & Sundqvist, E., 2014, ‘Project Management Maturity Models – A Critical Review’, *Procedia - Social and Behavioral Sciences*. 119, pp. 837–846. DOI: 10.1016/j.sbspro.2014.03.094.

Badewi, A., 2016, ‘The impact of project management (PM) and benefits management (BM) practices on project success: Towards developing a project benefits governance framework’, *International Journal of Project Management*. 34(4), pp. 761–778. DOI: 10.1016/j.ijproman.2015.05.005.

Badewi, A., and Shehab, E., 2016, ‘The impact of organizational project benefits management governance on ERP project success: Neo-institutional theory perspective’, *International Journal of Project Management*. 34(3) pp. 412–428. DOI: 10.1016/j.ijproman.2015.12.002.

Bettuzzi, S., 2009, ‘*Chapter 1: Introduction*’, V. 104. DOI: 10.1016/S0065-230X(09)04001-9.

Beukers, M.W., 2011, ‘*Project management of life-science research projects: project characteristics, challenges and training needs*’, V. 16. DOI: 10.1016/j.drudis.2010.11.015.

Blom, T. 2017, ‘Unplugging corruption at Eskom’, pp. 27(October).

Brian Tracy International, 2013, ‘Time Management Tools and Techniques’, 4(4) pp. 57–62. Available: http://www.briantracy.com/blog/time-management/time-management-tools-and-techniques-time-planner-master-list/ (Acessed 23 November 2016).

Brookes, N., & Clark, R., 2009, ‘Using Maturity Models to Improve Project Management Practice’, المشاريع إدارة ممارسات لتحسين النضج نماذج باستخدام. *POMS 20th Annual Conference*. (2001) pp.11.

Burde, D., 2008, ‘*Project Management Process*’, Artech House. DOI: 10.2139/ssrn.1284391.

Butler, J. 2018. September 2018. *Private Club Advisor*. September(September):1–2.

De Fazio, E., 2017, ‘Why it is important to build an innovation strategy through the project management maturity model', *IEEE Aerospace and Electronic Systems Magazine*, 32(5), pp.54–59, DOI: 10.1109/MAES.2017.160101.

Johansen, A., Bjerke, Y.C. & Landmark, A. 2018. ‘Effective Opportunity management in a Megaproject. *Procedia Computer Science*, 138, pp.883–890. DOI: 10.1016/j.procs.2018.10.115.

Caillaud, E., Rose, B., & Goepp, V., 2016, ‘Research methodology for systems engineering: some recommendations’, *IFAC-PapersOnLine*. 49(12):1567–1572. DOI: 10.1016/j.ifacol.2016.07.803.

de Carvalho, M.M., Patah, L.A., & de Souza Bido, D., 2015, ‘Project management and its effects on project success: Cross-country and cross-industry comparisons’,

International Journal of Project Management. 33(7), pp. 1509–1522. DOI: 10.1016/j.ijproman.2015.04.004.

Christoph, A.J., & Konrad, S., 2014, 'Project Complexity as an Influence Factor on the Balance of Costs and Benefits in Project Management Maturity Modeling', *Procedia - Social and Behavioral Sciences*. 119(119), pp. 162–171. DOI: 10.1016/j.sbspro.2014.03.020.

Cooke-Davies, T.J., & Arzymanow, A., 2003, 'The maturity of project management in different industries', *International Journal of Project Management*. 21(6), pp.471–478. DOI: 10.1016/S0263-7863(02)00084-4.

Crawford, J. K., 2002, '*Project management maturity model : providing a proven path to project management exellence*', New York: CRC Press.

Crawford, J.K., 2006, 'The Project Management Maturity Model. *Information Systems Management*. 23(4), pp. 50–58. DOI: 10.1201/1078.10580530/46352.23.4.20060901/95113.7.

Daya, B. & Lutteroth, C., 2011, 'Climbing the ladder: Capability maturity model integration level 3', *Enterprise Information Systems*. 5(1), pp. 125–144. DOI: 10.1080/17517575.2010.495789.

Demir, C., & Kocabaş, I., 2010, 'Project Management Maturity Model (PMMM) in educational organizations', *Procedia - Social and Behavioral Sciences*. 9, pp. 1641–1645. DOI: 10.1016/j.sbspro.2010.12.379.

Eberhard, A., & Mtepa, M., 2003, 'Rationale for restructuring and regulation of a 'low priced' public utility: A case study of Eskom in South Africa', *International Journal of Regulation and Governance*. 3(2), pp. 77–102. DOI: 10.3233/IJR-120030.

Einsatz, V., Ahlemann, F., & Teuteberg, F., 2015, '*ISPRI-Arbeitsbericht Kompetenz- und Reifegradmodelle für das Projektmanagement Grundlagen , Vergleich und Einsatz Herausgeber :*

Elving, W.J.L., 2005, 'The role of communication in organisational change. *Corporate Communications*. 10(2):129–138. DOI: 10.1108/13563280510596943.

Eskom, 2017, 'The Eskom Transmission Development Plan 2018 to 2027 (TDP 2017). 2027(October), pp.1–168. Available: http://www.eskom.co.za/Whatweredoing/TransmissionDevelopmentPlan/Documents/

2018-2027TDP_PubForumPresentationOct2017rev3.pdf (Acessed 26 October 2018].

Eskom Ltd., 2013, ‘Standard Presentation Dec 2013’, (December), pp. 67.

De Fazio, E., 2017, ‘Why it is important to build an innovation strategy through the project management maturity model’, *IEEE Aerospace and Electronic Systems Magazine*. 32(5), pp.54–59. DOI: 10.1109/MAES.2017.160101.

Goksen, Y., Cevik, E., & Avunduk, H., 2015, ‘A Case Analysis on the Focus on the Maturity Models and Information Technologies’, *Procedia Economics and Finance*. 19(15), pp.208–216. DOI: 10.1016/S2212-5671(15)00022-2.

Görög, M., 2016, ‘A broader approach to organisational project management maturity assessment. *International Journal of Project Management*. 34(8), pp.1658–1669. DOI: 10.1016/j.ijproman.2016.08.011.

Habib, M.M., Pathik, B.B., & Maryam, H., 2014, ‘*Research Methodology - Contemporary Practices : Guidelines for Academic Researchers*. Newcastle-upon-Tyne, UNKNOWN: Cambridge Scholars Publishing. Available: http://ebookcentral.proquest.com/lib/limpopo/detail.action?docID=1819209 (Acessed 03 September 2016).

Hellered, C., 2010, ‘Benchmarking project management maturity in two organisations-A case study focusing on the value of having an established project management model in an organisation’, *Environmental Engineering*. 26(7), pp.63. Available: /citations?view_op=view_citationandcontinue=/scholar?q=(multi_projects+OR+multi_project+OR+multiple_projects+OR+multiple_project+)+andhl=nlandstart=120andas_sdt=0,5andscilib=1028andcitilm=1andcitation_for_view=gTBd1pcAAAAJ:QoJ_w57xiyACandhl=nlandoi=p (Acessed 14 April 2016).

Heppes, D.W., 2006, ‘an Assessment of the Level of Maturity of the Competitive’, *Evolution*. 1(February), pp.44.

Hillson, D., 2001, ‘Benchmarking organizational project management capability’, *Project Management Institute Annual Seminars and Symposium*, pp. 6.

Hlophe, S., & Visser, J.K., 2018, ‘Risk Management During Outage Projects At Power Plants’, *South African Journal of Industrial Engineering*. 29(3), pp.82–91. DOI: 10.7166/29-3-2051.

Huffman, J., & Whitman, L.E., 2011, ‘Developing a capability maturity model for

enterprise intelligence', *IFAC Proceedings Volumes (IFAC-PapersOnline)*. 18(PART 1), pp.13086–13091. DOI: 10.3182/20110828-6-IT-1002.02641.

Humphrey, W.S., Snyder, T.R., & Willis, R.R., 2011, 'Software process improvement at Hughes Aircraft', *Software Process Improvement*. 10(4), pp. 65–77. DOI: 10.1109/9781118156667.ch2.

Hutchins, G., 2018, '*Book Review: Strategic Planning for Project Management Using a Project Management Maturity Model*. ', V. 32. DOI: 10.1177/875697280103200411.

Hyväri, I., 2016, 'Roles of Top Management and Organizational Project Management in the Effective Company Strategy Implementation', *Procedia - Social and Behavioral Sciences*. 226(October 2015), pp. 108–115. DOI: 10.1016/j.sbspro.2016.06.168.

Jahed, M., Amra, R., Mnguni, G., & Mohamed, S., 2017, 'Analysis of Eskom ' s financial position Full report', 34(March):20. Available: https://www.parliament.gov.za/storage/app/media/PBO/Analysis_of_Eskom_finances_Report_to_SCOA_presented_8_March_2017.pdf (Acessed 25 July 2016).

Jeffrey, L.S., 2005, 'Challenges associated with further development of the Waterberg Coalfield', *Journal of The South African Institute of Mining and Metallurgy*. 105(6), pp. 453–458. Available: http://reference.sabinet.co.za/webx/access/journal_archive/0038223X/3109.pdf%5Cnhttps://www.scopus.com/inward/record.uri?eid=2-s2.0-24144476571andpartnerID=40andmd5=a0e880b05acd0e6c33e91809b3410024 (Acessed 24 November 2017).

Jiang, J.J., Klein, G., Hwang, H.G., Huang, J., & Hung, S.Y., 2004, 'An exploration of the relationship between software development process maturity and project performance', *Information and Management*. 41(3), pp. 279–288. DOI: 10.1016/S0378-7206(03)00052-1.

Joffe, H., 2012, 'Challenges for South Africa's Electricity Supply Industry', *Helen Suzman Foundation Publications*. 64, pp. 32–37. Available: https://hsf.org.za/publications/focus/focus-64/HJoffe64.pdf.

Joskow, J., & Yamane, T., 1965, *Statistics, an Introductory Analysis.* V. 60. DOI: 10.2307/2282703.

Joslin, R., & Müller, R., 2015, 'Relationships between a project management

methodology and project success in different project governance contexts', *International Journal of Project Management*. 33(6), pp. 1377–1392. DOI: 10.1016/j.ijproman.2015.03.005.

Khembo, P., 2015, 'Determinants of energy poverty in South Africa 1 Zaakirah Ismail', *Journal of Energy in Southern Africa*. 26(3), pp. 66–78.

Khoshgoftar, M., & Osman, O., 2009, 'Comparison of maturity models', *Proceedings - 2009 2nd IEEE International Conference on Computer Science and Information Technology, ICCSIT 2009*, pp. 297–301. DOI: 10.1109/ICCSIT.2009.5234402.

Kulik, P., 2000, '*A Practical approach to software metrics*', V. 2. Springer-Verlag New York, Incorporated. DOI: 10.1109/6294.819938.

Kwak, Y.H., & Ibbs, C.W., 2002, 'Project Management Process Maturity (PM)2 Model', *Journal of Management in Engineering*. 18(3), pp. 150–155. DOI: 10.1061/(asce)0742-597x(2002)18:3(150).

Loh, N.E.D., 2009, 'Maturity of Project Scope Management in Mtn South Africa : a Gap Analysis Leading To a Roadmap for', 3(October):22.

Maize, K., 2016, 'Chronic Tardiness at South Africa ' s Eskom Could Be Its Downfall', *Power Mag*. (October):5.

Martens, C.D.P., Carneiro, K.D.A., Martens, M.L., & Silva, D. da., 2015, 'Relationship between Entrepreneurial Orientation and Project Management Maturity in Brazilian Software Firms', *Revista Ibero-Americana de Estratégia*. 14(02), p. 72–91. DOI: 10.5585/ijsm.v14i2.2232.

Mårtensson, M., 2000, 'A critical review of knowledge management as a management tool', *Journal of Knowledge Management*. 4(3), pp. 204–216. DOI: 10.1108/13673270010350002.

Martínková, N., Nová, P., Sablina, O. V., Graphodatsky, A.S., & Zima, J., 2004, DOI: 10.1007/s13398-014-0173-7.2.

Masoga, M.V., 2013, 'the Impact of Performance Management on Moletele Communal'.

Makui, A., Moeinzadeh, P., & Bagherpour, M., 2017, 'Developing a fuzzy inference approach to evaluate the static complexity of construction projects', *Journal of Intelligent and Fuzzy Systems*, 32(3), pp.2233–2249, DOI: 10.3233/JIFS-16234.

Mashiloane, R., E., and Jokonya, O., 2018, ‘Investigating the challenges of project governance processes of IT projects', *Procedia Computer Science*, 138, pp.875–882. DOI: 10.1016/j.procs.2018.10.114.

Mtsweni, E., S., & Maveterra, N., 2018, ‘Issues affecting application of tacit knowledge within software development project', *Procedia Computer Science*, 138, pp.843–850, DOI: 10.1016/j.procs.2018.10.110.

Mateen, M., 2015, ‘Measuring Project Management Maturity -A framework for better and efficient Projects delivery. 2(4), pp. 23. Available: http://publications.lib.chalmers.se/records/fulltext/224129/224129.pdf [2016, May 03].

Meridian Economics., 2017, ‘Eskom’S Financial Crisis and the Viability of Coal-Fired Power in South Africa’, (November).

Mihic, M.M., Petrovic, D.C., Obradovic, V.L., & Vuckovic, A.M., 2015, ‘Project management maturity analysis in the Serbian energy sector. *Energies*. 8(5), pp. 3924–3943. DOI: 10.3390/en8053924.

Miklosik, A., 2015, ‘Improving Project Management Performance through Capability Maturity Measurement’, *Procedia Economics and Finance*. 30(15), pp. 522–530. DOI: 10.1016/S2212-5671(15)01264-2.

Miklosik, A.., & Janovska, K.., 2015, ‘Measuring maturity of project management implementation processes’, *Actual Problems of Economics*. 163(1), pp.36–42. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84930807851andpartnerID=40andmd5=f87e39c6c663e3e12104365a2069d904 (Acessed 03 November 2016).

Moutinho, L., Hutcheson, G., & Salkind, N.J., 2014, ‘Internal and External Validity’, *The SAGE Dictionary of Quantitative Management Research*. 340(7749), pp.148–149. DOI: 10.4135/9781446251119.n45.

Muresan, A., 2017, ‘Eskom: Electricity and Technopolitics in South Africa’, *Politeia*. 35(2), pp. 128–130. DOI: 10.25159/0256-8845/2363.

Nehru, M., & Sumathi, S., 2013, ‘*Removal of cadmium (II) and nickel (II) ions by copper substituted hydroxyapatite*’, V. 8. (ITPro). Newtown Square, Pennsylvania: Project Management Institute. DOI: 10.1002/pmj.20125.

Neverauskas, B., & Railaitė, R., 2013, ‘Formation Approach for Project Management

Maturity Measurement', *Economics and Management*. 18(2), pp. 360–365. DOI: 10.5755/j01.em.18.2.4604.

Newbery, D., & Eberhard, A., 2008, 'South African Network Infrastructure Review : Electricity', *Paper prepared for National Treasury and the Department of Public Enterprises Government of South Africa*.

Nikolova-Alexieva, V., 2013, 'Process Maturity Analysis of the Bulgarian Enterprises', *Procedia - Social and Behavioral Sciences*. 92(Lumen), pp. 632–636. DOI: 10.1016/j.sbspro.2013.08.729.

Ntshangase, B., 2017, 'Identifying delay factors in electrical distribution projects at Eskom Northern Cape Operating Unit', (August), pp. 1–175.

Papke-Shields, K.E., & Boyer-Wright, K.M, 2017, 'Strategic planning characteristics applied to project management', *International Journal of Project Management*. 35(2), pp. 169–179. DOI: 10.1016/j.ijproman.2016.10.015.

Pasian, B., 2014, 'Extending the concept and modularization of project management maturity with adaptable, human and customer factors', *International Journal of Managing Projects in Business*. 7(2), pp. 186–214. DOI: 10.1108/IJMPB-01-2014-0006.

Passos, M.H.P., Silva, H.A., Pitangui, A.C.R., Oliveira, V.M.A., Lima, A.S., & Araújo, R.C., 2017, 'Reliability and validity of the Brazilian version of the Pittsburgh Sleep Quality Index in adolescents', *Jornal de Pediatria (Versão em Português)*. 93(2), pp. 200–206. DOI: 10.1016/j.jpedp.2016.08.010.

Patanakul, P., Shenhar, A.J., & Milosevic, D.Z., 2012, 'How project strategy is used in project management: Cases of new product development and software development projects', *Journal of Engineering and Technology Management - JET-M*. 29(3), pp. 391–414. DOI: 10.1016/j.jengtecman.2012.04.001.

Pinto, J.K., 2007, '*Project Management Best Practices: Achieving Global Excellence*', *(Kerzner, H.; 2006)*. V. 54. Hoboken, N.J.: Wiley. DOI: 10.1109/tem.2007.893984.

Pooe, D., & Mathu, K., 2016, 'The South African coal mining industry: A need for a more efficient and collaborative supply chain', *Journal of Transport and Supply Chain Management*. 5(1), pp. 316–336. DOI: 10.4102/jtscm.v5i1.80.

Pretorius, S., 2012, 'PMMM in Africa. *International Journal of Project Management*',

23(November):1–12. Available: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84876095780andpartnerID=40andmd5=a7de322a7ff16232feeb602b1a6dea9c (Acessed 03 September 2016).

Rambe, P., & Modise, D., 2016, 'Power Distribution at Eskom: Putting Self-Leadership, Locus of Control and Job Performance of Engineers in Context', *African Journal of Business and Economic Research*. 11(1), pp. 45–92.

Eskom, D., 2014a, 'Operating highlights Operating challenges'.

Eskom, I., 2014b, 'Integrated Report 2014 Integrated Report'.

Rosenthal, M., 2016, 'Qualitative research methods: Why, when, and how to conduct interviews and focus groups in pharmacy research', *Currents in Pharmacy Teaching and Learning*. 8(4), pp. 509–516. DOI: 10.1016/j.cptl.2016.03.021.

Sciences, M., 201, ' a Critical Analysis of Electricity Distribution Processes in Nigeria: a Management Perspective', (2005-2015). Available: http://etd.uwc.ac.za/xmlui/bitstream/handle/11394/5567/Igwemezie_cjp_mpa_ems_2017.pdf?sequence=1.

Shaun, V., & Marais, C., 2014, 'Corporate governance , integrated reporting , and stakeholder management : A case study of Eskom', *African Journal of Business Ethics, Vol. 8 No. 2*. 8(2), pp. 31–57. Available: http://ajobe.journals.ac.za/pub/article/download/84/95 (Acessed 27 October 2018).

Simangunsong, E., & Da Silva, E.N., 2016, 'Analyzing Project Management Maturity Level in Indonesia', *The South East Asian Journal of Management*. 7(1), pp. 72–84. DOI: 10.21002/seam.v7i1.1521.

Solutions, A.P.M., 2009, 'Project Management Best Practice Benchmarks Senior executives want to know one thing about project management : " What ' s the value ?" Today more than ever , every dollar invested must be justified , and any', 8(2), pp. 9.

De Souza, T.F., & Gomes, C.F.S., 2015, 'Assessment of maturity in project management: A bibliometric study of main models', In *Procedia Computer Science*. V. 55. Elsevier B.V. 92–101. DOI: 10.1016/j.procs.2015.07.012.

Spalek, S., 2014, 'Assessing Project Management Maturity in the Area of Knowledge Management in Select Companies', *International Journal of Economics, Finance and Management Sciences*. 2(2), pp. 164. DOI: 10.11648/j.ijefm.20140202.18.

Spaulding, D.T., 2016, '*Program evaluation in practice: Core concepts and examples for discussion and analysis*', San Francisco : Jossey-Bass, [2014]. Available: https://books.google.com.my/books?id=OiDcAgAAQBAJ (Acessed 22 May 2016).

Sivusuo, J., Sivusuo, H., & Takala, J., 2018, 'Model of Excellence: From Individuals to Dynamic Capabilities. *Management*', 13(2), pp.97–109, DOI: 10.26493/1854-4231.13.97-109.

Sousa, P., Tereso, A., Alves, A. & Gomes, L., 2018, 'Implementation of project management and lean production practices in a SME Portuguese innovation company', *Procedia Computer Science*. 138, pp.867–874, DOI: 10.1016/j.procs.2018.10.113.

Styan, J.-B., 2016, 'The state of Eskom. *Finweek*'.

Sumerson, J.B., 2014, '*Finish Your Dissertation, Don't Let It Finish You!* ', Hoboken, N.J.: Wiley. Available: http://search.ebscohost.com/login.aspx?direct=trueanddb=edsebkandAN=657300andsite=eds-live (Acessed 20 September 2016).

Svensson, G., Tronvoll, B., & Slåtten, T., 2008, "Empirical characteristics" and "geocentricity" in "top" journals of logistics management', *The International Journal of Logistics Management*. 19(3), pp. 436–450. DOI: 10.1108/09574090810924598.

Tahri, H., & Drissi-Kaitouni, O., 2015, 'New Design for Calculating Project Management Maturity (PMM) ', *Procedia - Social and Behavioral Sciences*. 181, pp. 171–177. DOI: 10.1016/j.sbspro.2015.04.878.

Teljeur, E., Sheik Dasarath, F., Kolobe, T., & Da Costa, D., 2016, 'Electricity Supply Industry Restructuring: Options for the Organisation of Government Assets Contact Information', *Document Reference*. (April). Available: www.genesis-analytics.com.

Thabane, T., & Deventer, E.S., 2018, 'South Africa's state-owned companies: A critical reflection', 2018(21), pp. 10–120.

Todorović, M.L., Petrović, D.T., Mihić, M.M., Obradović, V.L., & Bushuyev, S.D. 2015, 'Project success analysis framework: A knowledge-based approach in project management', *International Journal of Project Management*. 33(4), pp. 772–783. DOI: 10.1016/j.ijproman.2014.10.009.

Torp, O., Belay, A.M., Thodesen, C., & Klakegg, O.J., 2016, 'Cost Development Over-

time at Construction Planning Phase: Empirical Evidence from Norwegian Construction Projects', *Procedia Engineering*. 145(7), pp. 177–1184. DOI: 10.1016/j.proeng.2016.04.152.

Value, D.B., 2002, '*Financial Results*', V. 13. DOI: 10.1016/s0965-2590(01)00603-x.

Varajão, J., Colomo-Palacios, R., & Silva, H., 2017, 'ISO 21500:2012 and PMBoK 5 processes in information systems project management', *Computer Standards and Interfaces*. 50(May 2016), pp. 216–222. DOI: 10.1016/j.csi.2016.09.007.

Vergopia, C., 2008, '*Project review maturity and project performance: An empirical case study*', ProQuest. Available: http://search.proquest.com.library.capella.edu/docview/304147255?accountid=27965 (Acessed 21, September 2016).

Willis, B.E., 1995, 'APM project-management body of knowledge: the European view', *International Journal of Project Management*. 13(2), pp. 95–98. DOI: 10.1016/0263-7863(95)00006-C.

Woodward, J.F., 2002, '*Handbook of Project Management*', V. 22. Surrey, England: Gower. DOI: 10.1016/s0263-7863(01)00077-1.

Yazici, H.J., 2009, 'Does project maturity matter for organizational success? ', *Industrial Engineering Research Conference*, pp. 356–361.

Yazici Julie, H., 2009, 'The Role of Project Management Maturity and Organizational Culture', *Project Management Journal*. 40(3), pp. 14–33. DOI: 10.1002/pmj.

Zhang, L., He, J., & Zhang, X., 2012, 'The project management maturity model and application based on PRINCE2', *Procedia Engineering*. 29(Sei 1994), pp. 3691–3697. DOI: 10.1016/j.proeng.2012.01.554.

Zhong, L., Leung, D., Law, R., Wu, B., & Shao, J., 2014, 'An application of the capability maturity model for evaluating attraction websites in Mainland China', *International Journal of Tourism Research*. 16(5), pp. 429–440. DOI: 10.1002/jtr.1937.

Part A: Applicable project management maturity model questionnaire

Dear participant

You have been selected to take part in this maturity evaluation due to your expertise and experience in the said speciality area of project management. Please receive the attached project management maturity assessment questionnaire and kindly complete it.

Your contribution to this study is valuable and highly appreciated as this study is part of the Masters in Business management in the Unit of Management and Law at the University of Limpopo.

The questionnaire will be assessing the various project management dimensions such as processes, business strategy and culture maturity of the project management area. This evaluation aims to determine the current project management maturity level of Eskom's business units, namely Generation, Distribution and Transmission, as well as to evaluate the current project management maturity of the organisation.

Please complete the assessment and send it back by 20 June 2018.

Your effort and time is highly appreciated.

Tshepiso Christian Moepi

Ethical clearance number: TREC/405/2017: PG

e-mail:_____

Cell: _____

Important message to the study participants

1) Participation in this study is voluntary.
2) It is private and confidential.
3) The responses are strictly for a scientific analysis.
4) The participants' identities are not disclosed and protected at all times.

PART A: GENERAL INFORMATION

a. What unit do you work in?

Transmission	
Generation	
Distribution	

b. What is you gender

Male		Female	

c. What is your age?

20-30 years	
31-40 years	
41-50 years	
51-60 years	
61-older	

d. What is your project management experience at Eskom? (Please specify)

0-5 years	
6- 10 years	

11- more	

e. What is your current position?

Executive or senior management	
Project manager	
Project management personnel	

Part B

Please rate each of the following statements according to the maturity levels, by making an X in the appropriate box. If your organisation does not implement a specific section, please mark the N/A (not applicable) box.

Guideline

Levels No	**The Applicable project management maturity model**
1 – Ad Hoc	• Informal project management process and practices. • No organisation support. • No project management organisational culture in place • No project management strategy
2 – Defined	• Basic project management processes for repeating projects. • Project teams' formation; • Informal project management. • Limited project risk management culture; • Lack of project management commitment. • Lack of trust amongst the project management teams. • The importance of the business strategy is realised but it is not included in the business strategy
3 – Managed at organisation level	• Awareness of the project management; • Project teams' development; • Project management systems introduced and managed at organisation level. • Selective trust amongst project management team members; • Selective project management commitment culture. • Informal project risk management culture in place. • Informal project changes authorisation authority. • The importance of project management strategy is identified and included in the business strategy but there is no project unit

4 – Managed at corporate level	• A controlled project management system in place; • Project management systems introduced and managed at corporate level (integrated with the organisation's project management system); • Experienced project management personnel. • Only identified project risks culture. • Improved project management commitment. • Moderate trust amongst project management teams. • The project management strategy is assigned a unit; with project leaders, and resources are readily available.
5 – Continuous improvement	• Continuous improvement of the organisation's best practices and processes. • Continuous assessment of the business strategy goals and vision. • High degree level of trust. • Identified and unexpected project risks incorporated. • Extensive project management commitment. • Intuitive project management knowledge culture. • There is a continuous improvement of the business strategy from the evaluation results.

Project Scope Management Processes

How would you rate your organisation's Project Management Maturity level in terms of the following key process areas?

B.1 How accurate is your scope planning process?

1	2	3	4	5	N/A

B.2 How well documented is the scope definition?

1	2	3	4	5	N/A

B.3 Is your Work breakdown structure accurately prepared?

1	2	3	4	5	N/A

B.4 Is your project scope verification done timeously and effectively?

1	2	3	4	5	N/A

B.5 Is your change control process implemented correctly?

1	2	3	4	5	N/A

Project Time Management Processes

C.1 How effective is your activity definition process?

1	2	3	4	5	N/A

C.2 Is the activity sequencing process accurately and effectively implemented?

1	2	3	4	5	N/A

C.3 Is activity resource estimation process undertaken correctly?

1	2	3	4	5	N/A

C.4 Is activity duration estimating process performed accurately and effectively?

1	2	3	4	5	N/A

C.5 Is the schedule development process timeously and effectively done?

1	2	3	4	5	N/A

C.6 How effective is the Schedule control process implemented?

1	2	3	4	5	N/A

Project Cost Management Processes

D.1 Is the cost estimating process performed effectively and timeously?

1	2	3	4	5	N/A

D.2 How is the cost budgeting process performed?

1	2	3	4	5	N/A

D.4 Is the cost change control process accurately and effectively implemented?

1	2	3	4	5	N/A

Project Integration Management Processes

E.1 Is the plan development process effectively and timeously carried out?

1	2	3	4	5	N/A

E.2 How is the execution process performed?

1	2	3	4	5	N/A

E.3 Is the integrated change control process accurately and effectively implemented?

1	2	3	4	5	N/A

Project Quality Management Processes

F.1 Is your quality planning processes effectively performed?

1	2	3	4	5	N/A

F.2 Are quality assurance processes continuously incorporated?

1	2	3	4	5	N/A

F.3 Does your organisation take quality control as the KPA?

1	2	3	4	5	N/A

Project Human Resource Management Processes

G.1 How would you rate your organisational planning process?

1	2	3	4	5	N/A

G.2 Is your staff acquisition processes effectively done?

1	2	3	4	5	N/A

G.3 Is there a team development process in place?

1	2	3	4	5	N/A

Project Communication Management Processes

H.1 How accurate is your communication planning process?

1	2	3	4	5	N/A

H.2 How effective is the information distribution process?

1	2	3	4	5	N/A

H.3 Is performance reporting of the project in order?

1	2	3	4	5	N/A

H.4 Is there an administrative closure?

1	2	3	4	5	N/A

Project Risk Management Processes

I.1 Is risk management planning done accurately and timeously?

1	2	3	4	5	N/A

I.2 Does the organisation have risk identification in place?

1	2	3	4	5	N/A

I.3 Is Qualitative risk analysis process performed on all projects?

1	2	3	4	5	N/A

I.4 Is qualitative risk analysis process encouraged for all the projects?

1	2	3	4	5	N/A

I.5 Does the project team undertake risk response planning?

1	2	3	4	5	N/A

I.6 How effective is the risk monitoring and control process?

1	2	3	4	5	N/A

Project procurement management processes

J.1 Is procurement planning effectively and timeously implemented?

1	2	3	4	5	N/A

J.2 Is there a solicitation planning process in place?

1	2	3	4	5	N/A

J.3 Does the organisation have a solicitation process in place?

1	2	3	4	5	N/A

J.4 How accurate is your source selection process?

1	2	3	4	5	N/A

J.5 Is there a process for contract administration?

1	2	3	4	5	N/A

J.6 Is Contract closeout intensively reviewed?

1	2	3	4	5	N/A

J.7 Has the organisation developed its risk monitoring and control process?

1	2	3	4	5	N/A

Part B: project management culture maturity

How would you rate your organisation's Project Management Culture Maturity level on a five likert-scale if you agree with the case or not?

Here is the guideline to rate:

1 = "Strongly disagree"

2 = "Disagree"

3 = "Neither Disagree nor Agree"

4 = "Disagree"

5 = "Strongly Agree"

K.1 The relationship between the project team members.	No culture	
	Little or no relationship whatsoever	
	Just a work relationship	
	More effort team relationship	
	Best team relationship	
K.2 The degree of trust amongst the team members, project managers and senior management.	No culture	
	Significant lack of trust amongst.	
	Little, selective trust.	
	Moderate trust.	
	High degree of trust amongst project teams.	
K.3 Rewarding model has an impact on project management personnel performance.	No culture.	
	Rewarding model based on selected projects.	
	Slight improvement in personnel performance based on rewards.	
	Moderate performance based on rewards.	
	Significant personnel performance improvement based on rewards.	
K.4 Project risks incorporated in everyday duration of the project.	No culture	
	Very limited project risks are incorporated.	
	Only informal project risks are incorporated and only for selected time.	
	Only identified project risks incorporated but no unexpected risks expected	
	Identified and unexpected project risks incorporated in duration.	
K.5 Project major changes are authorised by senior management first before implemented.	No culture	
	Any team member can authorise a major project change.	
	Any team member can authorise and implement major project change.	

	Project managers can authorise and implement major project changes.	
	Project management processes are updated time to time and on a regular basis.	
K.6 There is project success commitment amongst project team members.	No culture.	
	Lack of commitment amongst team members.	
	Selective commitment on selected projects only.	
	A slight commitment for project success amongst team members.	
	Extensive project success commitment amongst team members.	

Part C: project management Organisation strategy maturity evaluation

Note

"S/D" means Strongly Disagree
"D" means Disagree
"A" means Agree
"S/A" means Strongly Agree

L.1. How aware are you of your organisation's business strategy?

S/D	D	A	S/A	N/A

L.2. Are the projects goal clearly aligned to the organisation's strategic goal?

S/D	D	A	S/A	N/A

L.3. Do project teams have a clear understanding of the value that the projects add to the organisation?

S/D	D	A	S/A	N/A

L.4. Did the project core team take part in creation of the project goal statement?

S/D	D	A	S/A	N/A

L.5. Were intensive and consistent selection criteria utilised to choose this project?

S/D	D	A	S/A	N/A

L.6. Do you understand the link between the organisation's projects to achieve the organisation's strategy?

S/D	D	A	S/A	N/A

L.7. Was the project chosen based on the contribution to the organisation comparing the priority ranks?

S/D	D	A	S/A	N/A

Appendix 1: Certificate of editor

NJ Nel
PO Box
BENDOR PARK
0713

Tel:

CERTIFICATE

This serves to certify that I have language edited the Dissertation of

Mr TSHEPISO CHRISTIAN MOEPI,

Student number:

entitled:

"THE REVITALISATION OF PROJECT MANAGEMENT CAPABILITY MATURITY IN THE ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION INDUSTRY - THE CASE OF ESKOM IN THE REPUBLIC OF SOUTH AFRICA"

N J Nel

Lecturer of English, Department Applied Languages
Tshwane University of Technology
(Retired)

28 Jan. 2019

Appendix 2: Permission memorandum

Memorandum

To: Eskom South Africa
Ms Elsie Pule (Group Executive: Human Resource)

Subject: Request for permission to conduct research at Eskom South Africa

"**THE REVITALISATION OF PROJECT MANAGEMENT CAPABILITY MATURITY IN THE ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION INDUSTRY-THE CASE OF ESKOM IN THE REPUBLIC OF SOUTH AFRICA**"

Background and motivation

I, T. C. Moepi am doing research with Professor GPJ Pelser, a Professor, in the Unit of Business Management towards a Masters of Commerce degree at the University of Limpopo. We are inviting you to participate in a study entitled "**THE REVITALISATION OF PROJECT MANAGEMENT CAPABILITY MATURITY IN THE ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION INDUSTRY-THE CASE OF ESKOM IN THE REPUBLIC OF SOUTH AFRICA**".

The aim of the study is to develop an applicable project management maturity model to determine the project management maturity level of Eskom's core business units (Transmission, Distribution and Generation) in order to point and identify grey areas for improvement.

This organisation, Eskom, was chosen after seeing it in the media *[the Protection of Personal Information Act, nr 4 of 2013, necessitates the disclosure of personal*

information]. The approximate number of participants is one hundred and thirty three (133): about forty-five from each unit.

The study involves questionnaires. Project management related questions will be asked. Ten minutes is the expected duration of participation.
Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. However, the study involves a non-identifiable material such as a questionnaire,
It will not be possible to withdraw once the questionnaires are submitted. None of the questionnaires indicate the identity or ask for identity.

The purpose of this research is to assess the current project management maturity level of its core business units (Transmission, Distribution and Generation) to compare the project management maturity levels of its core business units; and lastly to identify process and best practices improvement stages that it has to go through in order to improve maturity. There are no negative consequences for your participation in this research project.
The partaking employees have the right to insist that their name not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about their involvement in this research
Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. The electronic copies will be permanently

deleted from the hard drive of the computer through the use of a relevant software program.

There will be no payment or reward offered, financial or otherwise. The participant is not expected to incur costs to participate as it is a questionnaire, taking approximately twenty minutes to complete.

This study has received the approval from the Research Ethics Review Committee of the University of Limpopo (TREC). A copy of the approval letter can be obtained from the researcher if you so wish.

If you would like to be informed of the final research findings, please contact T. C. Moepi on _____.
Should you require any further information or want to contact the researcher about any aspect of this study, please contact T. C. Moepi on _____.

Should you have concerns about the way in which the research has been conducted, you may contact Professor Pelser. Contact the research ethics secretary of the University of Limpopo Research administration and development, Mr Maluleke if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.
Thank you.
Yours sincerely

Tshepiso Christian Moepi
University of Limpopo student

Appendix 3: Letter of acceptance

Eskom

Tshepiso Christian Moepi

Dear Mr Moepi

ACKNOWLEDGEMENT OF RECEIPT OF YOUR REQUEST FOR ESKOM'S SUPPORT OF ACADEMIC MASTERS PROGRAMME.

This serves to confirm that Eskom will endeavour to support your request to base your master's programme research project, titled **"The revitalisation of Project Management Capability Maturity In the electricity Generation, Transmission and Distribution Industry -The case of Eskom in the Republic of South Africa"** on Eskom. Please be advised that this will be at your own cost and time. Eskom will also not take accountability for non-response from individuals to whom you will be introduced to.

It is highly recommended that you narrow your research to a specific project within Eskom, focusing on a specific project e.g. choose from current active projects.

Should, you agree on the above, You will be required to abide by Eskom's rules, governance procedures and other expectations that will be communicated to you in handling Eskom data and information. Please also be advised that we require a formal recommendation letter on the university letterhead from your Research Supervisor.

Please furnish Eskom with details of the nature of engagements you will require from Eskom, the number of participants, the time required from these individuals, frequency of engagements etc. Also detail the time it will take to complete your research and how Eskom stands to benefit from participating.

Dorcas Moloi, Senior Manager in my office will liaise with you and provide you with the support required.

Yours sincerely

Elsie Pule
GROUP EXECUTIVE: HUMAN RESOURCES
Date 18/10/2017