MANAGEMENT OF SKILLS SHORTAGES WITHIN ESKOM: A CASE STUDY OF MEDUPI POWER STATION, LEPHALALE, SOUTH AFRICA

By

YAGAMBRAM RAVU

STUDENT NUMBER: 19952539

Submitted in fulfilment of part of the requirements for the degree of

Doctor of Technology

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Approved for examination

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2014

DECLARATION

I, the undersigned, certify that:

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ABSTRACT

The study explores issues around human resources and training within Eskom using the Medupi Power Station as a case study. This power station is currently being constructed in the Limpopo province approximately 350 kilometres north of Gauteng. The main aim of the study was to identify the skills shortages on the project and make recommendations on how to manage them in the long and short term. The research objectives included ascertaining the types of skills shortages being experienced and perceptions regarding the employment of expatriates and their contribution to knowledge transfer at Eskom.

The mixed methods approach was utilised to conduct the research. The combination of quantitative and qualitative methods using questionnaires and interviews provided detailed and relevant data for addressing the research questions. A sample of 48 highly skilled employees who are currently working on the Medupi Project participated in the study. They included senior management, engineering and other technical staff and human resources personnel. The results revealed the nature of the skills shortages on the Project, namely supervisory, civil engineering and contracts management skills. The findings regarding the employment of expatriates reveal that they are employed on a contract basis and can terminate their contract on a short notice. This has an adverse effect on continuity on the Project. In addition, the local employees believed that the expatriates are chiefly motivated by the financial incentives and are not fully capable of transferring skills as they do not have power station experience.

The study proposes a new knowledge transfer model for the Medupi Project. According to this model, the line management's ability to provide an enabling work environment and support for on-the-job training influences knowledge transfer. Furthermore, employee motivation to acquire and utilise a newly learnt skill on the job, the setting of goals that are achievable given the multitude of constraints experienced on the Project, and senior management support are key determinants of line managements' success in providing an enabling knowledge transfer environment.

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Great is thy faithfulness

Lamentations 3:23

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This thesis is dedicated to my son Liam Uriel……my greatest joy

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LIST OF ACRONYMS AND ABBREVIATIONS

DME	Department of Mineral and Energy
ESI	Electricity Supply Industry
FRC	Faculty Research Committee
GDP	Gross domestic product
HC	Human Capital
PCA	Principal Component Analysis
HR	Human Resources
IDP	Individual Development Plan
IREC	Institutional Research Ethics Committee
IT	Information Technology
KM	Knowledge Management
LDM	Lead Discipline Manager
LTM	Learning Transfer Model
MNC	Multinational Corporations
MTS	Medupi Training System
NERSA	National Electricity Regulator of South Africa
NPM	New Public Management
NQF	National Qualifications Framework
PB	Parsons Brinckerhoff
RDP	Reconstruction and Development Programme
SPSS	Statistical Package for the Social Sciences

CHAPTER ONE: INTRODUCTION

1.1 Introduction

Since the apartheid government believed that only certain segments of the population should have access to electricity, little provision was made for the building of future power stations during the apartheid era, and the available capacity was provided to a select few at minimal cost (Malzbender, 2005:5). The new democratic government of 1994 prioritised access to electricity as a basic need for all South Africans (Reconstruction and Development Programme, 1997:59) and again noted by President Thabo Mbeki in his 2004 State of the Nation address (www.info.gov.za). This has placed Eskom under huge pressure over the past two decades and has resulted in periods of blackouts and load shedding since 2006 as electricity demand has outstripped supply.

Consequently, in 2006 Eskom was tasked to build two new power stations, viz. the Kusile and Medupi Power Stations, respectively (Eskom News, 2010). However, there were many other projects in progress at this time such as the construction of the new stadiums for the 2010 World Cup, upgrading of the road networks and the building of the Gautrain system. Since these projects had to be completed for the World Cup, most of the locally available skilled personnel were taken up on these projects.

Faced with these skill shortages, Eskom was forced to import skills from various parts of the globe in the hope that this would alleviate the skills gap in the short term, enable construction on the projects to proceed and lead to knowledge transfer from the expatriates to the locals over time. This research will examine the opinions of selected Eskom employees on the nature and causes of the skill shortages, the organisation's strategy of addressing these shortages by employing expatriates and the factors that influence skills and knowledge transfer on the Medupi Power Station Project.

1.2 Definition of concepts

1.2.1 Skill

Shah and Burke (2005:53) state that a skill is the ability to execute a particular task at a certain level of expertise. Skills are linked to qualifications through education and training.

1.2.2 Highly skilled

For the purposes of this research, highly skilled employees are those who hold a National Qualifications Framework (NQF) level 6 qualification, and who have a minimum of 3 years practical experience in the construction field.

1.2.3 Knowledge

Gupta et al (2000:19) describe knowledge as a resource, an intangible asset in an organisation that may be combined with other tangible assets to attain competitive advantage.

1.2.4 Knowledge Transfer

Rotsios, Sklavounos and Hajidimitriou (2014:240) define knowledge transfer as a migration of knowledge from one partner to another, either directly or indirectly.

1.3 Research problem

Due to the shortage of construction and engineering skills within the public sector in South Africa, Eskom formed a joint venture with the United States-based engineering and project management consultancy Parsons Brinckerhoff (or PB) Power (Pty) Ltd., for the construction of the Medupi Power Station Project (henceforth referred to as the Medupi Project). PB Power (Pty) Ltd. assists public and private clients to design, construct, operate and maintain key infrastructure projects around the world (www.pbworld.com). PB Power has sourced critical skills including engineers,

planners and project managers from other countries and from other sources within South Africa to work on the Medupi Project. The concern is that these skilled contract personnel will soon leave the Project once they have fulfilled their employment obligations.

As stated by Parsons Brinckerhoff's then Project Director on Medupi, Joe Schroedel, "Transfer of knowledge is an important part of Parsons Brinckerhoff work for Eskom, which has developed a formal skills and knowledge transfer strategy" (www.pbworld.com).This research therefore interrogates the extent of knowledge transfer from and the effectiveness of the training provided by these highly skilled expatriate employees to the local Eskom employees so that South Africans are in the long term better equipped to take over the responsibilities associated with future mega construction projects within the public sector in general, and within Eskom in particular.

1.4 Objectives of the study

The overall aim of this research is to identify how the skills shortages at Eskom can be managed both in the short and the long term with particular reference to the Medupi Project. Key research objectives include the identification of the types of skills shortages; methods of knowledge transfer within Eskom; perceptions of the expatriates' skills and job performance; and determining the degree of and the factors influencing learning and knowledge transfer on the Medupi Project.

1.5 Significance of the study

Knowledge transfer in the Eskom project environment is still in its developing stage as Eskom is new in the construction industry. Prior to Medupi and Kusile, the last power station had been commissioned in 2001, viz. Majuba Power Station (Eskom News, 2010). This research will explore the current skill shortages in Eskom and make recommendations on the management of such shortages for future projects. Without the correct skills, a project cannot be completed on time, nor at the appropriate cost, and quality may be compromised. It is important that construction industries address the issue of skill shortages. Bennett and McGuiness (2009:731)

state that skill shortages have a negative impact on productivity and performance, for example, companies may have to lower recruitment standards to fill positions. Tang and Wang (2005:323) note that small to medium size Canadian manufacturing firms have higher skill shortages and the result of this is low productivity. This implies that skills and productivity work hand in hand. Giese (2011:22) notes that the skill shortages of project managers, directors and engineers in the global wind sector slow the industry growth due to some suppliers being forced to send employees for training in order to fill the skills gap.

Eskom should address the shortage of skills as it impacts negatively on the production of electricity, and hence on the government's electrification programme. It also affects the economy; for example load shedding and blackouts have disastrous effects on mining, manufacturing and many other sectors, and thus impact negatively on economic growth (Beytenbach, 2008:6). Hlongwane (2012:23) estimates that the load shedding that occurred in 2008 cost the South African economy R50 billion.

1.6 The theoretical framework of the study

This study emerged out of the researcher's previous employment on the Medupi Project and hence his experiencing first-hand the issues pertaining to skill shortages. Further opinions held by local employees about the employment of expatriates and their contribution to skills and knowledge transfer on the Project, and concern with the relevance and the effectiveness of Eskom's policies on training and human capital development. The study may be housed within the discipline of Human Resources Management as it deals with staff and skills training as core components of human resource development. However, a thorough literature review could not locate a single model that integrated the theory of knowledge transfer with the role of expatriates and then contextualised these within the complex technology and skill requirements of a power station. Traditional mentorship models do not apply since expatriates were not perceived to fulfil all the requirements and characteristics of mentors as will be revealed in the results in Chapter Four. A further complication is the study's empirical context: a multi-billion rand infrastructural project that is well over budget, an economy that is severely constrained by power shortages, a population of which the vast majority of whom had been denied electricity and hence

an organisation that is under immense political pressure to deliver this basic need in an election year, 2014.

In an attempt to ground the study, the researcher has drawn firstly on the propositions and concepts located within Intellectual Capital Theory. These include the concept of knowledge, different types of knowledge and knowledge transfer. There are many models under the umbrella of Intellectual Capital Theory, but the one that is argued to be the most relevant for this study is the Human Capital Model (Kaplan and Norton 2004:59) which identifies the roles played by human and organizational capital as crucial in the knowledge transfer process. These ideas are related to Leimbach's (2010:83) Learning Transfer Model (LTM), a holistic all-encompassing model which likewise targets individual (Learner Readiness) and organizational (Organizational Alignment) components as important in the transfer of knowledge and skills. A third component of the LTM, is Learning Transfer Design, which in the context of this study is interpreted as the mechanisms and policies that Eskom has implemented to encourage and promote knowledge transfer. The LTM is therefore suitable as a generic theoretical framework for the study but this very "broadness" is at the same time its weakness. As discussed in Chapter Two, almost every factor identified in the LTM can itself be interrogated and developed into various models, for example, learner motivation is identified as a key factor influencing Learner Readiness yet there are a multitude of theories on learner motivation itself. Despite this problem, the LTM is adopted as the broad theoretical framework for the study and informs the design of the instruments used for data collection.

1.7. The empirical context of the study will now be explored

1.7.1 History of Eskom

Eskom was established in 1923 as the Electricity Supply Commission (ESCOM) by the South African government in terms of the Electricity Act (1922). Known in Afrikaans as the Elektrisitsvoorsieningskommissie (EVKOM), its name was later changed in 1986 to ESKOM (www.eskom.co,.za). Prior to the establishment of Eskom, the first electricity utilities in South Africa were the municipalities; for

example, in 1907 the Victoria Falls and Transvaal Power Company (VFP) supplied electricity to major towns in South Africa (Gaunt 2005:1309). Newbery and Eberhard (2008:13) state that Eskom supplies 60 percent of Africa's and 96 percent of South Africa's electricity respectively. This totals more than half of the electricity supplied on the African continent. Independent Power Producers produce about 3percent and municipalities about 1percent of the balance of electricity in the country. South Africa's electricity generation is mostly dependant on coal, with about 93percent of Eskom's electricity being produced from coal (Davidson and Mwakasonda 2004:28). Fetcher and Matibe (2003:722) observe that these coal-fired power stations are located towards the east of Gauteng and near coal mines. Eskom also supplies electricity to neighbouring countries such as Zimbabwe and Mozambique (Davidson and Mwakasonda, 2004:29).

Eskom has 27 power stations in operation currently with a load capacity of 43 875 megawatts, of which 13 are coal-fired, 4 are gas / liquid fuel turbines, 6 are hydro-electric, 2 pump storage, 1 wind energy and finally 1 is nuclear-powered (www.eskom.co.za). Table 1.1 provides further information on these power stations. As shown in Table 1.1, the coal-fired power stations supply the bulk of the total of the electricity produced in South Africa (37 455 megawatts).The dates when these power stations were commissioned are provided to give context to the urgent need for the new power stations to be completed timeously.

Table 1.1: Eskom's power stations

Name	Location	Capacity(MW)	Date Commissioned (first and last unit)
Coal-fired Power Stations (13)			
Komati	Middelburg	940	1961-1966
Camden	Ermelo	1520	1966-1969
Grootvlei	Balfour	1200	1969-1977
Hendrina	Mpumalanga	1965	1970-1977
Arnot	Middelburg	2352	1971-1975
Kriel	Bethal	3000	1976-1979
Matla	Bethal	3600	1979-1983
Duvha	Witbank	3600	1980-1984
Tutuka	Standerton	3654	1985-1990
Lethabo	Viljoensdrift	3708	1985-1990
Matimba	Limpopo	3690	1987-1991
Kendal	Witbank	4116	1988-1993
Majuba	Volksrust	4110	1992-2001
		Total 37455	
Gas / Liquid fuel turbine stations (4)			
Acacia	Cape Town	171	
Ankerlig	Atlantis	1338	
Gourikwa	Mossel Bay	746	
Port Rex	East London	171	
Hydro-electric stations (6)			
Colley Wobbles	Mbashe River	42	
1st and 2nd Falls	Umtata River	17	
Gariep & Ncora	Norvalspont	362	
Vanderkloof	Petrusville	240	
Pumped Storage Schemes (2)			
Drakensberg	Bergville	1000	
Palmiet	Grabouw	400	
Klipheuwel **(Wind)**	Klipheuwel	3	
Nuclear (1)			
Koeberg	Cape Town	1930	
Total power stations (27)		**43 875**	

Source: Eskom Annual Report 2010

Eskom is owned by the South African government and falls under the ambit of the Department of Minerals and Energy (DME). The Government stipulates its energy requirements through the DME (Fecher and Matibe 2003:722). Eskom like any large organisation has many divisions, of which, those dealing with Eskom's core business in the production and supply of electricity are Generation, Transmission and Distribution. Eberhard (2005:5310) notes that Eskom owns and controls the Transmission grid and supplies approximately half of its electricity directly to its customers whilst the balance is sold to the municipalities, which then distribute, often at a marked-up price to residential and business customers (Sebitosi 2010:316). According to Eberhard (2005:5309) the South African Electricity Supply Industry (ESI) was formed to regulate the price of electricity. Davidson and Mwakasonda (2004:30) note that in 1995 the South African government launched the National Electricity Regulator (NERSA or NER) as a replacement to the ESI.

1.7.2 Eskom's vision, mission and priorities

Aspects of Eskom's strategic plan that are pertinent to the study's objectives will be outlined in this section. Eskom's purpose is *"*to provide sustainable electricity solutions to grow the economy and improve the quality of life of the people in South Africa and in the region*"* (www.eskom.co.za). This purpose is in line with the South African government's "Electricity for all" programme which is aimed at improving the lives of all South Africans by providing affordable electricity as a basic need (Gaunt, 2005:1310). Eskom's vision elements involve the organisation aiming to be:

- a low-cost good investment where Eskom is a global benchmark for investment;
- a trusted company in building a reliable relationship with its stakeholders;
- a greener energy company in attaining lower emissions;
- the best company to work for and an employer of choice;
- amongst the top 5 global utilities worldwide;
- a utility provider that keeps its customers satisfied;
- a provider of electricity for all;

- an organisation that ensures no harm is caused to people and the environment, that drives investment and grows its customer base.

Eskom's values includes zero harm to employees, contractors, public and the environment; integrity and respect for people; innovation in adding value added creativity; caring; customer satisfaction in committing to meeting the requirements of the receivers and excellence in acknowledging performance. Eskom has a list of its five year priorities which include a focus on safety, keeping the lights on, building stronger skills, improving operations, delivering capital expansion, maximising its socio-economic contribution and reducing its environmental footprint (www.eskom.co.za).

Eskom's vision, values, strategic imperatives and five year priorities are interrelated and support the government's objective to improve the quality of life for all previously disadvantaged communities (Fetcher and Matibe, 2003:722). Furthermore, two important priorities mentioned are directly linked to this study, which are the delivery of capital expansion (e.g. constructing power stations) and the building of a stronger skills base within Eskom. The Medupi Project falls under the Group Capital Division of Eskom. This study examines perceptions about learning transfer and Eskom's policies and strategies in managing skill shortages and improving the skills of local employees.

1.7.3 Electrification as a service delivery imperative

One of the methods whereby the government can improve the quality of lives of the people of South Africa is to provide electricity for all by means of electrification projects. The Reconstruction and Development Programme (RDP) which was a policy framework developed by the first democratic president, Nelson Mandela, lists electricity as a basic need (www.nelsonmandela.org). Murphy (1993:53) states thet almost all white South Africans had access to electricity whilst less than 10 percent of black African township residents had access to electricity up to 1990. According to Bekker et al (2008:3125), in 1990, South Africa had electricity reserves of almost 55 percent primarily because electricity was provided mainly to White residential and commercial areas by the Apartheid government.

The democratically elected South African government initiated the “Electricity for all” programme in 1997 to redress these previous imbalances in the provision of basic services (Gaunt, 2005:1310). President Thabo Mbeki’s 2004 state of the nation address promised that by 2012 every household should have electricity (www.info.gov.za). Gaunt (2005:1310) notes that in 1990 only 36 percent of households had electricity and by the year 2000, this number had increased to 67 percent of households. According to Mzamo and Nkomo (2001:9), in 1994 Eskom committed to electrifying 1.75 million homes within a six year period. By the end of 1999, this goal had been achieved at an average rate of 1000 households connected per day and 300 000 per annum. Lemaire (2011:278) notes that 74 percent of South Africa is already electrified and more than 3.5 million households have access to electricity.

Given the progress in Eskom’s electrification programme, it is to be expected that the demand for electricity has increased substantially over time. Sebitosi (2010:316) observed that in 2008 Eskom confirmed a shortfall in capacity of 10 percent, one of the reasons for this was the electrification programme. This subsequently led to blackouts and load shedding commencing in 2008 (Buscher, 2009:3951). Lindiwe Hendricks, the then Minister of Minerals and Energy, had acknowledged much earlier in 2005 that South Africa faced a huge challenge due to capacity constraints (Sebitosi and Pillay, 2008:3313). Furthermore, Sebitosi and Pillay (2008:3313) state that the government consistently failed to grant Eskom permission timeously to expand its capacity by building more power stations. Another reason for expansion is that a coal-fired power station’s life cycle is about 50 years and some of the current operational units will last to the year 2020 at most. Hence, it is only in the past 10 years that Eskom has attempted to meet rising demand and tight capacities by embarking on mega build projects such as Medupi and Kusile. The current budget for capital expansion is R385 billion and is estimated to be more that R 1 trillion by the year 2026, at which time Eskom is expected to double its capacity to 80 000 megawatts (www.eskom.co.za).

1.7.4 The Medupi Power Station Project

Medupi Power Station is located at Lephalale in the Limpopo province, approximately 350 kilometres north of Gauteng. According to Rafey and Sovacool (2011:1141), in 2006 during the early phase of "*Project Alpha*", which was the pilot phase of Medupi, the South African government decided to name the new Eskom power station project, Medupi, meaning *"rain that soaks parched land"*. Thereafter the name Medupi was officially the name of the new power station. Medupi is the first power station to be built in South Africa in 20 years. Its life cycle will be 50 years like any other coal-fired power station. On completion, Medupi will generate 4800 megawatts of electricity through six units of 800 megawatts each which amounts to 10 percent of South Africa's electricity (Sovacool and Rafey 2011:92). It will be the seventh largest coal-fired power station in the world and the largest that is dry cooled.

The Medupi Project takes into account a comprehensive environmental management plan. The design of the power station will result in higher efficiency, and thus in better utilisation of both water and coal resources and improved environmental performance. A dry cooled process uses less water than a conventional coal-fired power plant (www.eskom.co.za). This comprehensive environment management plan is in line with two of Eskom's visions which are to become a greener company and ensuring that no harm is caused to the environment.

Medupi is Eskom's single biggest investment in the 90 year history of the organisation; the total project value was R 105 billion as at July 2013 (www.eskom.co.za). During construction some 350,000 tons of reinforced concrete will be poured. The Medupi boiler house will stand approximately 130 meters in height. The boiler and turbine contracts for the Medupi Project are the largest signed contracts in the 90 year history of Eskom and constitute two thirds of the total project cost. This project incorporates super critical technology, which is able to operate at higher temperatures and pressures than previous generation boilers and turbines, and most importantly operate with greater efficiency. The supercritical design is a first for Eskom, and with the higher efficiency will result in better use of natural

resources, for example, water and coal, and will have improved environmental performance.

As noted earlier, Eskom has partnered with PB Power for the construction of the Project. All of the expatriate workers are employed by PB Power. The number of jobs created directly during construction has peaked at 17 000 employees, the gross domestic product (GDP) in Lephalale is estimated to increase by almost 95 percent per annum whilst 40 percent of the project cost is estimated to be spent locally (www.eskom.co.za). The construction of Medupi Power Station has a major impact on the lives and the economy of the small community in Lephalale as homes and social infrastructure are being developed to serve the thousands of contractors working on site in this small community. Furthermore, Eskom has built more than 1000 houses for employees and contractors in Lephalale and 46 percent of the locals are employed on site. According to Eskom's Build News Issue 1 (www.eskom.co.za), the first unit was due for completion in December 2013. This date has subsequently been changed to the second half of 2014.

1.8 Limitations of the study

This study is confined to an investigation of skill shortages and training issues on the Medupi Project. Although the Project is located in Ellisras in the Limpopo province, some of the participants in this study are based at Eskom Head Office, Megawatt Park, in Sandton. The study will only focus on the most highly skilled employees working on the project. These skilled employees include:

- Managers (Project package; Lead discipline; Risk)
- Project supervisors, Quantity Surveyors and Cost Engineers
- Engineers and Engineering Managers
- Human Resource Personnel

With the exception of the Human Resources personnel, the more technically oriented employees have worked or are currently working on the construction and technical component of the Project. There are certain limitations of this study including the following:

- the lack of a single extant model that could be used to house the study; this required the researcher to adopt an exploratory approach that is issues driven based on the empirical context rather than theory-driven;
- unwillingness and/or unavailability of the original 70 individuals who had been identified as potential participants to participate in the study;
- Limited generalisation of the findings since non-probability purposive sampling was employed;
- Very limited access to relevant secondary data (for example, Human Resources records on employment of expatriates vis a vis locals) given the sensitive nature of the study;

1.9 Layout of the thesis

This thesis comprises five (5) chapters organised as follows:

Chapter 1: Introduction and orientation of the study

This chapter introduces the foundation of the study which includes the significance of the study, the definitions of the key concepts and the background and history of Eskom. A summary of the research methodology used in the study is also given.

Chapter 2: Literature review

Chapter Two discusses the literature review of the study which includes Leimbach's Model on Learning Transfer. It also focuses on the concepts of knowledge and knowledge management and the factors influencing knowledge and skills transfer. The role of expatriates including willingness to share knowledge is discussed.

Chapter 3: Research Methodology

This chapter focuses on the research design which is based on the mixed methods approach using quantitative and qualitative analysis. The instruments used to collect the data are described, including the data collection process. Reliability and validity

considerations pertaining to the study are also discussed. The chapter closes with an explanation of how ethical issues were dealt with.

Chapter 4: Results

This chapter presents the quantitative and qualitative results of the study. Quantitative data is obtained from the questionnaire and presented in tabular and graphical format. Information obtained in the interviews is transcribed according to common themes. The pre-coded quantitative data from the questionnaire is analysed using SPSS. A knowledge transfer model for Medupi is also derived.

Chapter 5: Conclusions and recommendations

The results of the study are summarised in this chapter, conclusions are drawn and policy recommendations arising from the results of the study are suggested.

1.10. The Research Methodology for this study will now be spelt out

1.10.1 Research design

The case study approach will be used in this study to investigate the processes utilized in knowledge transfer and training on the Medupi Project. According to Amaratunga *et al* (2002:23) a case study is an examination into current occurrences operating in a real life context. Perry (1998:793) explains that a case study involves the collection of perceptions and that the research problems addressed in a case study are more descriptive. Naslund (2002:329) notes that qualitative and quantitative methods can be utilized in the case study approach.

The approach adopted is a mixed methodology including both quantitative and qualitative analysis. Hussey and Hussey (1997:43) explain that the utilization of different research methods in the same study is known as triangulation, and such triangulation can overcome the potential bias and sterility of single method approaches.

Mansourian and Madden (2007:97) describe quantitative research as dealing with numbers and figures. Amaratunga *et al* (2002:24) state that quantitative methods can be used to allow statistical testing of the strengths in such relationships. Quantitative data in this study will focus on sample demographics. The study will include interview and survey questions.

Hyde (2000:84) argues that a qualitative approach allows the researcher to gain knowledge of the issues in-depth and thus enables the researcher to have a greater understanding of the situation. This study has qualitative aspects because the perceptions of the Medupi Project employees will be solicited on a variety of issues pertaining to skills shortages and training through face-to-face interviews.

1.10.2 Sampling

There are approximately 70 individuals currently employed on the Medupi Project who could be described as highly skilled according to this study. All these personnel will be included in this study and hence a census is used. The final sample in the study includes the following personnel:

Job Description	**Number**
Integration Manager	4
Project Package Manager	15
Lead Discipline Manager	5
Risk Manager	3
Supervisor	10
System Engineer	13

All of these participants have a technical background and hold some engineering qualification; there is also a mixture of male and female, and foreign and South African participants.

1.10.3 Data collection

Amaratunga *et al* (2002:28) state that data should be a prearranged assembly of information from which findings can be drawn. Data will be collected by means of a questionnaire and follow-up interviews with at least one individual from each job category. The questionnaires will be emailed to the participants. The participants will have the option of emailing the completed questionnaires or hand delivering them to the researcher.

The questionnaire will be piloted on a small group of people who used to report directly to the researcher. This sample consists of five people including one supervisor, one engineer, two package managers and one lead discipline manager. The people who participate in this pilot study will not be involved in the main study. According to Lancaster *et al* (2004:310) a pilot study is a small experimental study constructed to test and gather data prior to a large study in order to advance quality and efficiency. The objective of the pilot study is to filter and modify the structure and content of the questionnaire based on pre-testing (Leedy and Ormrod, 2005:34). Piloting also serves to improve the content validity of the questionnaire in the sense that it measures that which it is supposed to measure. The questionnaire is aimed at targeting the skills shortages and training mechanisms within the Project. The results of this measurement would unveil the skills shortages experienced on the Project.

Reliability deals with the data compilation procedure ensuring consistency of results, whilst validity focuses on the way in which these results support conclusions (Then, 1996:19). The questionnaire will provide demographic data on the respondents as well as their views on skills shortages and Eskom's mechanisms for managing these shortages through knowledge transfer and training. Reliability will be measured using Cronbach's alpha coefficient. Oppenheim (1992:51) states that reliability can be measured in the following ways, namely; internal consistency method (Associated with Cronbach's Alpha coefficient), split-half method and parallel-form method.
Bless and Higson-Smith (1995:21) explain two types of validity namely; content validity and criterion validity. The first is aimed at the measuring instrument being

designed to measure the full content. The second is when the researcher uses the instrument to predict an outcome which is external to the test.

1.10.4 Data analysis

The data will be analysed using the Statistical Package for the Social Sciences (SPSS version 20) programme. This software is a data analysis application used to analyse surveys and questionnaires. Descriptive and inferential analysis of the data will be performed, including central tendency statistics, cross- tabulations, and analysis of variance (Anova). The software is also used to graphically depict the data analysis. According to Petersson et al (1999:1251), descriptive analysis is used to characterize the nature of the signals present in the data whilst the inferential analysis is utilised to test the hypotheses.

1.11 Conclusion

This chapter focused on the orientation and the layout of the study with a view to giving a broader perspective of the entire study. The next chapter, Chapter Two, explores the literature relating to knowledge and knowledge transfer, seeks to identify appropriate theoretical underpinnings such as Intellectual Capital theory and the Learning Transfer Model, and also discusses other associated evidence relating to the role of expatriates in knowledge transfer.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

As stated in the preceding chapter, this research is exploratory in nature and was guided by the very real issues experienced as construction work on the Medupi Project has progressed. These issues ranged from labour unrest within the lower skilled ranks (Kaplan, 2013), and resource supply constraints such as under investment in human capital (Gigaba, 2013), to political pressure from government as a result of public outrage with electricity price hikes in the face of blackouts and electricity disruptions (Rees, 2013). Being involved on the Project, the researcher was privy to the unpublicised frustration and discontent that was oftentimes felt by the more skilled personnel employed on the Project. The research was therefore born out of two concerns, viz. first, Eskom's management of the ongoing skill shortages of the more highly skilled technical and managerial personnel primarily through the use of expatriates; and second, the effectiveness of current training programmes and other skills transfer mechanisms as part of a longer term knowledge management strategy for Eskom.

The literature review presented in this chapter straddles various theoretical concepts and ideas given the complex empirical context and the primary objectives of the research. First, the concept of knowledge will be explored, including the different types of knowledge, followed by a brief overview of the field of knowledge management. The factors that impact the effectiveness of knowledge sharing will then be discussed in section 2.2. Although there is a paucity of empirical work on knowledge sharing within the public sector, every attempt has been made to provide as thorough a review of the existing literature as is possible. This is followed by an overview of the literature on expatriates in section 2.3, specifically their role in knowledge transfer. Therefore the first 3 sections of Chapter 2 outline the theoretical concepts, and common issues underlying the analysis of knowledge transfer.

Given the central concerns motivating the research, i.e. the current Eskom human resources policies to address skills shortages and the factors that impact their

efficacy and the use of expatriates to fast track completion of the Project, two complementary theories will be used to underpin the research objectives. First, in section 2.4, Leimbach's (2010:83) Learning Transfer Model is described. The latter identifies three components that impact upon learning and the transfer of knowledge, viz. learner readiness, learning transfer design and organizational alignment. This study focuses on two of the components comprising the Learning Transfer Model, viz. learner readiness and organizational support as these are the most pertinent in relation to the issues contextualised in this research. It is also used to guide the development of the research instruments. However, much of the theoretical basis for the model and this study derives from the Intellectual Capital literature which is discussed in section 2.5, with specific reference to the Human Capital model of Kaplan and Norton (2004:59). Hence although the Learning Transfer Model provides the general framework for the current study, the theoretical justification will rest on the Human Capital model.

2.2 Knowledge and knowledge management will now be explored

2.2.1 Definition of knowledge

Knowledge as a construct, from its nature, form and extent, to its measurement and role both as a dependent and an independent variable respectively, has grown in theoretical and empirical relevance across a broad range of research fields (Minbaeva, Foss and Snell, 2009:479). Consequently there are various definitions of what constitutes "knowledge" and "knowing" depending on the discipline to which one makes reference. For example, a large part of the extant literature on knowledge draws from the field of cognitive psychology and is very theoretical and conceptual. Terms like "knowledge", "information", "intellectual capital", "core competencies", "absorptive capacity" etc. are often used interchangeably resulting in much confusion (Moon and Kym, 2006:257). The varied literature on knowledge tends to view the concept from three perspectives, viz. the so-called hierarchical view of knowledge in relation to other concepts such as data and information (Davidson and Voss, 2002:75); knowledge as an applied or operational concept (Quinn, Anderson and Finkelstein, 1996:75) and finally, knowledge understood as existing in two

dimensions, subjective and objective (Sabherwal and Becerra-Fernandez, 2003:232).

In the hierarchical view, knowledge is constructed through a combination of evidence and the terms “data”, “evidence” and “knowledge” are not substitutable (Quink 2008:28). The operational view of knowledge rests on three elements: the first element is to “know what” i.e. the knowledge that is achieved through training; the second element is to “know how” i.e. the conversion of theory into practice; and the third element is to “know why” which alludes to moving beyond execution, to find solutions to real world problems. The subjective view of knowledge is that knowledge is stored inside the individual, i.e. people make sense of knowledge in their own way. Finally, the objective view refers to data and information that can be stored in external storage and databases.

2.2.2 Types of knowledge

For the purposes of this study, the more philosophical approaches to the definition of knowledge described above are less pertinent than a classification of knowledge according to various types. In the latter view, various types of knowledge have been defined, for example, “kernel” and “ephemeral” knowledge (Leseure and Brookes, 2004:109); “codified” and “non-codified” knowledge (Dunford, 2000:299); “implicit” knowledge (Polanyi, 1966:37); “diffused” and “undiffused” knowledge (Boisot, 1983:179 in Smart, Maull, Radnor and Housel, 2003:51); “tacit” and “explicit” knowledge (Polanyi, 1958:101; Nonaka 1991:97 and Takeuchi, 2010:1045) etc. In the business context, knowledge takes on a pragmatic meaning. For example, Carla O'Dell, President of the American Productivity and Quality Center, described knowledge as “information that has value ..." (Elliott, 1996 cited in Gupta et. al., 2000:19). In other words, knowledge is a resource, an intangible asset in an organisation that may be combined with other tangible assets to attain competitive advantage.

Leseure and Brookes (2004:108) describe kernel knowledge as knowledge that is generic and that can be repeated on different projects; hence it remains within an organization. Dunford (2000:297) explains codified knowledge as knowledge which

can be transferred and is stored in systems and processes, whilst non-codified knowledge is stored in the minds of individuals and is difficult to transfer. Polanyi (1966:39) explains diffused and undiffused knowledge as the extent to which knowledge can be transferred. Diffused knowledge is regarded as public knowledge, for example as captured in written form in libraries and other databases and is therefore easily transferred. Undiffused knowledge is less easily transferred as it is based on individuals' experience.

The dominant typology in the business literature (and which is relevant for the current study) is that of tacit and explicit knowledge. The concept of tacit knowledge was first used by Michael Polyani in his 1962 seminal work, *The Tacit Dimension* as cited by many writers when he said, "we can know more than we can tell." In other words, tacit knowledge is knowledge that is unspoken, embedded in experience and tied to the minds of individuals (Lindner and Wald 2011:878). Furthermore, tacit knowledge is personal and is rooted in people's behaviors. Yusof and Bakar (2012:129) confirm that tacit knowledge is gained by learning and experience. This type of knowledge is extremely difficult to communicate and transfer yet it is often the most important type of knowledge within an organization.

Dombrowski, Meilke and Engel (2012:438) and Lindner and Wald (2011:878) describe explicit knowledge as verbal or written and that can be stored; hence the user who attains this explicit knowledge can easily communicate and transfer it. Braganza and Mollenkramer (2002:32) state that explicit knowledge is transmittable in an organized method and it is stored in documentation, manuals and databases. Storey and Barnett (2000:147) state that explicit knowledge is stored in computer systems whereas tacit knowledge is the practical and operative experience of the employees of an organization. Yeh, Yeh and Chen (2012:247) observe that tacit knowledge can be acquired by sharing and experiences whereas explicit knowledge can be transferred easily by practicing. Human resources policy documents within Eskom acknowledge the concepts of explicit and tacit knowledge. Specifically, the Knowledge Management Procedure (Eskom 240-42427008:6) and the Capital Expansion Division skills and knowledge transfer procedure (Eskom PPZ265-92:17) state that explicit knowledge is "*knowledge that has been expressed in words and*

characters" while tacit knowledge is "*explicit knowledge gained by the individuals through experience and embedded in the individuals*."

Dombrowski *et al* (2012:438) explain four mechanisms whereby knowledge may be transferred from one individual to another which include; externalization (tacit knowledge gained from experience can be written down and hence externalized), socialization (tacit knowledge can be transferred to another person, for example, children learning from their parents by imitating them), internalization (when explicit knowledge is applied over and *over*, and practiced daily) and finally, combination ("*when new knowledge is gained by integrating isolated explicit knowledge in a holistic system*"). These four methods of knowledge transfer are also described in Eskom HR policy documents and implies that the knowledge management policy will be aligned to these methods (Eskom 240-42427008:6).

2.2.3 Knowledge management

The emergence in the 21st century of the so-called knowledge economy and the knowledge worker means that a policy on knowledge management (KM) is critical. In other words, knowledge is an asset to be fostered, valued and managed like any other asset in an organisation. Hence, 1996 onwards saw the rapid evolution of the field of KM (McAdam and McCreedy, 1999:96). Lindner and Wald (2011:877) state that "*knowledge management involves all practices of an organization to create, store, use and share knowledge*". Salimi et al (2012:269) describe KM as producing suitable knowledge for the right time and place. Allameh, Zamanai and Davoodi (2011:1228) explain KM as an arrangement of procedures for the understanding and application of knowledge strategic assets in a company. It is a planned approach which suggests systems for acknowledgement, assessment, organizing and applying knowledge in order to meet the requirements and aims of the company.

Allameh *et al* (2011:1229) categorises KM into 6 different processes namely:

- Knowledge Creation – Finding new knowledge from external sources;
- Knowledge Capture – Capturing knowledge in a consistent manner which makes the process of distribution easy;

- Knowledge Organization – Filtering and refining knowledge so that it can easily be searched, examined and protected;
- Knowledge Storage – Saving knowledge such that it is easily accessible when required;
- Knowledge Dissemination – Identifying appropriate tools used for the dissemination and distribution of knowledge; and
- Knowledge Application – Knowledge must be able to be utilised such that users can learn and produce new knowledge.

The above implies that the aim of KM is to make available when required the appropriate knowledge to the appropriate people in order to assist them in making the best decision in the interests of the organisation (Zhang, Zhao, Xie and Chen 2011:1026). According to McAdam and McCreedy (1999:97), there are three broad categories of KM models, viz: intellectual capital models, knowledge category models and socially constructed models; while these are based on similar ideas, each emphasizes a particular aspect of knowledge, knowledge creation and knowledge transfer. Knowledge management may be associated with a diverse range of disciplines as observed by McAdam and McCreedy (1999:97), viz. information technology and media studies, economics, organizational behaviour, psychology, epistemology, human resources management etc.

Riege and Lindsay (2006:24) and Syed-Ikhsan and Rowland (2004a:96) observe that knowledge management is fairly new to the public sector, and hence there is very little empirical research on KM within the public sector. Moreover, since the 1980s in particular, the concept of New Public Management (NPM) has been given increasing recognition and this has certain implications for knowledge management. Cong and Pandya (2003:28) explain NPM as a set of tools and procedures utilised in government and public sector organizations to ensure effective service delivery to the community. A significant aspect of NPM is the marketization or application of business management principles and practices to managing the public sector, hence the emphasis on efficient service delivery (Tolofari 2005:75). The latter also requires the use of relevant and modern technology, a productive work force, and professional management who are afforded the freedom to manage (Kolthoff et al.

2006:333). Cong and Pandya (2003:30) observe that private and public companies operate totally differently, and that NPM is difficult to implement consistently because of frequent policy changes, or if a new political party comes to power. For example, effective knowledge management on the Medupi Project is hampered by the fact that construction was placed on a so-called “fast track” or priority basis from the outset. On any fast track project, the focus is on completion and so it is very difficult to transfer skills.

2.3 Knowledge and skills transfer will now be discussed

2.3.1 Definition of knowledge and skills transfer

A skill is the ability to execute a particular task at a certain level of expertise, and therefore forms part of knowledge (Shah and Burke 2005:50). Skills are linked to qualifications through education and training. Shah and Burke (2005:51) further categorise skills into general and specific skills. General skills are those generic competencies that are utilised in many companies, and can more easily be obtained on the labour market. Specific skills that are more job-related are required in fewer companies. The companies which require specific skills usually provide training for these skills as they are learned in-house. In this study, the term “skilled workers” refers to those individuals who have a formal qualification and at least 3 years relevant construction industry experience.

Szulanski, Cappetta and Jensen (2004:608); De Corte (2003:143) and Lewis et al (2005:587) describe skills transfer as the transfer of knowledge from one individual to another such that it changes the behaviour of the respondent in a productive way. Skills are usually learned by observation and imitation and tend to reflect the transfer of tacit knowledge e.g. an apprenticeship (Quink 2008:38). In this study the terms “knowledge transfer”, “skills transfer” and “learning transfer” will be used interchangeably since the concern is with the ability to perform a job to a certain level of technical expertise based on one’s knowledge/skills and how those skills may be transferred or shared rather than on philosophical or epistemological differences in meaning. De Corte (2003:145) categorizes skills transfer into two areas, namely, preparation for future learning and productivity of learning results. Hence learning is

productive if knowledge can be utilised and maintained in the workplace (Burke and Hutchins 2007:280; Bates, Holton and Hatala 2012:549).

2.3.2 Factors affecting knowledge transfer

Although a rich literature exists on knowledge management and knowledge transfer within the private sector, very little research has been done on how public sector workers perceive the sharing and management of knowledge (Sandhu, Jain & Ahmad, 2011:207; Syed-Ikhsan & Rowland, 2004a:101). While there are clear differences in the ways in which public sector and private sector organisations operate, which one could expect would impact on how their employees would regard and react to knowledge sharing initiatives, the factors that affect the efficacy of knowledge transfer are not expected to be fundamentally different. This section outlines the key factors that have commonly been identified in previous literature as impacting on knowledge transfer.

2.3.2.1 Organizational factors

A study by Syed-Ikhsan and Rowland (2004a:103) on employees within the Ministry of Entrepreneur Development in Malaysia investigated several factors that were hypothesized to influence knowledge sharing, including organizational culture. They found a positive relationship between a supportive knowledge sharing organizational culture and knowledge transfer. Hence knowledge transfer will not occur unless individuals or teams display a high degree of co-operation and trust. Yao, Kam and Chan (2007:60) examined knowledge sharing culture amongst 40 employees of the Trade and Industry Department of the Hong Kong Government. Yao et al (2007:66) concluded that the employees, who ranked from junior to senior level, were very eager to gain knowledge at their own cost and time. In addition, they were willing to share knowledge; the environment was supportive of knowledge sharing.

Organizational barriers to knowledge sharing include lack of incentives and rewards, and insufficient information technology (IT) support. Bartsch, Ebers and Maurer (2013:242) state that construction companies frequently lack incentives and official processes to inspire learning and knowledge sharing throughout the project

boundaries. A contrary view is expressed in Chiem (2001:56) where it is noted that public sector workers will engage in knowledge sharing because “they believe in the sense of social good.” Another study by the Syed-Ikhsan and Rowland (2004b:241) located within the same Malaysian Ministry noted that there was no specific KM strategy in place although much knowledge was embedded within the Ministry’s policies and procedures. Sandhu et al’s (2011:209) study, also located within the Malaysian public sector, found that employees believed that knowledge sharing enhanced competitive advantage, but that KM policies were not effectively communicated.

Zheng, Yang and Mclean (2010:766) conducted research with 384 Human Resources professionals from two HR companies in a Midwestern metropolitan area located in the United States of America. The aim was to observe the mediating function of knowledge management in relation to organizational culture, structure, strategy and organizational effectiveness. Zheng et al (2010:769) concluded that culture has the strongest influence on knowledge management. This implies that knowledge management must create a culture friendly environment or a social environment that is knowledge friendly to enhance knowledge management outcomes.

2.3.2.2 Availability of knowledge assets

Knowledge assets refer to the existing knowledge base of an organisation. According to Ruuksa and Vartiainen (2005:374) the codification approach to knowledge management is dependent on codifying the knowledge and keeping it in documentation and databases so that it can be an available asset to be reused. Lopez-Nicolas and Merono-Cerdan (2011:503) state that “*In the codification strategy knowledge is extracted from the person who developed it, made independent of that person, and reused for various purposes”.* Syed-Ikhsan and Rowland (2004a:105) found a positive relationship between a knowledge sharing organizational culture, the availability of and access to knowledge assets and knowledge transfer.

2.3.2.3 Employee characteristics

In the personalization approach to knowledge transfer, knowledge is linked to the people who created it by experience and is expressed as personal interventions; this is also referred to as the knowledge sharing factor, i.e. the characteristics of the employees themselves (Ruuksa and Vartiainen 2005:374). Social processes representing the personalization strategy have also been recognized as important in project environments. Other factors such as education and age have been examined. Syed-Ikhsan and Rowland (2004a:105) found there was no statistically significant correlation between employee education and training and knowledge transfer and creation of knowledge assets. In another study (Yao, Kam and Chan, 2007:58), younger professionals working in the Hong Kong SAR government were found to be more open-minded and willing to share knowledge.

Quek (2005:235) conducted research with 32 graduate employees within the private engineering, banking, communications and production sectors. The research aimed to determine whether employees possessed generic competencies such as creativity and motivation that are argued to be crucial for successful learning transfer and hence work performance. Quek (2005:240) concluded that the employees in his study lacked generic competencies for transferring learning back to the workplace, and recommended that such competencies should be taught at tertiary institutions.

2.3.2.4 Role of management

Management support of knowledge sharing has been identified as crucial in several studies (Ritter and Choi, 2000 cited in Yao et al., 2007:53; Sandhu et al., 2011:210; Yao et al., 2007:55). Lindner and Wald (2010:886) confirm that senior management commitment is crucial in the knowledge management process. However, it should be cascaded to all employees. Bartsch et al (2013:240) confirmed that knowledge sharing should be at the different levels of the organization which means everyone should be involved in knowledge sharing. In Syed-Ikhsan and Rowland's (2004b:246) study located within the Malaysian public sector, less than half of the study participants believed that KM should be the responsibility of all employees, and not limited to top management.

Amayah's (2013:461) research located within a United States public academic institution involved a large sample of 1738 professional and non-professional service employees. Amayah (2013:467) concluded that public sector managers must create a sense of community within their workforce. Once this sense of community is created, the employees tend to share knowledge with their co-workers. Lindner and Wald (2011:882) examined the success factors of KM within project organizations. They concluded that knowledge culture is by far the most crucial factor in the success of KM (Lindner and Wald 2011:887). Although culture and executive management commitment is crucial in successful knowledge transfer, soft skills such as communication tools complement culture and executive management commitment. Although executive management is crucial in the knowledge transfer, Salimi *et al* (2012:273) claim that knowledge management at the upper levels of the organization is highly complex and executive managers are not very eager to share their knowledge.

Alavi, Kayworth and Leidner's (2005:198) research at a large global hi-tech company explored the role of organizational culture in knowledge management. Alavi *et al* (2005:220) concluded that top management must play a major role in empowering KM leaders to create an environment conducive for knowledge sharing. Brookes, Morton, Dainty and Burns (2006:478) conducted research within the engineering sector in the United Kingdom. The research examined employee social processes, patterns and interactions (so-called "social capital") within the project management environment. Brookes *et al* (2005:481) concluded that management interventions increase social capital and knowledge transfer.

The preceding discussion implies that successful skills transfer alludes more to the application of the learning in specific contexts, for example in the workplace, rather than learning per se within the training environment. Learning or skills transfer depends on many interrelated factors, e.g. learner motivation, the relevance of the training to the employee's career and work environment, opportunities to practice the newly acquired skills, organizational and peer support etc. (Leimbach 2010:82). Several of these factors were found to influence knowledge transfer in the general literature on knowledge management. Many of these factors will be discussed again

within the context of the Learning Transfer Model in section 2.4 which provides the framework for the empirical analysis in this study.

2.4 The role of expatriates in knowledge transfer

While very little research has been done on knowledge transfer within the public sector (Syed and Rowland, 2004b), empirical studies on the role of expatriates in public sector knowledge transfer are virtually non-existent. The term “expatriates” refers to individuals who are transferred outside their native country to another country, described as the “host” country, specifically for employment purposes (Edström and Galbraith, 1977 in Hocking, Brown & Harzing, 2004:570). Makela (2007:109) defines expatriate relationships as the interpersonal connections which expatriates share with their host country employees during the project. Brock *et al* (2008:1294) confirm that expatriates are employed to fill a technical requirement or where training is lacking mostly in developing countries. Expatriates are often sent for the primary purpose of transferring explicit knowledge and if possible, tacit knowledge on-the-job (Smith, 2004:40). A common longer term strategic objective of this training role is to replace expatriates with suitably trained locals within a designated time frame (Franko 1973; Welch, Fenwick and De Cieri 1994 in Smith, 2004:40).

Much of the literature on the role of expatriates in knowledge transfer has focused on their employment in multinational corporations (MNCs) and the so-called adjustment process that determines whether the international assignment is successful (Kraimer, Wayne, and Jaworski 2001:81; Shaffer, Harrison, Gregersen, Black, and Ferzandi 2006:115; Takeuchi 2010:1051). Successful deployment implies effective knowledge transfer from the parent to the subsidiary, and hence value added to the organisation. Ahmad, Sharom and Abdullah suggest that for non-profit organisations such as the government, knowledge sharing is a mechanism for continuous performance improvements. Hence, an effective KM policy should add value to an organisation and this could be interpreted within the context of Eskom’s service-delivery mandate. This section of the literature review outlines the major factors that have been identified as impacting on knowledge transfer by expatriates. While every effort has been made to identify appropriate public sector expatriate research, due to

the paucity of the latter, the common findings of research across both public and private sectors will be described. It must also be noted that the factors identified in the previous section as impacting on knowledge transfer in general may also apply to expatriate knowledge transfer.

2.4.1 Types of knowledge

Several researchers have found that the type of knowledge being transferred, i.e. explicit or tacit can play a role in the efficacy of knowledge transfer. For example, Smith (2004:40) found that while some tacit knowledge transfer occurred, most of the knowledge sharing was explicit in nature. Further, practical examples and hands-on knowledge sharing were more important since there were sometimes differences in understanding of industry terminology between expatriates and host country employees. Contrary to Smith (2004), Bonache and Brewster (2001:152) found that expatriate managers at a Spanish financial institution were effective in transferring mainly tacit knowledge. Riusala and Smale (2007:18) reported similar findings, i.e. there was no significant difficulty experienced in sharing tacit knowledge. Interestingly the latter study focused on accounting and finance personnel, thus implying possible interaction effects between type of knowledge (explicit or tacit), discipline-specific knowledge and knowledge transfer.

Nohria and Ghoshal (1997:23) found that the tacit knowledge and experience of an expatriate could be transferred to the locals through a process of trial-and-error learning. In this regard Smith (2004:45) notes the importance of socialization and face to face interaction in the transfer of tacit knowledge. Since tacit knowledge is context-specific, it can only be acquired on-the-job where it is used. This fact is noted in Riusala and Smale (2007:18) when they state "*If knowledge tacitness represents the extent to which knowledge resides in the human mind and manifests itself in behavior and perception, then expatriation, as a form of human agency, is argued to be a basic mechanism for transfers of this kind."*

2.4.2 Willingness to share knowledge

Research suggests that successful knowledge transfer and management are contingent upon individual and team dynamics (Goh, 2002:25; Syed-Ikhsan and Rowland, 2004b:250). This can include willingness to teach and learn on both sides. A study by Smith (2004:44) examined the effect of willingness to teach and to learn, on transfer and acquisition of knowledge. She found that American expatriates exhibited willingness to transfer knowledge and that knowledge transfer was thus more successful. Similar results were also established in the studies by Gupta and Govindarajan *(*2000:480) and Steensma and Lyles (2000:839). Some early research raised the concern that these attributes may not normally be evident in expatriates since they are focused on their own careers, and hence the importance of a systematic mentoring system to ensure that knowledge transfer does take place (Rogers, 1999:31; Wong and Law, 1999:31).

The current Eskom KM policy of employing expatriates is premised upon a unidirectional knowledge transfer from the foreign workers to the locals. Yet knowledge transfer occurs in multiple directions; Miesing, Kriger, and Slough (2004:5) argue that research is needed into the specific types of relationships and activities pertaining to knowledge transfer in multiple directions. Knowledge sharing amongst the local Eskom employees themselves is another dimension explored in this study.

2.4.3 Expatriate competency

Competency in managerial and technical skills is a key attribute required in successful expatriate assignments, and therefore in knowledge transfer. Bjorkman and Schaap's (1994:150) study on western expatriates working in China found that Chinese employees were more willing to learn from expatriates possessing superior managerial and technological skills. Moreover, those expatriates perceived as not professionally competent were resented for their high salaries thus hindering knowledge transfer. Delios and Bjorkman (2000:285), Tsang (2001:35) and Wang et al. (2004:283) all conclude that the greater the knowledge and skills possessed by expatriates, the greater the knowledge transfer to locals. Finally, Bonache and

Brewster (2001:152) observe that the greater the number of skilled expatriates in a subsidiary, the more the knowledge that can be transferred.

2.4.4 Host country employee competency

A study by Riusala and Smale (2007:20) of Finnish expatriates found that 'absorptive capacity' and the complexity of the information to be transferred were significantly related to knowledge transfer. Absorptive capacity refers to the capacity of local employees to learn and encompasses motivation and willingness to learn. The lower the absorptive capacity and the greater the complexity of the information, the more difficult it was to transfer knowledge and hence the less the knowledge shared. Smith (2004:47) concluded that the lack of organizational and management skills in local employees impeded knowledge transfer since expatriates spent most of the time directing the work of local managers and on administrative duties instead. This implies that local employees must possess a certain base level of knowledge and skills for building upon.

2.4.5 Cultural factors

Several studies cited in Riusala and Smale (2007:20) suggest that relational factors between the parent and subsidiary companies can also influence individual employees' interactions and relations, and hence impact on knowledge transfer (Nonaka 1991:98). These so-called relational factors have also been interpreted in terms of local and organizational culture and socialisation (Smith, 2004:48). While the parent-subsidiary relationship does not translate directly to the current study, the relationship between the expatriates and the local Eskom employees may play a role in knowledge transfer. However, Riusala and Smale (2007:19) did not find statistically significant effects on knowledge transfer from expatriates to locals of relational factors such as trust in and identification with the parent organisation.

Peltokorpi (2010:180) conducted research on intercultural communication involving 58 Nordic subsidiaries located in Japan. The conclusion was that the language differences created significant barriers to intercultural communication (Peltokorpi 2010:185). Moreover, some of the expatriates had to speak through an interpreter as

they did not understand the local language (Peltokorpi 2010:185). This had an adverse effect on knowledge sharing and transfer. Musasizi (2010:26) cites Black and Stephens' (1989) concept of 'interaction adjustment' to refer to expatriate's ability to adapt to the local employees' way of relating and thus to interact effectively. Shaffer, Harrison and Gilley (1999) cited in Musasizi (2010:29) found that support from supervisors and co-workers influenced 'interaction adjustment', expatriate adaptability, and hence success in knowledge transfers. Ralston et al (1995/1:110) concur that expatriates must adjust to the host country; failure to adjust will result in serious problems within the organization, severely limit knowledge transfer and result in a loss of productivity and increased efficiency.

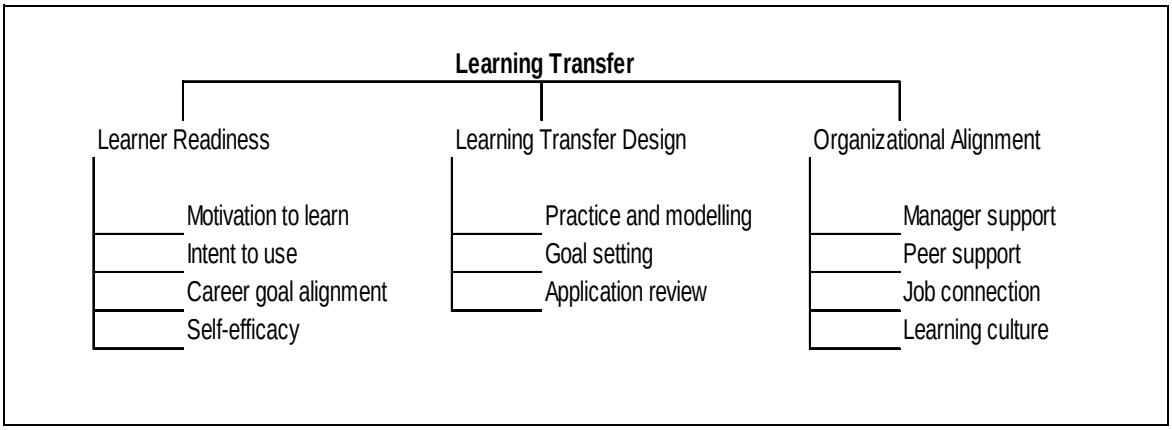
2.5 The Learning Transfer Model

The sharing and transfer of knowledge are important aspects of building a knowledge-based competitive advantage, especially within the private sector (Minbaeva, Foss and Snell, 2009:479). As discussed earlier in this chapter, knowledge sharing can be determined and managed at several levels, e.g. at the micro or individual level, at team level and even at a more macro organizational level (Foss et al. 2009:889). Given the particular context and objectives of this research, it was hypothesized that knowledge sharing in the Medupi Project environment is rooted in individual and organizational factors. Individual factors include motivation to learn and to share knowledge, cognition and confidence, career progression etc. Organizational factors encompass team dynamics, peer-effects on learning and knowledge sharing, organizational support and culture etc. An added dynamic in knowledge transfer is the role played by the expatriates who are employed on the Project. Further, the various interactions between and amongst these factors will all impact on the success of knowledge management policy. After an intensive literature review, the model that provided the closest (although not perfect) fit in terms of the research objectives and the multifaceted issues that underpin knowledge transfer and management on the Project, was identified as the Learning Transfer Model (Leimbach 2010:83).

Leimbach (2010:83) identifies aspects pertaining to learning and skills transfer that have been found to be significant in other studies and thus summarises the main

factors in a meta-analysis. This so-called Learning Transfer Model is based on an examination of 32 studies on skills transfer, and identifies three primary components that influence learning and hence skills transfer, viz. Learner Readiness, Learning Transfer Design and Organizational Alignment. Each of these components comprises several factors (Figure 2.1). These components and factors are all interrelated, for example, the factors of self-efficacy and motivation to learn are related – confident individuals are motivated and keen on self-improvement (Thomas *et al* 2009:162), Learner Readiness impacts on the success of Learning Transfer Design, and the latter is closely associated with the factor of job connection (Organizational Alignment). In this research, the Learning Transfer Model provides a broad framework to determine and analyse the available evidence for ascertaining, informing and improving knowledge transfer and management on the Medupi Project.

Figure 2.1: The Learning Transfer Model



Source: Leimbach 2010:83

2.5.1 Learner Readiness

Leimbach (2010:84) describes Learner Readiness as the level of preparedness of the learners prior to engaging in learning and knowledge transfer. This component is made up of four factors namely; motivation to learn, intent to use, career goal alignment and self-efficacy. Holton (2005:45) explains learner readiness as the degree to which people are ready to co-operate and contribute in the learning

process. Leimbach and Emde's (2011:66) research at Georgia-Pacific Workforce confirmed that learners must be willing and prepared to learn if they want an effective learning experience. They further advise that workers be informed of the outcomes of the training prior to the commencement of the training, as this impacts on their willingness to contribute to the knowledge transfer process.

Bakker et al (2011:496) conducted a research study of 7 project venture organisations that aimed to examined knowledge transfer in temporary projects and permanent parent organisations. The research focused on the factors influencing knowledge transfer which included inter alia various constructs such as embeddedness, absorptive capacity, and motivation that are associated with learner readiness. The authors conclude that knowledge transfer within an organisation is the most effective when the parent company directs the training and learning transfer process since the project manager is limited to implementing knowledge transfer on site. This finding is relevant for most construction companies, including Eskom, where temporary projects that are geographically disparate from the parent are the norm. For example, the Medupi Project, which is Eskoms's biggest temporary construction project to date, is located approximately 350 kilometres from Eskom Head Office (www.eskom.co.za).

2.5.1.1 Motivation to learn

Learners' motivation to learn can be increased through the use of training activities that communicate the significance and value of learning. Tabassi *et al* (2012:216) describe training as a crucial plan for companies to assist employees gain knowledge and skills required at the workplace. In addition, from a training perspective, motivation can impact on the readiness of an employee to join and follow a training curriculum. Burke and Hutchins (2007:267) and Colquitt *et al* (2000:680) confirm that motivation is linked to the extent of knowledge transfer. According to Donovan and Darcy (2011:123), not more than 10 percent of knowledge acquired during the knowledge transfer process is transferred back to the workplace due to individual characteristics such as ability, personality and motivation.

Dwivedula and Bredillet (2010:160) conducted a study with 199 participants who were involved in various project management training programmes. The purpose of this research was to understand employee motivation within the project environment. Several factors were hypothesized to influence learner motivation and hence knowledge transfer, including employee development, work climate, perceived equity and job security. Many of these were identified earlier as impacting on knowledge sharing as well e.g. work climate, perceived equity and job security and are closely related to several factors in the Learning Transfer Model as outlined below.

Employee development, particularly within a construction project environment, occurs when workers are given the flexibility and the freedom to innovate due to the complex nature of the work. Dwivedula and Bredillet (2010:162) found that management should not be present at an operational level, thus creating a sense of ownership and motivation within employees, similar to the element of Job Connection in the Learning Transfer Model (Figure 2.1). Management involvement at a strategic planning level is still important in knowledge transfer as revealed earlier in this chapter in the KM literature however. Perceived equity, which hinges on the financial and non-financial rewards at the workplace (Dwivedula and Bredillet, 2010:162) entailed independence being given to the project team to execute the project and being rewarded upon successful completion. Regarding job security, Dwivedula and Bredillet (2010:162) found this to depend jointly on the employer (viz. to provide continuation of employment) and on the employees viz. (to be willing to advance their knowledge and skills).

2.5.1.2 Intent to use

Leimbach (2010:84) describes intent to use as the integration of learning into the workplace, i.e. the application of new skills learned to the work environment. Belling *et al* (2004:238) conducted research involving 17 organisations participating in a public management programme; the aim of this research was to establish how organisations become more supportive of knowledge transfer. The authors note that successful knowledge transfer occurs when skills and knowledge are transferred back to the workplace, and are practiced on a regular basis. Holton (2005:45) explains that intent to use is determined by the extent to which trainees are provided

with resources and tasks on the job, thereby allowing them to utilise training in the workplace. This element is closely associated with that of Application Review in the Learning Transfer Design component of the model (Figure 1).

Tabassi, Ramli and Abu Bakar (2009:475) conducted a study involving 120 construction and engineering companies in Iran. The aim was to investigate the role of construction workers' training and motivation in effective human resource management within the company. They recommended that government and the private sector should create project training facilities to train workers within the engineering and construction sector; the skills and explicit knowledge gained at these facilities must be transferred back to the workplace and applied on the job for knowledge transfer to occur most effectively (Tabassi, Ramli and Abu Bakar, 2009:478).

2.5.1.3 Career goal alignment

Leimbach (2010:84) describes career goal alignment as the alignment of the job one performs to one's career goals. Loi *et al* (2012:251) state that career goal alignment refers to the extent to which the training and new skills support and are aligned with the individual's overall career goals; for example, an apprenticeship system is effective if it aligns the skills developed to the participants' overall career goals. Cheng and Ho (2001:22) conducted research involving MBA graduates at 4 educational institutions in Hong Kong. The authors concluded that career goal alignment and commitment enhance learner motivation and ultimately knowledge transfer. Tabassi *et al's* (2012:218) research involving managers within construction companies found that training and motivation increases productivity and performance on the project; if workers are to remain productive, career motivation and training programmes must be available et all times (Tabassi et al 2012:222).

2.5.1.4 Self-efficacy

Self-efficacy refers to the learners' belief that they have the ability to learn (Leimbach 2010:84). As one of the four factors that influence Learner Readiness, self-efficacy addresses learners' confidence in both their capacity to learn, and that the learning

will lead to a positive change in job performance (Leimbach 2010:85). In other words, self-efficacy informs the decisions people make about their capability to perform a task. Hutchins' (2009:76) research involving 413 training professionals aimed to identify best practices associated with knowledge transfer. The author concludes that effective knowledge transfer programmes include exercises that affect learner characteristics such as motivation and self-efficacy. In addition, self-efficacy and learner motivation have a positive effect on training performance.

The relationship between self-efficacy and motivation is investigated in Thomas *et al's* (2009:162) research involving African women from previously disadvantaged universities in the United States of America. The results revealed that self-efficacy impacted positively on motivation to learn. Reich *et al* (2012:668) conducted a study involving 252 project managers. The authors concluded that the project manager creates an environment for knowledge sharing which impacts greatly on the project team, creates confidence in employees' belief in their ability to learn, and hence enhances self-efficacy. In other words, organizational support in the form of management support impacts positively on knowledge transfer. This is also reflected in Organizational Alignment, the third component in the Learning Transfer Model (Figure 2.1).

2.5.2 Learning Transfer Design

Leimbach (2010:85) describes Learner Transfer Design as identifying and utilizing specific learning transfer activities to enhance learning and improve job performance. This component of the model illustrates how appropriate knowledge transfer methods enhance work performance, and is argued to enhance knowledge transfer by 37 percent (Leimbach, 2010:85). Learning Transfer Design comprises three factors namely; Practice and Modelling, Goal Setting and Application Review (Leimbach, 2010:85). All these factors emphasize the importance of associating the knowledge transfer programme with the tasks performed in the actual workplace. Since this aspect of the model is not the focus of the current study, a brief overview is given of the three factors that are argued to comprise this component.

2.5.2.1 Practice and modelling:

Leimbach (2010:85) describes practice and modelling as learning transfer which is directly related to the job. Bard *et al* (1987) observe that when the learning design includes significant practice and modelling, the greater the knowledge transfer and the greater the improvement in workers' skills. Practice and modelling enhances job and worker performance (De Vos *et al,* 2007:182). Toney (2007:8) propose two types of training namely, formal training and informal training. Formal training takes place in the classroom, whereas informal training entails on the job training. Although related to a training context, these are similar to the concepts of explicit and tacit knowledge, respectively.

Baharaim (2007:8) conducted research involving 437 government employees within the Malaysian public sector. The purpose of the study was to examine the factors affecting training, motivation and knowledge transfer. He concluded that formal training workshops should be designed to encourage trainees to practice and share their knowledge back on the job, i.e. the design of the training process should facilitate practice and modelling of the workshop material in the work environment (Baharaim 2007:16). Hutchins (2009:73) states that practice is crucial in knowledge transfer and was found to impact training performance positively. However, employees must have a clear understanding of what must be done to influence transfer positively, and hence even talking about skills-related issues can lead to knowledge transfer. Practice and modelling assists the learners in applying new knowledge and skills to the workplace and this is associated with a second factor impacting knowledge transfer, viz. Application Review.

2.5.2.2 Application review

Leimbach (2010:85) describes application review as the extension of learning by constant reviewing of content, specifically the application of content knowledge and skills to actual work tasks, to improve learning transfer. Burke and Hutchins (2007:274) state that training materials should be content valid and linked to transfer

of learning. Workers must have a clear understanding of what must be done in order to apply knowledge and skills acquired to tasks in the workplace (Hutchins, 2009:73) and hence add value to the organisation (Bates *et al,* 2000:20) These ideas are closely related to the concepts of explicit and tacit knowledge in the KM literature.

Birdi *et al* (2007:266) emphasize the importance of regularly reviewing and applying the explicit content knowledge acquired during training in the actual work environment through their concepts of on-the-job and off-the-job training. On-the-job training occurs when a new learner is paired up with an experienced employee to perform work tasks, whilst off-the-job training refers to practical exercises in a lecture set up. Ayas (1996:134) states that most of a company's knowledge and skills is stored in the heads of its employees, i.e. it is tacit knowledge. Through effective knowledge transfer the tacit knowledge may be converted to explicit knowledge; this process assists in the application of skills to on-the-job work tasks. On-the-job training is the most common method utilised in construction companies (Birdi *et al* 2007:266). In the researcher's own observation at Eskom it is noted that experienced construction employees have tacit knowledge which is not converted to explicit knowledge. This is due to the time constraints and the nature of the fast track project environment.

2.5.2.3 Goal setting

According to Leimbach (2010:86), goal setting within the context of the Learning Transfer Model refers to learners setting goals for their learning, which are either behavioural or performance goals. Burke and Hutchins (2007:280) state that goal setting is necessary for effective knowledge transfer as it helps individuals develop strategies for attaining these goals, and that transfer will be positive when learning outcomes match the departmental goals. This also implies that the individual transferring the knowledge (in the current study, the expatriates) and those receiving the knowledge (the local Eskom employees) must share common goals and expectations, and the relationship is cordial and co-operative. In addition, Burke and Hutchins (2001:273) note that goals should be effectively communicated to achieve their desired effect, viz. the application of knowledge to the workplace.

Morin and Latham (2000:570) and Donovan and Darcy (2011:122) observe that goal setting occurs when an employee is motivated to acquire knowledge; motivation is positively associated with learner expectations including the learning of new skills and improved job performance (Donovan and Darcy, 2011:125). Goal setting in itself can serve as an effective motivation tool (Bures *et al,* 2000:598). Research by Li and Butler (2004:49) concluded that involving learners upfront in the setting of goals increases learner commitment to achieving those goals. Moreover, goal setting by allowing learners to set goals first, and thereafter apply them on the job can improve knowledge transfer by enhancing self-efficacy (Machin and Fogarty, 2003:55). The interrelatedness of the various constructs of the Learning Transfer Model is reflected in the study by Morin and Latham (2000:569). Their research involving supervisors and engineers at a Canadian paper mill concluded that goal setting on its own does not create effective knowledge transfer; it must be combined with other mechanisms such as self-efficacy for successful transfer. Finally, learners will best utilise and apply new knowledge in the workplace when knowledge transfer programmes are properly structured (Tziner *et al,* 1991:168).

2.5.3 Organizational Alignment

Organizational alignment refers to whether and how organizations support the learning and use of new skills, i.e. the extent to which the processes, procedures and overall work climate are aligned to opportunities for employees to develop new skills and use them effectively in the workplace (Dwivedula and Bredillet, 2010:162). As noted earlier, this is a central concern in knowledge transfer within the Medupi Project environment. This third component of the Learning Transfer Model comprises four factors namely; Manager support, Peer support, Job connection and Learning culture (Leimbach, 2012:42). Leimbach and Emde (2011:2) state that organizational alignment is crucial in learning transfer, primarily because it involves the executives and managers of the organisation, and it also determines the extent of peer support. Several studies have highlighted the importance of organizational support in the effectiveness of learning and skills transfer (Kirwan and Birchall,2006:255; Jodlbauer *et al,* 2011:43; Lim and Johnson, 2002:46).

2.5.3.1 Learning culture

A culture of learning is said to exist within an organisation when the organisation supports change which has a significant impact on the transfer of knowledge in the work environment (Leimbach 2012:42). Ruuksa and Vartiainen (2005:378) suggest that organizational support may be inferred by the allocation of time given to knowledge transfer, both formal (e.g. training workshops) and informal (e.g. on-the-job learning). Moreover, when employees know that an organization allocates time towards knowledge transfer, they are more committed to the training. Ruuksa and Vartiainen (2005:378) further state that a strong learning culture can increase knowledge sharing within the project community.

Holton (2005:41) states that employees who have a positive attitude towards the organisation will themselves encourage a culture of learning that in turn will benefit the organisation. Moreover, positive attitudes towards the organization are linked to job commitment and improved productivity. Velada and Caetano (2007:291) found that employees who are satisfied with their jobs, and are committed to the organisation, are better able to acquire explicit knowledge (e.g. through material provided in training workshops) and apply it to the workplace. Teerajetgul *et al* (2009:835) conducted a study involving construction managers that focused on knowledge management practice within a construction project. They concluded that leadership skills are important in promoting a learning culture and knowledge sharing within the project environment (Teerajetgul *et al,* 2009:837). Velada *et al* (2007:285) and Jackson and Bushe (2006:983) confirm that skills transfer and the application of learned capabilities are more favourable in positive work environments.

2.5.3.2 Job connection

Leimbach (2010:86) describes job connection as the relationship between knowledge acquired and the knowledge required at the workplace. Burke and Hutchins (2007:270) state that learning transfer is greatly influenced by job connection, which is the degree to which an employee identifies with and relates to his/her job and regards improvement in job performance as an important aspect of training and development. Hence they conclude a positive correlation between job

connection and the extent of skills transfer to the workplace. The latter is also argued to depend on an employee's self-management strategies (Burke and Hutchins, 2007:277). Noe (1986:739) and Cheng and Ho (2001:21) likewise find that employees with a high level of job involvement and commitment are motivated to learn more skills which results in individuals improving their job performance.

Job connection may also be understood within a training context as occurring when a trainee identifies the training with the work environment and is able to put it into practice (Noe, 1986:739 and De Vos et al, 2007:182). This factor is therefore closely associated with an employee's motivation to learn, intent to use the new skills acquired in the workplace, and the extent to which the training is aligned with the employee's career goals. Chen *et al* (2012:112) conducted research on how knowledge is transferred and received amongst voluntary workers on a witness program based in Canada. They concluded that knowledge transfer is a two way process which consist of knowledge sharing and feedback loops (Chen et al, 2012:116). Shared knowledge assists and motivates the receiver to be willing to learn resulting in positive outcomes for both employees and employers due to improved production and job connection (Toney 2007:8). However, these benefits depend on the so-called transfer climate associated with linking skills learnt back to the workplace (Burke and Hutchins, 2007:280).

2.5.3.3 Peer Support

Leimbach (2010:86) describes peer support as the encouragement and assistance that a learner's peers provide during the learning process. Jackson and Bushe (2006:983), describe peer support as the structures within in which employees can discuss goals and listen to new concepts relating to the work environment. Interacting with peers and discussing ideas about the course matter (explicit knowledge) in a training programme helps promote knowledge transfer. Reich *et al* (2012:670) state that the project manager does not need to employ staff to develop great quality results on the project; he needs to employ staff who are willing to share knowledge and develop other less experienced team members as this in itself leads to knowledge transfer.

However, apart from peer support during the training process, several authors find that peer support in the work environment to which trainees return is crucial in the transfer of learning (Kupritz, 2002:442); Dirani, 2012:163). Bhatti et al's (2012:282) research involving 503 employees from 11 Malaysian banks examined the role of peer support and learner readiness in knowledge transfer. Bhatti *et al* (2012:282) concluded that peer support affects knowledge transfer through motivation. Cromwell and Kolb (2004:453) confirm that trainees who receive greater supervisor and peer support experience positive training transfer. On the other hand, the lack of peer support can actually hamper the knowledge transfer (Belling et al, 2004:236).

Burke and Hutchins (2007:279) state that peer support and a conducive work environment provide an opportunity for the learner to perform, and are key factors in knowledge transfer. Peer support is highly influential because peers often share information for a period of 6 months after the training. Chiaburru and Marinova's (2005:115) research investigated how knowledge transfer translates from the instructional to the workplace. Their findings confirm that peer support inspires and encourage employees, and motivates them to perform, thereby meeting the objectives of knowledge transfer (Chiaburru and Marinova, 2005:120).

2.5.3.4 Manager / Supervisor support

Manager support is defined as the degree to which a manager supports and highlights the utilization of newly acquired knowledge and skills in the workplace (Holton 2005:41; Toney 2007:8). Machin and Fogarty (2003:55) and Leimbach (2010:86) define management support as the emphasis placed on training and skills development by top management. There are various forms that this support can take, for example the importance placed on the assessment of training by the managers, the extent to which managers recognise employees who have newly acquired skills by assigning responsibility to such employees (Bhatti et al, 2012:279) etc. Manager support is crucial in effecting the transfer of learning to the workplace (Burke and Hutchins 2007:270; Belling et al 2004:242) and can determine if recently learnt skills are actually retained.

Management play a key role in determining whether the organizational climate is favourable to knowledge transfer (Kirwan and Birchall 2006:255). Their research located within the health sector in Ireland concluded that the workplace climate including manager support impacts on the employees' ability to transfer knowledge and skills in the public sector (Kirwan and Birchall's 2006:266). Al-Eisa *et al* (2008:1226) observe that the form of manager support in the workplace is crucial in facilitating knowledge transfer. Manager support that was found to be effective in knowledge transfer include applying and optimising the use of new learning in the workplace and providing feedback to employees about the knowledge transfer process (Al-Eisa et al, 2008:1226). In sum, one can conclude that manager support is in fact organizational support, since management provide the leadership and strategic vision of any organisation.

2.6 The intellectual capital theory will now be explored

2.6.1 The concept of intellectual capital

The Learning Transfer Model described in the previous section provides the framework for the empirical investigations in this study. Its usefulness derives from the fact that it is not a model in the pure sense, but is an amalgam of various constructs that have been identified in previous research as impacting upon learning and knowledge transfer. Several of these constructs are themselves the basis of theoretical models, for example, there are various models of motivation and how it can influence learning. Thus the major shortcoming of the Learning Transfer Model is that it does not draw on a single cohesive theory per se. At the same time, there is no single "one size fits all" model that can be applied to this study given the multifaceted and complex issues, and hence Leimbach's (2010) "model" serves as an organising framework to delimit this study and facilitate the empirical analysis. Since the central concern of this study is on knowledge and skills, and the possibility of how skills shortages may be managed through knowledge transfer from expatriates to locals, the underlying "purist" theoretical model was found to derive from intellectual capital theory. In section 2.1 in this chapter it was observed that the intellectual capital view of an organisation is one approach to understanding knowledge, knowledge transfer and the management of that knowledge.

Intellectual capital may be defined as knowledge that has been transformed into an asset (Kok, 2005:383). London and Siva (2011:848) state that intellectual capital is the collation of an organization's skills, experiences, competencies and knowledge, crucial for the survival of the organization, especially in international markets. Abdullah and Sofian (2012:538) define intellectual capital as all the non-financial and non-physical resources that are completely or partially driven by the organization and that contribute to its value creation. Hence intellectual capital refers to the intangible assets of an organization. Several writers (Edvinsson and Malone, 1997; as cited in Reed et al, 2006:870; Edvinsson, 2002 as cited in Kok, 2005:383; Sveiby, 2001:350) identify the core components of intellectual capital as the knowledge created by and embodied within an organisation's employees (human capital) and the infrastructure and relationships that support human capital (structural capital). Other writers further differentiate the relationship (or social) aspect of structural capital into internal (Leana and van Buren, 1999:545; Nahapiet and Ghoshal, 1998:253) and external dimensions (Bontis, 1996:2). Thus for example, Rexhepi *et al* (2013:46) and Abdullah and Sofian (2012:538) classify intellectual capital into 3 elements namely:

- Human capital: this incorporates the skills, knowledge, experience, creativity and educational qualifications of employees.
- Structural capital: this includes the organization's systems, tools and equipment, and policies and procedures utilized.
- Relational capital: this refers to goodwill, customer relations and marketing.

Farsani *et al* (2012:1299) conducted research involving 3000 employees at a petrochemical plant based in Iran. They found a positive relationship amongst the three elements of intellectual capital and organizational learning capability but the relationship with human capital was the most meaningful. This component of intellectual capital (human capital), together with the internal social capital dimension of structural capital are argued to be the primary determinants of knowledge transfer (i.e. the "sharing" of human capital) within the Medupi Project environment.

Measuring the value of an organisation's intangible assets, especially those relating to human capital and social capital, became a central concern on the intellectual

capital research agenda from an early stage particularly amongst Scandinavian businesses (Bontis, 1996:2). These included the Balanced Scorecard of Kaplan and Norton (1992) and Sveiby's (2001) Intangible Assets Monitor followed by the Skandia Navigator, developed by the Scandinavian insurance company Skandia, which combined the principles of the former metrics. This study is based on the principles underlying Kaplan and Norton's (2004) theory of human capital which was identified as the most appropriate to the research objectives and the particular context of and dynamics experienced on the Medupi Project.

2.6.2 The Human Capital Model of Kaplan and Norton

The basic premise of Kaplan and Norton's model is that an organisation's strategy is intrinsically linked to its intellectual capital. Hence the measurement of intellectual capital is in essence a test of how well it is aligned to the overall strategy of the organisation, its "strategic readiness": if the organisation has a sound strategy and the intellectual capital is aligned to that strategy, then it will add value to the organisation (and conversely). The model identifies three categories of intellectual capital that determine the strategic readiness of an organisation, viz. human capital, information capital and organizational capital (Kaplan and Norton, 2004:55). These aspects of intellectual capital devolve from the so-called Learning and Growth perspective of the Balanced Scorecard. The human capital and organizational capital categories of the model are pertinent to the Eskom situation and these will be outlined next.

2.6.2.1 Human capital

Human capital (HC) refers to employees' skills, knowledge and talents. Human capital readiness is measured by the availability within an organisation of the appropriate skill levels required to perform a task (Kaplan and Norton 2004:55). Identifying the core group(s) of employees (the so-called strategic job families) that have the greatest impact on determining whether an organisation attains its strategic objectives is key to determining the human capital "readiness" of the organisation. The issue then is whether these job families possess the requisite explicit and implicit knowledge and skills. An organisation's human capital readiness is measured

by the difference between the existing skills base and that necessary for attaining the strategic objectives, viz. the competency gap. The model recommends that human capital development activities in the organisation should be focused on the job families rather than attempting to train and develop the entire workforce. Since this policy has financial implications, it is more readily accepted by senior management although it would be less palatable to other marginalised employees.

Gadau (2012:669) states that human capital comprises intellectual aptitude and competence, and is regarded as the most crucial resource of an organization. Birasnav *et al* (2010:1037) explain that human capital is produced from employees' knowledge, experience and talent and reflect their commitment, ideas and know-how. They also suggest that leadership is another form of investment in human capital adding value to the organization (Birasnav et al, 2010:1038). Brown *et al* (2007:78) argue that organizations possessing a greater quantity and quality of human capital are more successful. Guo et al (2012:716) state that human capital is one of the key factors that lead to an individual's career success. Furthermore, Guo et al (2012:717) explain that human capital can be measured according to 2 aspects, namely, *"measuring related dimensions of all employees in all sectors and measuring special employee's dimensions in particular"*. The first aspect, viz. dimensions related to all employees, is associated with the organizational capital category of Kaplan and Norton's (2004) model.

2.6.2.2 Organizational capital

Organizational capital refers to an organization's culture (Kaplan and Norton 2004:55). Organizational capital readiness exists when there is culture whereby employees are aware of the organization's mission, vision, goals and core values and actively promote them. The definition of organizational culture derives from anthropology, viz. "the symbols, myths and rituals embedded in the group consciousness (or subconscious)" (Kaplan and Norton 2004:60). Organizational capital is also influenced by the extent to which an organisation's leadership is able to mobilise and align employees to the strategic objectives, and whether a spirit of common interest and teamwork prevails. Farsani *et al* (2012:1299) state that *"organizational culture … might be useful in developing the learning capability" of an*

organization; for example when the organization provides an appropriate environment for informal training. Organizational capital has internal and external dimensions. Whereas the latter refers to the organization's relations with its external stakeholders such as customers, suppliers etc., it is the internal relations or internal social capital that this study focuses on.

Hau *et al* (2013:358) define social capital as "*the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit*". There are three dimensions to social capital, viz. employee social ties, shared goals and social trust. Hau *et al* (2013:360) state that the willingness of employees to share knowledge is influenced by social capital; employees tend to share knowledge when social connections are close and friendly. Beuningen and Schmeets (2013:74) note that trust and participation are crucial components of social capital. Gonczaryk's (2011:63) identifies 2 aspects of social capital, viz. bonding and bridging. Bonding social capital influences performance, assists in sharing knowledge, increases employees' satisfaction and communication within the organization; bridging social capital refers to the relationship amongst employees from different teams which can impact the performance of the entire organization.

Vincenza and Mascia (2012:09) conducted research within a large Italian construction company that builds gas pipelines, electric power plants and factory buildings. The aim of this research was to investigate the role of social capital within the organization. Vincenza and Mascia (2012:13) concluded that from a project viewpoint, social capital promotes growth and progress on the project; it also reduces quality problems on the project which are oftentimes the reason for cost escalations on the project. These findings have relevance for the Medupi Project, specifically the internal social capital readiness in terms of relationships between expatriates and locals, and amongst the local employees themselves.

Another aspect of the internal social capital of an organisation is the "climate" within the organisation. In the Kaplan and Norton (2004) model, organizational climate refers to the way in which organizational policies, practices and procedures, both formal (e.g. promotion and incentives structures) and informal (e.g. perceived

warmth of management) influence employees' motivation and behaviour. Hence the four pillars upon which organizational capital readiness depend are organizational culture, leadership, alignment and teamwork within the ambience of the existing organizational climate. Other writers have also noted the important role played by the organisation in knowledge transfer and management (Sveiby, 2001:349) Although a common cultural identity is consistent with an organisation attaining its strategic objectives, Kaplan and Norton (2004:60) caution that sometimes cultural variation in different operating units or departments may be desirable, for example, the culture of the R&D unit is (and indeed should be) different from that of the manufacturing unit.

The organizational capital readiness of an organisation is argued to be the least understood and hence most difficult to measure (Kaplan and Norton, 2004:60). In the authors' view, those organisations that were the most successful in attaining their strategic objectives had a culture in which all personnel within the organisation were aware of and had internalised the mission, vision, and core values needed to execute the organisation's strategy. The internal social capital dimension of organizational capital is incorporated in the third component of the Learning Transfer Model, i.e. organizational alignment which identifies factors such as culture, management and peer support as vital in effective learning and knowledge transfer.

2.7 Concluding comments

Given the various research questions posed and the complex empirical context of this study which include inter alia analysis of skill shortages within the Medupi Project environment, the human resources policy of employing expatriates to fill the skills gap, the somewhat tense relations between some expatriates and local employees, and the extent to which learning and knowledge transfer is taking place between the expatriates and the local employees, no single theory was found to underpin the research objectives. However, the general theory around the construct of knowledge, knowledge transfer and the field of knowledge management resonate with the Eskom human resources policy chosen to address the skills issue at least in the short term. Given that knowledge and skills and the dynamics of social interaction are central concerns, selected aspects of Kaplan and Norton's (2004) human capital model are relevant to the analysis. These factors are subsumed in the

meta-analytic model of Leimbach (2010) which combines the individual motivational and human capital aspects influencing the efficacy of knowledge transfer with the social-organizational aspects relating to social capital. Thus the Learning Transfer Model of Leimbach (2010) was chosen to structure the empirical investigation in this study as outlined next in Chapter 3 which deals with the research methodology employed in this study.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodological approach used to conduct the research and describes the research experience. It explains the mixed methods approach and why it was the chosen mode of study. The instruments used to collect data, the data collection process and methods of data analysis are described in detail. The steps taken to ensure authenticity of the research, such as pre-testing of the questionnaire, and determining its reliability and validity are described. The chapter closes with a discussion of the ethical underpinnings of the research which include obtaining the informed consent of participants, ensuring confidentiality and anonymity and issues around accessibility of the research findings.

3.2 The Research Process

Janes (1999:212) and Leedy (1974:9) describe research as the process of asking and trying to answer questions. Malina, Norreklit and Selto (2011:66) explain that research is a learning process and every assignment should educate both the researcher and the readers. Bell (1996:2) states that research is done to resolve problems, increase knowledge and is an orderly way of asking questions. Eldabi, Irani, Paul and Love (2002:64) state that research should be conducted according to a precise methodology. In addition, a methodology serves as a set of rules for evaluation of research. The research process which is followed in this dissertation is that proposed by Janes (1999:212) namely; identify the problem; read the literature; identify methodologies; collect data, analyse, evaluate, and finally draw conclusions.
The overall aim of this research is to explore the perceptions of Eskom employees regarding skill shortages at Eskom, the employment of expatriates and how skills shortages at Eskom can be managed both in the short and the long term with particular reference to the Medupi Project.

The identification of the research problem is crucial and requires a great deal of thought. The problem identified in this study is the skills shortages experienced on

the Medupi Project and the manner whereby Eskom has attempted to solve the problem in the short term, i.e. employing expatriates. Having worked on the Project, the researcher had first-hand experience of the consequences of these skills shortages and it was evident that there was some dissatisfaction felt on the part of some local Eskom employees regarding the employment of expatriates.

Regarding the second step in the research process, the researcher began by reviewing literature on knowledge and skills and the theories dealing with the management of skills. It became apparent that no single theory or model could be identified. Instead, various approaches within the field of human resources had some relevance, for example, Knowledge Management, Intellectual Capital Theory and the Human Capital Theory of Kaplan and Norton (2004:59). A “model” proposed by Leimbach (2010:83) the so-called Learning Transfer Model appeared to encompass those various aspects, hence it was chosen as the best-fit (albeit imperfect) framework for this research.

The third and fourth steps in the research process are amongst the most crucial as they involve the research design which may be regarded as the strategy to address the central research problem, and hence guides the procedures that are followed and the relevant research instruments used to gather and analyse the data (Leedy and Ormrod 2005:91). For the purposes of this study, a mixed methods case study was used, given the various theoretical and contextual considerations of the research. Although the initial strategy was to focus on quantitative data and analysis derived from a questionnaire, it emerged that a more naturalistic inquiry based on qualitative feedback from interviews was more appropriate for this study. These aspects of research design within the overall research process will be discussed next.

3.3 The Case study method

The case study approach will be used in this study to investigate the processes utilized in skills transfer and training on the Medupi Project. Gummesson (1991:73) states that the utilization of the case study is becoming a popular method in

research. Mangan et al (2004:571) explains a case study as a general scrutiny of a single instance of a spectacle of concern. A case study is a powerful research method especially in the development of new theory because it focuses on single organizations, in this study, the organization of interest is Eskom. According to Amaratunga, Baldry, Sarsha and Newton (2002:20) a case study is an examination into current occurrences operating in a real life context. This is appropriate to Eskom, as the organization is currently under extreme pressure to deliver electricity but is hampered by skills shortages. Perry (1998:787) explains that a case study involves the collection of perceptions and that the research problems addressed in a case study are more descriptive. This study explores the perceptions of local and expatriate Eskom employees of skills shortages and knowledge transfer on the Medupi Project.

Bell (1996:8) states that a case study method is suitable for individual researchers because it allows one aspect (or a few key aspects) of a study to be explored in-depth, which in this study involved knowledge and skills transfer on the Medupi Project. Gomm, Hammersley and Foster (2000:3) describe the uniqueness of case study in that it cannot be used as a wider generalization. However, this is potentially a disadvantage of case studies as a research approach. In other words, a case study is unique to a specific project and cannot be generalized to other projects. Similarly, the Medupi Power Station Project is unique and cannot be compared with other construction projects. However, as noted by Hanson and Grimmer (2005:60) “case studies, focus groups and interviews allow in-depth investigation of human behaviours that can be targeted to practical, commercially relevant problems.”

Sergi and Hallin (2011:201) explain that writing is an important part of doing research that utilizes a case study approach. Gillman (2000:17) states that the case study method assists in reviewing particular techniques and obtaining in-depth data which gives the researcher an insight into and understanding of the respondents. Therefore this research adopted the case study since the writing of this research involved unpacking the issues surrounding knowledge transfer within the Medupi Project environment. Although questionnaires were used to collect data, it must be noted that much richer information was forthcoming from the private interviews on the concerns and tensions experienced on the Project.

3.4 Mixed methods approach

Malina *et al* (2011:61) state that mixed methods research engages both qualitative and quantitative approaches to build a research result stronger than each method separately. Cameron and Azorin (2011:256) argue that mixed methods research has now been recognised as a genuine practical choice and is employed by many researchers from various disciplines. However as a methodology, it requires logical theories that direct the compilation and analysis of the data. Generally, the combined quantitative and qualitative methods permit studying more complex features and relations of the social sphere. This is appropriate for the current study given the complex and multifaceted nature of the research problem and the fact that issues such as trust and relationships between individuals were found to be key to knowledge and skills transfer. Milliken (2001:75) notes that the combination of qualitative and quantitative methods can increase the usefulness of the research, thereby adding value.

3.4.1 Quantitative Research

Mansourian and Madden (2007:93) describe quantitative research as dealing with numbers and figures. Maree (2007:145) defines quantitative research as a systematic and objective process of utilizing numerical data from a certain population to determine the relationships between variables and to simplify the results. Amaratunga *et al* (2002:28) state that quantitative methods can be used to allow statistical testing of the data. Some common techniques used are chi-square, correlation and factor analysis. According to Liebscher (1998:669), a quantitative research is appropriate when the measures are quantifiable and hypotheses can be formed and tested.

Eldabi *et al* (2002:69) state that the purpose of quantitative research is to produce quantifiable summaries of the data; it focuses on methodology, procedure and statistical amount of validity. In this study, quantitative data is derived from the questionnaire and comprised biographical information about the respondents, their perceptions of skills issues on the Medupi Project and their responses to questions

pertaining to knowledge and skills transfer. Biographical information included gender, age, race, education etc. whilst knowledge transfer was explored using the framework of the Learning Transfer Model, namely Learner Readiness, Learning Transfer Design and Organizational Alignment.

3.4.2 Qualitative Research

Maree (2007:51) describes qualitative research as understanding the procedure and the social and cultural settings which cause various behavioural arrays and is mostly concerned with discovering the "why" questions of the research. Sobh and Perry (2006:1194) state that qualitative research utilises words and meanings to build theories. Eldabi *et al* (2002:66) suggest that qualitative research often entails face to face contact with the respondents, which supports Qu and Dumay's (2011:238) contention that interviews are one of the most popular methods utilized in qualitative research due to face to face contact. Branthwaite and Patterson (2011:436) describe three main features in qualitative research namely; a conversation which could be face to face or over the telephone, attentive listening and meeting of minds whereby deep insights arise from the interview process.

Walliman (2001:203) states that the researcher gains an inside view of the situation in qualitative research whilst on the other hand in quantitative research, the researcher distances himself / herself and just collects the hard evidence. Sergi and Hallin (2011:193) state that qualitative research is used to generate interpretations and meanings of the research. Hyde (2000:84) argues that a qualitative approach allows the researcher to gain knowledge of the issues in-depth and thus enables the researcher to have a greater understanding of the situation. Liebscher (1998:671) states that qualitative research is time consuming thus requiring engagement and observation. The qualitative data in this study derived from interviews which focused on the nature and causes of skills shortages being experienced on the Medupi Project, and on the third component of the Learning Transfer Model, namely Organizational Alignment. Questions ranged from the nature and extent of manager and peer support to the learning culture within Eskom.

3.5 The participants in the study

Bertram and Christiansen (2014:60) define sampling as deciding on which population and settings to include in the study. Jankowicz (2005:202) defines a sample as those "who are to provide you with data from which you will draw conclusions about some larger group." The researcher in this case study was employed previously on the Project and has knowledge of the organizational structure and of the resources employed on the Project. Therefore a non-probability sampling strategy was chosen, in particular, purposive sampling. This type of sampling occurs when participants are chosen because of their suitability for the research. Babbie (1975:204) explains that purposive sampling allows the researcher to make his/her own judgement on the selection criteria.

The researcher purposively selected 70 individuals who are currently employed on the Medupi Project directly in technical or managerial roles and who could be described as highly skilled. For the purposes of this study, highly skilled employees are those who hold a National Qualifications Framework (NQF) level 6 qualification, and who have a minimum of 3 years practical experience in the construction and / or Human Resources fields. Rule and John (2011:63) explain that it is very difficult to consult everyone in the case study. Hence the researcher has to select participants who can add more value to the study. They further state that participants are selected because of their knowledge and interest in the study and are hence more likely to make a meaningful contribution to the outcomes of the study.

3.6 Data Collection

Amaratunga *et al* (2002:27) state that data is a pre-arranged assembly of information from which findings can be drawn. In this study, both quantitative and qualitative data were collected. The majority of data is primary in nature, i.e. collected by the researcher as self-reported by the participants. This data is drawn from two instruments, namely, a questionnaire and follow-up interviews with selected individuals from representative job categories. Secondary data is obtained from

various Eskom documents pertaining to Human Resources policies on knowledge management and training. Walliman (2001:201) notes that qualitative and quantitative methods differ in the data collection and analysis processes.

3.6.1 The questionnaire

According to Somekh and Lewin (2011:224), questionnaires offer an economical method of obtaining well-thought-out data from respondents in a consistent manner through self-completion. McClelland (1994:22) states that pre-testing a questionnaire can improve the accuracy of the data. The advantages of questionnaires as a data collection tool include the following: they can be administered to a large population from different geographical areas; they are non-intrusive methods of gathering data; there is a lower likelihood of bias relative to interviews; and finally, completing questionnaires is simple and straight forward and usually does not require much time. Oppenheim (1992:102) claims the disadvantages of questionnaires are a low response rate generally, not suitable for participants with poor literacy skills, no quality checks on incomplete responses and no opportunity to offer explanations to the respondents.

Ader and Mellenberg (1999:110) explain that one way to carry out a survey is to collect all information from the respondents; this survey is called a census. The disadvantages of the census approach are that it is time consuming and could be very expensive to collect the data. Census is used in this study as all 70 purposively selected personnel were invited to participate. Of this group of 70 highly skilled individuals, 48 were willing to participate in the research (Table 3.1).

Table 3.1: Job description of the sample

Job Description	Number
Supervisor	7
Project Package Manager	8
Lead Discipline Manager	2
Risk Manager	1
System Engineer	9
Quantity Surveyor	3
Cost Engineer	4
Engineering Management	6
Human Resources	8
Total	48

This group included male and female, and foreign and South African participants. Supervisors manage the project first hand on the ground, and report to the Project Package Manager who is responsible for managing a sub-section of the plant. In addition, the Project Package Manager reports to the Lead Discipline Manager (LDM) who is responsible for one of the main sections on the plant, for example the turbine section. In this study, LDMs represent the highest level of management. Risk managers ensure that all risk assessments are done for the entire project. The System Engineers deal with particular sections of the plant and report to Engineering Management. The Cost Engineers and Quantity Surveyors are responsible for the project costs and the payment assessments on site. Finally the Human Resources personnel deal with all human resources issues such as recruitment, training, salary queries, pension fund, etc. Further details regarding the sample will be provided in Chapter 4.

A letter of consent and information pertaining to the study was attached to the questionnaire. The questionnaires were emailed to all 70 purposively selected individuals, who were requested to complete the questionnaires within one week. Questionnaires were returned to the researcher via email and the Eskom internal mailing system. After the one week had passed, only 48 questionnaires had been returned with the letters of consent, giving a response rate of approximately 69 percent.

3.6.2 The interviews

Maree (2007:87), Bertram and Christiansen (2014:81) state that an interview is a two way conversation in which the researcher asks the respondent questions and gathers the data and learns the behaviour of the respondent. Patton (1987:117) identifies several advantages of interviews, including the following: the participants answer the same questions which increases the comparability of responses, there is less bias when several interviewers are utilized; and decision makers can review the instrumentation used in the evaluation (i.e. the interview questions). Gillham (2000:9) however notes the main disadvantage of interviews is that they can be very time consuming because there is no time limit prescribed during the interview, it takes time travelling to and from the interview location, and transcribing and analysing the interviews can be very time consuming.

Subsequent to the 48 completed questionnaires being returned, the researcher invited 10 of these individuals to participate voluntarily in the follow-up interviews. The criterion for selection was the job description of the individual, and thus his/her ability to engage in the more probing and in-depth discussions emanating from the interviews. This also aligns with Kaplan and Norton (2004:59) concept of “key job families”. The duration of each interview was approximately 30 minutes. Six individuals indicated their willingness to be interviewed on an individual basis. These included 2 expatriates and 4 local employees. The interviewees comprised 2 Engineering Managers, 2 Lead Discipline Managers, 1 Supervisor and 1 Human Resources employee.

3.7 Instrument design will now be explained

3.7.1 The Questionnaire

McClelland (1994:73) states that questionnaires should be written in a clear and direct manner and should focus on a particular subject. Given the multifaceted nature of the issues investigated in the study, there was no pre-existing instrument that could be used directly or that could be adapted for use. Instead, the researcher developed the questionnaire using the Learning Transfer Model as a broad framework for exploring the research objectives (Appendix A). The questionnaire in this study consisted of six sections (Table 3.2).

Table 3.2: Questionnaire Structure

Section A	Biographical Information
Section B	Skills and the employment of expatriates
Section C	Learner Readiness
Section D	Learning Transfer Design
Section E	Organizational Alignment
Section F	Open-ended questions

As indicated in Table 3.2, Section A describes the biographical information of respondents, for example, gender, age, qualifications, experience on the Project etc. Age and gender of the respondent are requested to ascertain the degree to which these influence perceptions on skills and knowledge transfer issues on the Project. Section B explores the various concerns around skills and the employment of expatriates. For example, one of the questions stated “in terms of meeting the Project objectives, the necessary core and critical skills are available locally”. Sections C, D and E are intended to test the Learning Transfer Model within the context of Eskom. A particular focus is given to Section E which interrogates opinions on the organization’s commitment to knowledge transfer. For example, one of the items states “the Medupi Project provides an enabling environment for skills

transfer and learning". The final section of the questionnaire (Section F) comprised 3 open ended questions.

The options for the responses to the statements in Sections B to E of the questionnaire range from 1 (strongly agree) to 5 (strongly disagree). This is according to the Likert scale which is based on the summated ratings method of item analysis (Rosnow and Rosenthal 1996:105).

3.7.2 The Interview

A semi-structured interview design was chosen comprising two sets of questions that were directed at the local employees and the expatriates respectively (Appendix B). There were 12 questions directed to both the expatriates and the local employees. These covered issues such as the specific types of skills shortages experienced on the Project, the relevance and effectiveness of training and knowledge transfer policies and management support.

Given the semi-structured nature of the process, during the course of the interviews other issues were raised that lead to the following questions:

- What are the reasons for staff turnover on the project?
- Would you recommend on-the-job training on the project?
- Do you think that the locals have qualifications and no experience?
- Does the consequence of skills transfer result in delay on completion?

This is one of the advantages of the semi-structured interview design in that it gives both parties latitude to explore related issues hence providing rich and in-depth information.

Apart from the 12 questions that were posed to both groups of respondents, an additional 6 questions were raised with the local employees only. The questions were directed to this group only because they focused on issues dealing with the employment of expatriates and their contribution to knowledge transfer. For example, one such question is, "Do you think the local employees are learning/acquiring skills by working with the foreigners?"

Maree (2007:89) states that recording of interviews must be done in a precise way; a tape recorder is a preferable method to use for this purpose. In this study, the information and opinions expressed during the interviews were tape recorded. All the participants were aware that the interviews were being recorded. These recorded interviews will be kept in a secure location at the Durban University of Technology for a period of 3 years, after which they will be destroyed. The researcher then transcribed all the interviews from the digital tape recordings, relevant aspects of which are presented and discussed in detail in Chapter 4.

3.8 Authenticity of the research

Tawab (2013:490) defines authenticity as evaluating of the acceptability of the evidence sources in terms of the integrity or the reliability of the sources. Coleman and Briggs (2007:91) further state that authenticity assists in the assessment of the quality of the study and also assists in defining the research approach. In this study, authenticity is established in three ways, namely through pre-testing of the questionnaire, maximising the reliability of the questionnaire and ensuring that it is valid.

3.8.1 Pre-testing of questionnaire

Draves (1998:2) explains that questionnaires must be proof-read and checked for errors prior to commencement of the research as this creates the framework for reliability and validity. A draft questionnaire had been prepared by the researcher and reviewed by the researcher's peers for typographical errors and ambiguous questions. This group consisted of five people including 1 Supervisor, 1 Engineer, 2 Project Package Managers and 1 Lead Discipline Manager. All these individuals have similar educational backgrounds and experience as those comprising the main sample and all had worked on the Medupi Project previously. Principal component analysis with varimax rotation was performed on the data in Sections B to E. At this stage it became clear that reliability for section B was low. Given that the questionnaire is newly designed, and the pre-testing was on a small sample, this is

not unexpected. After the questionnaire was pre-tested, based on the feedback received and the preliminary statistical analysis, the number of items in Sections B to E was reduced from 33 to 28. Reliability is discussed in more detail below.

3.8.2 Reliability

Reliability deals with the data compilation procedure ensuring consistency of results. Maree (2007:147) describes reliability as the consistency of an instrument; high reliability will ensure that the same results will occur repeatedly on the same sample. In this study, reliability is measured using Cronbach's alpha coefficient, Reliability is computed by taking several measurements on the same subjects, a reliability coefficient of 0.70 or higher is considered as "acceptable" (Oppenheim 1992:31). As noted earlier, the questionnaire is entirely self-developed by the researcher. The absence of a pre-existing (standardized) instrument can influence reliability. Cronbach's alpha was measured for sections B to E of the questionnaire as indicated in Table 3.3.

Table 3.3: Cronbach's Alpha values for the questionnaire

	Cronbach's Alpha	No. of items
Section B	0.569	9
Section C	0.691	5
Section D	0.673	3
Section E	0.758	11

The reliability score for the entire questionnaire was 0.796 for the 28 items. All of the sections, except Section B, have high reliability scores approximating or exceeding 0.70. In particular, Section E which is the focus of the research has a score of 0.758, indicating a high degree of acceptable, consistent scoring for this section of the instrument.

Section B has a Cronbach reliability value that is lower than the standard. The overriding reasons for this low reliability are that the construct is newly devised, and

the number of sub-themes within the section was numerous. Low reliability may also result where the numbers of statements for the sub-themes are not sufficient. Given the researcher's experience working on the Project, it was apparent that there was an underlying tension regarding the employment of foreigners in management and leadership positions. Hence, one of the objectives of the research was to interrogate the opinions of foreign and South African personnel on the role and contribution of the expatriates on the Project. As recent media reports (Hlongwane, 2012), the load shedding and delays and the burgeoning costs associated with the Project, together with the urgent delivery imperatives, both from a social (service delivery) and economic (growth and development) standpoint have made Medupi a political hotspot. Since there are diverse issues at play, and the fact that these issues are specific to the Medupi context, it is not unexpected that the reliability score is fairly low for this section.

3.8.3 Validity (Internal and External)

In general, the validity of an instrument is the extent to which it measures that which it is supposed to measure. Jankowicz (2005:111) describes validity as being accurate in that the data is reflected in an unbiased way, and reliability as the answer being accurate and being the same on re-measurement with the same measurement tool. If an instrument is not reliable, then it is often less likely to be valid and this is a concern with the current study. However, validity is equally important as it is possible for an instrument to be highly reliable, yet have low validity (Rosnow and Rosenthal 1996:122).

For the purposes of this study, two types of validity are relevant namely; content validity and criterion validity. The first type of validity is aimed at the measuring instrument being designed to measure the full content i.e. the questionnaire items represent the kinds of material (or content area) they are supposed to represent, which is a basic consideration when constructing the questionnaire (Rosnow and Rosenthal 1996:130). Content validity is ensured if all major aspects of the content area are covered. In this study, the focus is on skills shortages, the employment of expatriates and the issues surrounding knowledge transfer on the Medupi Project.

Sections B to E interrogate these aspects in detail and the Learning Transfer Model is used as a theoretical framework.

Criterion validity is when the researcher uses the instrument to predict an outcome which is external to the test (instrument). Also known as empirical validity, criterion validity therefore is the degree to which the questionnaire correlates with one or more outcome criteria (Rosnow and Rosenthal 1996:131). In this study, the questionnaire probes key employees' perceptions of the issues pertaining to skills shortages and the factors influencing skills transfer at Eskom. If these tensions and issues are resolved, then the organization would be able to deliver services more effectively. In other words, delays and other problems related to skills should ease and the Medupi Project should be delivered more timeously. Ader and Mellenbergh (1999:325) state that a study can be valid if the theories and statements can be justified. To further investigate the validity of the questionnaire, it was decided to conduct statistical analysis in terms of communalities. This is performed for section B only since the reliability scores of the other sections of the questionnaire are acceptable. Table 3.4 indicates the detailed results for Section B, and Table 3.5 gives the summary communalities for all sections in the questionnaire.

Table 3.4: Communality Analysis of Section B

	Initial	Extraction
1.The skills on the Project are properly utilized	1.000	.562
2.The Project objectives are directly linked to the skills requirements	1.000	.714
3.In terms of meeting the Project objectives, the necessary core and critical skills are available locally	1.000	.762
4.Critical skills required on the Project are easily sourced from the current skills resource pool in SA	1.000	.773
5.Expats largely contribute to the skills needed on the Project	1.000	.716
6.Expats are adequately skilled to transfer skills needed by the Project staff	1.000	.852
7.Skills are the key cause of delays on the Project	1.000	.864
8.Mismatched / Less skilled employees are taking responsibility for the Project outputs	1.000	.723

An assessment of how well this model is doing can be obtained from the communalities. The communality for a given item can be interpreted as the amount of variation in that variable explained by the factors that constitute the variable. The ideal is to obtain values that are close to one. Average communalities for each section and for the overall model can also be calculated as percentages. The latter gives an overall assessment of performance of the model.

For example, there are 8 items that make up Section B (The communalities reflected in Table 3.4 above were obtained after eliminating the first item relating the Project objectives to the sufficiency of critical skills employed. The result is analysed similar to that for multiple regression: for example, signage against two common factors yielding an $R^2 = 0.864$ (for the penultimate variable on skills being the key cause of delays on the Project), indicates that about 86 percent of the variation in terms of delays being attributable to skills were explained by the factor model. With the exception of the first item, all of the values in Table 3.4 above are high and show the

relevance of the statements to the section. However, the rotated component matrix indicates that some statements have negative covariances as indicated in Table 3.5 below.

Table 3.5: Section B: Rotated Component Matrix

	Component			
	1	2	3	4
1. The skills on the Project are properly utilized	.173	.012	.720	-.119
2. The Project objectives are directly linked to the skills requirements	.007	.010	.821	.199
3. In terms of meeting the Project objectives, the necessary core and critical skills are available locally	-.104	.814	.136	-.267
4. Critical skills required on the Project are easily sourced from the current skills resource pool in SA	-.153	.848	-.099	.145
5. Expats largely contribute to the skills needed on the Project	.789	-.227	.196	.055
6. Expats are adequately skilled to transfer skills needed by the Project staff	.916	-.083	.068	.048
7. Skills are the key cause of delays on the Project	-.016	-.102	.186	.905
8. Mismatched / Less skilled employees are taking responsibility for the Project outputs	.492	.062	-.314	.615

Despite the negative covariance's, the factor loadings indicate the existence of four sub-themes, each associated with just two variables (items). For example, the first and second items load on a single factor (viz. factor 3), the third and fourth items load on factor 2 etc. This multiplicity of sub-themes therefore partially explains the relatively low reliability score for this section as noted earlier.

Whereas the individual communalities tell how well the model is working for the individual variables, the total communality gives an overall assessment of performance. Table 3.6 below gives the average scores for each section of the questionnaire, and for the entire questionnaire.

Table 3.6: Average communalities for the questionnaire

Description	Average Communality percent
Section B	74.6
Section C	46.6
Section D	57.1
Section E	66.4
Overall	61.8

In this case, the model is acceptable as it explains approximately 62 percent of the variation for the 28 items. Sections B and E which are the focus of the study score fairly high at 74.6 percent and 66.4 percent respectively.

3.9 Data analysis

There are two types of primary data in this study, namely quantitative data from the questionnaire and qualitative data drawn from the interviews. This data is analysed and discussed separately in Chapter 5. Secondary data from Eskom internal policy documents and information obtained from relevant books, journal articles and websites are used to complement and help interpret the findings derived from the primary data. As such this data source seeks to triangulate the data obtained from the questionnaire and interviews. Both descriptive and inferential analysis are performed.

3.9.1. Descriptive analysis

The data collected from the questionnaire responses is analysed with the software, Statistical Package for the Social Sciences (SPSS) version 20.0. Chapter 5 will present the descriptive statistics in the form of frequencies, graphs, cross tabulations and other figures. According to Petersson (1999:1245), descriptive analysis is used to characterize the nature of the signals present in the data. The key characteristics of the sample, such as age, gender, qualifications and experience are presented in tabular form. The Likert scale responses in Sections B, C,D and E are summarised according to three categories, Strongly Agree/Agree, Neutral and Strongly Disagree / Disagree and are given in tabular form. Cross-tabulations include the degree to which the biographical characteristics of the respondents (eg. age, gender, qualification, nationality etc.) influence their responses on the various sections of the questionnaire. The interviews are transcribed and presented as major themes emerging from the discussions.

3.9.2 Inferential Analysis

Inferential analysis is normally used to test hypotheses. Given the exploratory nature of the study, no testable hypotheses are articulated. However, inferential tests are performed where relevant to test the statistical significance of the descriptive results. These include correlations and chi square testing which are interpreted using the p-values. The chi square test was used to determine if the difference in the scoring patterns, per statement, was significant.

Other statistical analyses such as communality analysis, discussed in previous sections, and factor analysis were performed. Factor analysis is a statistical technique whose main goal is data reduction. A typical use of factor analysis is where the researcher wishes to represent a number of questionnaire items as a small number of hypothetical factors. The traditional approach to reporting a result requires a statement of statistical significance. A p-value is generated from the test statistic of which a significant result is indicated with "$p < 0.05$". Factor analysis is performed on sections B, C, D and E. Bivariate correlation was also performed on

the (nominal and ordinal) data. Positive values indicate a directly proportional relationship between the variables and a negative value indicates an inverse relationship.

The researcher transcribed the interviews and identified common concerns expressed by the respondents and the resultant themes that emerged. This approach is recommended by Bless and Higson-Smith (2000:384) who suggest that data analysis is conducted to ensure that consistent patterns within the data are identified. These consistent patterns are compiled into the common themes and discussed in Chapter 5.

3.10 Research ethics

Rosnow and Rosenthal (1996:52) suggest that where research involves human resources, the researcher has a moral obligation not to do physical or psychological harm to the research participants, and to conduct the research in a manner that is most likely to produce valid results. In ensuring that this study meets all ethical requirements the following steps were taken:

3.10.1 Approval to conduct research

The researcher requested approval to conduct the study via an informal email to the Chief Advisor, Talent and Skills Management Department at Eskom before commencing the study. Permission was granted by means of a formal letter to conduct the research (Appendix C). Eskom did not require the researcher to provide the draft questionnaire nor interview schedule a priori. As indicated in this letter, the primary concern on the part of the organization related to security concerns on site and intellectual property rights.

All students conducting research at the Durban University of Technology are required to complete various PG (post-graduate) documentation as part of the research process. These include the PG4 form which is the research proposal that is to be approved by the Faculty Research Committee (FRC) and the Institutional

Research Ethics Committee (IREC) prior to the commencement of the research. The PG4 form has a section dealing with ethical clearance issues, including: obtaining "gate-keeper" permission (in this study, from Eskom's Talent and Skills Management Department); drafting a letter of informed consent (Appendix D) to the participants ensuring voluntary participation (Leedy and Ormrod 2005:101) and that they understand the research objectives and process; completing an ethical clearance checklist and signing a declaration. Thereafter, IREC gave written permission to continue with data collection.

3.10.2 Informed consent

Ruan (2005:21) explains informed consent as a procedure in which participants are aware of their choice to participate in the research on full disclosure by the researcher of all relevant facts pertaining to the research. In particular, participants should be made aware upfront of potential consequences of participation. The DUT requires certain information to be stated on the letter of informed consent a priori, which include:

- A brief description of the nature of the study;
- An indication of what participation entails in terms of activities and duration of the research;
- A list of potential risks arising from participation;
- A guarantee of confidentiality and anonymity; and
- A statement noting that participation is voluntary and can be withdrawn at any time without penalty or prejudice.
- Contact details of the researcher and his/her supervisor;
- A statement indicating willingness to make the results of the study available on completion, should they be requested; and
- A place for the participant's signature indicating consent to participate in the study.

Hence the researcher ensured thet all such provisions were included in the consent forms which were attached to the research questionnaire. As discussed earlier in section 3.6.1, the questionnaire was emailed to all the potential participants as

purposively selected by the researcher. Those who were willing to participate returned the signed consent forms together with the completed questionnaire.

3.10.3 Confidentiality and anonymity

Participants' right to privacy, including keeping their identities confidential, is a key requirement of any research study to ensure frank and open responses and participation (Leedy and Ormrod 2005:102). Confidentiality and anonymity provisions of this research were discussed with the participants. Data from the questionnaires is aggregated and no individual identities are revealed. Likewise, interviewees are referred to numerically as Local 1, 2, 3 and/or Expatriate 1 and 2. The data from the questionnaires will be stored for 3 years and will be disposed of thereafter. Only the researcher and supervisors will have access to the data.

3.10.4 Accessibility of research findings

Coleman and Briggs (2007:117) argue that the underlying ethical principle of research is that participants have a right to know the outcomes of a study. The Medupi Project is a very sensitive project and affects the entire nation because the delays in its completion have serious ramifications for the economy and for individuals who are subjected to load shedding and electricity price hikes. As discussed in Appendix C, Eskom has the right to peruse the final dissertation and decide whether the research findings are to be made available to the public. If Eskom does not embargo the dissertation, it will be placed on the electronic portal of the Durban University of Technology's library and thus made available to the public. However the results of the findings will be presented to the Eskom management team and all the participants.

3.11 Conclusion

This chapter described the research design used to conduct this study, namely a case study adopting mixed methods. The case study design was utilized as the study focuses on a single organization, Eskom and the issues around the Medupi Power Station Project. Detailed justifications for the mixed methods quantitative and qualitative approaches were proposed. The choice of participants in the study and the sampling approach adopted were explained. This chapter also discussed the instruments of the study, a self-administered questionnaire and one-on-one interviews, and provided a detailed exposition of the attempts made to authenticate the research. Ethical issues pertaining to the research, such as approval to conduct the research, participant informed consent and the accessibility of the research findings were discussed in the closing section of the chapter. Chapter 4 deals with data presentation, analysis and interpretation.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter will present, analyze and interpret key data received from the participants in this study. Data was obtained from two sources, namely a questionnaire and follow-up interviews with selected respondents (Appendix A and B) respectively. The interviewees comprised about 10 percent of the sample. This includes an analysis of the biographical data on the respondents, followed by a discussion on skills issues which are based on responses in Section B of the questionnaire. Next, opinions on knowledge transfer on the Project will be examined within the context of the Learning Transfer Model (Sections C, D and E of the questionnaire) and responses to the open-ended questions will be summarized. Recall that the focus of this study is on the role of the organization in knowledge transfer and management as outlined in the model of Kaplan-Norton (2004:59). The second part of the chapter focuses on the issues raised in the interviews. Hence, the discussion in this chapter ranges from respondents' opinions on the nature and causes of skills shortages experienced on the Project, and the role played by expatriates in knowledge transfer to the factors impacting knowledge transfer on the Project in terms of the Learning Transfer model, as outlined in the research objectives.

4.2 The sample

The sample of the study comprised skilled personnel who are directly involved on the Medupi Project. For the purposes of this study "skilled" personnel are those possessing a three year tertiary qualification and at least 2 years' experience in the construction industry. Questionnaires were distributed to 70 such individuals over the period 15th to 30th May 2013. Approximately 20 percent of these personnel are expatriates. Forty-eight questionnaires were returned, giving a response rate of approximately 69 percent. Of the 48 respondents comprising the total sample, 10.5

percent are expatriates and 89.5 percent are locals. Follow-up interviews were conducted with two expatriate and three local personnel during July 2013 to probe the quantitative results. This chapter is organized as follows: first, the data from the questionnaire will be presented. This chapter is organized as follows: first, the data from the questionnaire will be presented. Table 4.1 below describes the sample composition.

Table 4.1: Biographical Data of respondents

Variable	**Frequency**	**Percentage (percent)**
Gender:		
Male	37	77.1
Female	11	22.9
Age (years):		
30 and below	8	16.7
31 – 40	18	37.5
41 – 50	13	27.1
51 – 60	5	10.4
61 and above	4	8.3
Nationality:		
South African	43	89.6
British	3	6.3
American	1	2.1
German	1	2.1

Most of these participants have a technical background and hold some engineering qualification, hence the sample was purposively selected in line with Kaplan and Norton's (2004:59) directive that "job families" (i.e. key employees/teams) be identified who have the greatest impact on organizational performance; others, such as human resources personnel were selected based on their experience in skills development. South African males comprise the majority of the sample at 67 percent. There are no female expatriates in the sample. Amongst the South African

personnel, 42 percent are Black, 37 percent are White and the rest (21 percent) are Indian. In terms of the age dispersion of the sample, 54 percent are younger than 40 years, 27 percent are between the ages of 40 and 50 years, and 19 percent are older than 50 years. Sixty percent of the expatriates are between the ages of 40 and 60 years, while 40 percent are older than 60 years. Amongst the South Africans, this figure is much lower with almost 60 percent of South African personnel in the sample being younger than 40 years of age. All the females in the sample are below the age of 40 years. Almost 90 percent of the respondents are South Africans whilst 10 percent are expatriates. The expatriates are from the United Kingdom (60percent), United States of America (20 percent) and Germany (20 percent).

Table 4.2: Qualifications, Experience, and Nature of Employment

Variable	**Frequency**	**Percentage (%)**
Highest Qualification:		
Undergraduate Degree	23	47.9
Honours / Post Graduate Diploma	18	37.5
Masters	6	12.5
Doctorate	1	2.1
Employment Type:		
Contract	14	29.2
Permanent	34	70.8
Experience in Construction:		
Up to 5 Years	14	29.1
6 - 10 Years	15	31.1
11 - 15 Years	3	6.3
16 - 20 Years	5	10.5

21 Years and above	11	23

With regard to their qualifications, approximately 85 percent of the sample had obtained qualifications of at least an Honours degree (or postgraduate diploma), whilst 15 percent obtained qualifications from Masters up to Doctorate level. The employment on this project is on a permanent or contractual basis i.e. 70 percent of the sample is permanently employed Eskom staff and 30 percent are contracted workforce. The latter are contracted by both PB Power (Pty.) Ltd. and Eskom. Approximately 96 percent of the females in the sample are permanently employed at Eskom and the balance are contracted via PB Power (Pty) Ltd.

Since the nature of the Project is construction, a section on construction experience is included in the questionnaire. The experience of the employees varied from 60 percent of the respondents having up to 10 years' experience, and the others having worked longer in construction. The most experience reported is 34 years and the least experience is 2 years. One could argue that individuals in key positions should have extensive experience commensurate with their responsibilities. In this regard, all the Lead Discipline Managers (LDMs) in the sample have at least 10 years construction experience.

Since power station construction is a highly specialised activity, experience on the Medupi Project itself may lend more weight to an individual's opinions on the issues explored in this research. Given that the construction on the Project commenced in May 2007, 12 percent of the sample have less than 2 years' experience, 56 percent report 2 – 4 years' experience, and 31 percent have been working for more than 4 years on the Project. One individual, an expatriate, has worked on Medupi since its inception. In terms of nationality, 40 percent of the expatriates in the sample have less than 2 years Project-related experience, 20 percent have 2 – 4 years' experience and the balance have been working in excess of 5 years on Medupi. Further, one would hope that those working longer on the Project have greater general construction experience per se – a weakly positive but statistically significant (at the 95 percent level) correlation coefficient of 0.28 was found. Men in general

have more experience on the Project; only 2 women in this study were working more than 4 years on the Project.

The nature of one's employment, i.e. permanent or contract may influence willingness to share knowledge as one may surmise that contract workers feel less loyalty to the organisation, its human resources and its future growth. Twenty-nine percent of the overall sample and 100 percent of the expatriates are contract personnel. One may also argue that key personnel should ideally be appointed on a permanent basis to ensure continuity and stability. In this study, 29 percent of the personnel who held management positions and 26 percent of the technically-oriented personnel are on contract.

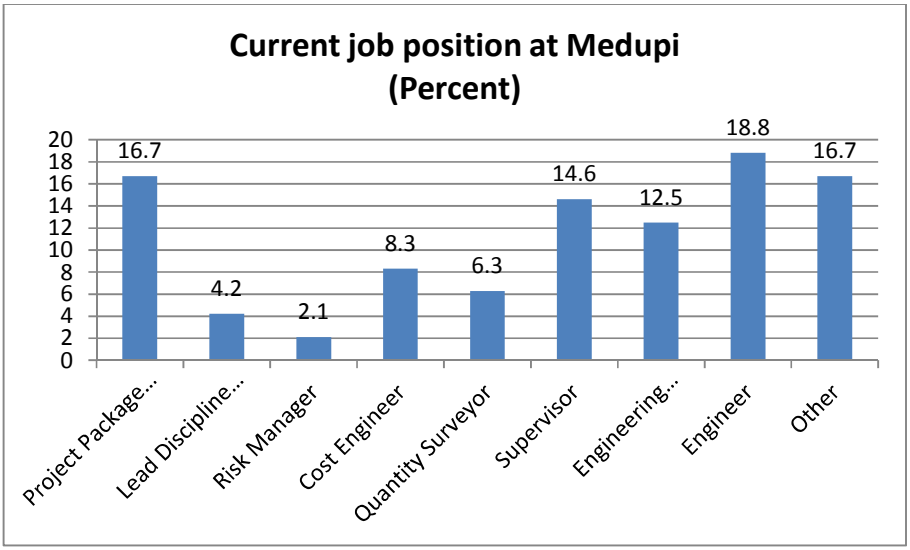
Table 4.3: Management, Technical and Other Job Categories

Job category	**Frequency**	**Percentage (%)**
Management	17	35
Technical	23	48
Other	8	17

Table 4.3 provides data on the broad job categories of the participants, viz. Management, Technical and Other. The category "Management" includes Lead Discipline Manager (4 percent), Project Package Managers (17 percent), Risk Managers (2 percent) and Engineering Managers (12 percent). The Lead Discipline Manager (LDM) holds one of the most senior management positions on the Project and is responsible for the execution of the works from a construction perspective. The literature review has indicated the important role that management plays in knowledge transfer. Both the LDMs in this study are South African and 4 of the 5 expatriates are working in management roles. Technical personnel include engineers, quantity surveyors and supervisors who are directly responsible for the various activities required to "get the job done" so-to-speak. These personnel, who represent 48 percent of the sample, closely approximate the "job families" in Kaplan and Norton's (2004) model. Finally, the category "Other" comprise human resources

personnel who are best equipped to comment on Eskom's skills development and knowledge management policies.

Figure 4.1: Current Job Positions



The actual job descriptions of the participants are illustrated in Figure 4.1. The highest category of participants is Engineers (18.8 percent) followed by Project Package Managers (16.7 percent) and Others (16.7 percent). Approximately 4 percent of the Project Package Managers are expatriates from the United Kingdom. Similarly, the Engineering Management (12.5 percent of the sample), include 4 percent expatriates from the USA and Germany. The disciplines of these participants vary, for example the Project Package Managers disciplines include Balance of Plant (8 percent), Electrical (6 percent) and Turbine (2 percent). Most of the participants falling within the "Other" category are from the Human Resources Department. The supervisors comprise 14.6 percent of the sample and all of them are local South Africans.

4.3 Findings from the questionnaire

The questionnaire is divided into 6 sections as follows. Section A covers the respondents' biographical Information such as gender, race, qualifications, and experience on the project etc. Section B explores skills issues such as the availability

of construction skills in the country, and the utilization and availability of skills on the Project itself. This section also covers opinions on the expatriate's contribution to knowledge and skills transfer on the Project. The balance of the questionnaire, namely sections C, D and E aim to measure knowledge transfer according to Leimbach's Learning Transfer model; this model comprises three main categories namely Learner Readiness (Section C of the questionnaire), Learning Transfer Design (Section D of the questionnaire) and Organizational Alignment (Section E of the questionnaire). The responses to the items in Sections B to E of the questionnaire were categorized and coded in a Likert scale ranging from Strongly agree (1); Agree(2); Neutral (3); Disagree (4) to Strongly disagree (5). Levels of disagreement were collapsed to show a single category of "Disagree". A similar procedure was followed for the levels of agreement. Section F included 3 open-ended questions on the Medupi Training System (MTS) and probed for participants' suggestions on skills shortages should be addressed within Eskom.

4.3.1 Section B: Skills

This section of the questionnaire examines opinions on the nature and causes of skills shortages experienced on the Medupi Project. Issues discussed include the following: the utilization of skills; whether the project objectives are linked to the skills requirements; opinions on the skills and knowledge of the expatriates and the experience they bring to the Project, and finally whether and the extent to which the expatriates are transferring skills to the locals.

General overview of results

Table 4.4 describes respondents' opinions on various issues pertaining to skills and the employment of expatriates on the Project. The results indicate strong consensus that available skills are not properly utilized on the Project. Further, the local opinion is that expatriates are not contributing towards the knowledge transfer process as they do not possess the requisite experience in order to transfer the knowledge and skills to local employees.

Table 4.4: Skill availability and use on the Medupi Project

Statement	Strongly Agree / Agree %	Neutral %	Strongly Disagree / Disagree %
1. In terms of meeting the Medupi Project objectives, the necessary core and critical skills employed on the Project are sufficient.	46.8	17.1	36.1
2. The skills on the Project are properly utilized.	10.6	14.9	74.5
3. The Project objectives are directly linked to the skills requirements.	25.5	34	40.4
4. In terms of meeting the Project objectives, the necessary core and critical skills are available locally.	55.3	6.4	38.3
5. Critical skills required on the Project are easily sourced from the current skills resource pool in SA.	27.7	19.1	53.2
6. Expatriates largely contribute to the skills needed on the Project.	42.6	19.1	38.3
7. Expatriates are adequately skilled to transfer skills needed by the Project staff.	19.1	25.5	55.3
8. Skills are the key cause of delays on the Project.	40.4	8.5	51.1
9. Mismatched/Less skilled employees are taking responsibility for the Project outputs.	53.2	23.4	23.4

In general, almost half the respondents in the study believe that the critical skills are sufficient but more than three-quarters feel that these skills are not being correctly utilized. The finding that 54 percent of the sample believes that less skilled

individuals are taking responsibility for outputs is of concern as it implies a lack of faith in those holding key positions in terms of Project deliverables. At the same time half the sample are of the opinion that skills are not the major cause of delays on the Project, indicating that there are many complex issues at play. It is the proper utilization of available skills that many of the respondents felt was at stake: in fact almost 75 percent of the respondents disagree that skills are being used optimally. This is the statement that received the highest number of negative responses.

In terms of skills availability 56.2 percent of the sample believe that skills are available locally, yet almost the same percentage argue that these skills are not easily sourced, implying competition between the public and private sectors for scarce engineering skills. While a small majority of respondents feel that expatriates contributed to skills needed, almost half the total sample (54.2 percent), all South African, believe that the foreigners were not able to transfer skills and knowledge to the locals. To the extent that this is true, it clearly negates the Eskom rationale for hiring expatriates. More than half the total sample (55.3 percent) claims that the expatriates are not adequately skilled to transfer skills to the locals.

Statistically significant results

Inferential techniques include the use of correlations and chi square test values which are interpreted using the p-values. The chi square test was used to determine if the difference in the scoring patterns, per statement, was significant. The null hypothesis states that there is no difference in the scoring patterns. The alternate states that there is a significant difference. Table 4.5 gives the probability (p) values for Section B in terms of various demographic characteristics of the respondents. Statistically significant results are indicated with a *.

Table 4.5: Statistically significant results (Section B)

Statement	Gender	Race	Age	Nationality	Highest Qualification obtained	Current job position/designation on the Medupi Power Station Project	Discipline	Current terms of employment at Eskom
1. In terms of meeting the Medupi Project objectives, the necessary core and critical skills employed on the project are sufficient	0.149	0.196	0.419	.033*	.010*	0.17	0.688	0.087
2. The skills on the Project are properly utilized	0.232	0.676	0.396	0.981	0.518	0.275	0.331	0.945
3. The Project objectives are directly linked to the skills requirements	0.386	0.65	0.054	0.411	0.579	0.402	.008*	0.558
4. In terms of meeting the Project objectives, the necessary core and critical skills are available locally	0.822	0.051	0.09	.022*	0.362	0.112	0.161	.041*
5. Critical skills required on the Project are easily sourced from the current skills resource pool in SA	0.861	0.179	0.227	0.863	0.2	0.315	0.487	0.851
6. Expats largely contribute to the skills needed on the Project	0.415	0.842	0.643	0.75	0.729	0.39	0.209	0.972
7. Expats are adequately skilled to transfer skills needed by the Project staff	0.665	.027*	0.064	.001*	0.436	0.361	.006*	0.375
8. Skills are the key cause of delays on the Project	0.612	0.564	0.955	0.327	0.82	0.953	0.149	0.344

9. Mismatched / Less skilled employees are taking responsibility for the Project outputs	0.265	0.127	0.292	0.581	0.562	0.481	0.487	0.774

The results indicate that the higher qualified respondents (p = 0.010) and South African employees (p = 0.033) respectively, tend to agree that the skills are sufficient on the Project (Statement 1). The latter result is not unexpected since local employees believe that skills are available locally (p = 0.022). Further to this, respondents' disciplines (or specific job categories) impacted on opinions regarding whether the Project objectives were aligned with the skills requirements (p = 0.008). The disciplines which were very vocal on this issue are the Project Package Managers and the Engineers. They disagree with the statement that the Project objectives are aligned to the skills requirements. In the researcher's opinion, this may be because these managers experienced severe skills shortages in their work area and could not close the skills gap timeously. Furthermore, the nationality of the respondents is significantly related to opinion on whether the expatriates working on the Project were adequately skilled to transfer knowledge and skills. South Africans believe the contrary to hold compared to the expatriates (p = 0.001). Finally, race plays a statistically significant role in the responses to the statement on expatriates' ability to transfer skills. Over 70 percent of the Black respondents and 67 percent of the Indian respondents disagree with this statement.

4.3.2 Section C: Learner Readiness

Leimbach (2010:83) explains Learner Readiness as the degree of preparedness of the learners prior to participating in the actual learning. There are four factors which make up this component namely, Motivation to learn, Intent to use, Career goal alignment and finally Self-efficacy. As discussed in Chapter 3, reliability in this section of the questionnaire is acceptable with Cronbach's alpha for the five items measuring 0.691 and PCA indicating a single factor reflecting the overall component of Learner Readiness. Participants' opinions on Learner Readiness are assessed in Section C of the questionnaire.

General overview of results

The results in this section indicate that employees are motivated to learn and to enhance their existing skills. They have an understanding of what the course content is prior to attending any training that may be offered. One very positive outcome from this section is that employees are convinced that they can utilize a newly learnt skill on the job and that a newly learnt skill can be aligned to the employee's career.

Table 4.5: Learner Readiness

Statement	**Strongly agree / Agree (%)**	**Neutral (%)**	**Strongly disagree / Disagree (%)**
1. Employees are motivated to learn new skills or enhance their existing skills on the Medupi Project.	53.2	17	29.8
2. Before any training occurs, I have a good understanding of how it would benefit my job related development.	47.8	21.7	30.4
3. I get excited when I think about trying to use my new learnt skills on the Project.	60.9	21.7	17.4
4. New skills learnt from the Project are aligned to the employee's career.	42.6	38.3	19.1
5. I am certain that I can utilize newly learnt skills on the Project.	70.2	25.5	4.3

In general the levels of agreement are higher than those for disagreement. The average level of agreement for the first 4 statements is 51.1 percent. In many instances, the ratio of agreement to disagreement for these first 4 statements is approximately 2:1. The last statement, which deals with respondents believing that they can utilise skills that they have learnt on the Project, has a 70 percent agreement level. Less than 5 percent of the respondents believe that the skills

acquired were not of any use. There are two underlying themes in this section of the questionnaire, namely employee motivation to acquire knowledge, and the possibility of applying new knowledge and skills to the work environment.

Regarding motivation, more than half of the respondents agreed that employees are motivated to learn new skills. In order for an employee to be motivated he / she must be ready for the training and co-operate in the training process as stated by Leimbach (2010:83). This finding is encouraging for knowledge transfer and management of knowledge within Eskom since effective learning can only take place when people are prepared to learn. The respondents also state that they get excited about utilizing newly learnt skills on the Project (almost 61 percent agreement). This is a positive outcome in terms of knowledge transfer since the intention to and possibility of applying newly learned skills on the job imply more effective knowledge transfer (Holton 2005:45).

Considering the application of skills, almost half of the respondents (47.8 percent) confirm that they have a good understanding of how training will benefit their development. Leimbach (2010:83) states that learning transfer is even more effective when a learner has a clear understanding of the training and its outcomes prior to the commencement. The majority of respondents (70.2 percent) report that they can utilize a newly learnt skill on the Project. In summary, the respondents are aware of the training outcomes and believe that newly learnt skills can be utilized on the Project. However, an important issue within the context of knowledge transfer and knowledge management within Eskom is the extent to which opportunities are available for employees to utilize a newly learnt skill on the Project. Machin and Fogarty (2003:53) confirm that skills should be practiced on the job to enhance knowledge transfer.

Statistically significant results

The chi square test was used to determine if the difference in the scoring patterns, per statement, was significant. The test results indicate that there are significant differences in the responses for all the statements in this section. A second Chi square test was performed to determine whether there was a statistically significant

relationship between responses on the statements in Section C of the questionnaire and selected biographical variables of the respondents.

The only significant finding ($p = 0.023$) is that a respondent's current job designation on the Medupi Project is related to responses on employee motivation to acquire new knowledge or enhance existing skills (statement 1 in Table 4.5). There was strongest agreement by the Package Managers, Supervisors and Engineers with the statement that employee motivation is required to enhance existing skills. These categories of employees work directly on the Project and therefore learning new skills and enhancing existing skills would be of significant value due to the "hands on" approach of these employees. The Human Resources employees stated that the site employees were less motivated to acquire new knowledge. This could possibly be due to the greater difficulty and challenge in acquiring new knowledge on site.

4.3.3 Section D: Learning Transfer Design

Leimbach (2010:85) describes Learning Transfer Design as identifying specific learner transfer activities to improve learning and job performance. This component of the model demonstrates how suitable knowledge transfer methods encourage effective work performance. The Learning Transfer Design consists of three factors namely; Practice and modeling, Goal setting and Application review. Reliability for the three statements in this section is 0.583 but increases to a more acceptable 0.762 if the third statement is omitted. As discussed in Chapter 3, the low number of statements and the fact that this is a newly devised instrument account for the low reliability. Feedback on the Learning Transfer Design component of the model is given in Table 4.6.

General overview of results

The three statements on Learning Transfer Design focus on the extent to which new knowledge and skills can be aligned to the setting and achievement of goals in the work environment. The results are given in Table 4.6. The respondents agree that goals can be set on the Project (statement 3 in Table 4.6). However, the issue here is that goals are not set by lower level management, but by the senior management

often under political pressure. This probably explains why almost half of the respondents (42.6 percent) disagree with the statement that employees set achievable goals within the Project. It was obvious to the respondents working directly on the Project that these goals were not achievable because of the tight schedule which eventually resulted in delayed completion.

Table 4.6 Learning transfer design

Statement	Strongly agree / Agree (%)	Neutral (%)	Strongly Disagree / Disagree (%)
1. Employees set goals within the Medupi Project that are achievable.	21.3	36.2	42.6
2. The structured setting of goals within the Medupi Project environment enables them to be achieved more easily.	10.6	44.7	44.7
3. A goal can be set for each and every work task on the Project.	55.3	27.7	17

Li and Butler (2004:49) found that employees must be involved upfront in goal setting for goals to be achievable. In the researcher's opinion, the goals for Medupi are set by senior management and delegated to the rest of the Project team. More than half of the respondents (55.3 percent) agree with the statement that a goal can be set for all tasks in the Project. However, while goals can always be set, the successful attainment of these goals is dependent on many factors, one of which is the idea that management may be "out of touch" with what's happening on the ground, and hence the goals they aspire to or that they are forced to specify due to political pressure are just not realistic in the time frame set.

4.3.4 Section E: Organizational Alignment

Organizational Alignment refers to the manner in which an organization supports learning and the utilization of new skills. This component consists of four factors namely; Manager support, Peer support, Job connection and Learning culture and has its underpinnings in the theory of Intellectual capital i.e. an organization's skills and knowledge base. The knowledge and skills embedded in an organization's employees comprise the human and social capital of an organization (Kaplan and Norton 2004:55). Cronbach's alpha measured 0.758 for the 11 statements in this section and is the highest of all three components of the Learning Transfer model. It is also the contention of this research that organizational support is the key to developing social capital and hence positively impacting knowledge transfer within an organization.

General overview of results

This section of the questionnaire examined respondents' perceptions of organizational support, and more specifically management and peer support (Table 4.7). The respondents agree that support is crucial for effective learning transfer. Other issues analysed included the learning environment provided by an organization. The results of this study show thet although respondents believe that senior management supports training and knowledge transfer, it does not provide a suitable environment for the application of the training.

Table 4.7 Organizational Alignment

Statement	Strongly agree / Agree (%)	Neutral (%)	Strongly disagree / Disagree (%)
1. Senior Management within the Project is supportive of training for employees on the Medupi Project.	57.4	19.1	23.4
2. My immediate Line Manager is supportive of training for me on the Medupi Project	58.7	15.2	26.1
3. Senior Management within the Project provides an enabling work environment for the use of new skills.	26.1	41.3	32.6
4. My immediate Line Manager provides an enabling work environment for me to utilise the use of new skills I have learnt.	54.3	23.9	21.7
5. My colleagues encourage me to use the skills I have learned in training on the Project.	52.2	37	10.9
6. My immediate Line Manager sets goals for me that encourage me to apply my training when working on the Project.	29.8	27.7	42.6
7. Peer support is crucial for the learning and use of new skills.	87.2	8.5	4.3
8. My experienced peers and colleagues are of a foreign nationality.	31.9	19.1	48.9
9. The Medupi Project provides an enabling	31.9	31.9	36.2

environment for skills transfer and learning.			
10. The Eskom recruitment policy supports fast and efficient employment of staff.	2.1	23.4	74.5
11. The Medupi Training system (if in use) on the Project supports skills transfer.	15.2	37	47.8

Principal component analysis described in Chapter Three revealed 3 themes (or factors) in this component of the Learning Transfer Model, viz. Management support (statements 1 – 6), Peer support (statements 7 and 9) and the Eskom procedures and systems for training and knowledge transfer (statements 10 and 11). Although reliability was improved when statement 8 was omitted, it is retained for the purpose of discussion in this section. Responses in terms of these 3 factors will be discussed next.

Knowledge transfer in the Leimbach model

- ***Management Support***

In this study, a distinction is made between 2 types of management, namely senior management and line management. Given that more than half of the respondents agree that senior management is supportive of knowledge transfer on the Project (57.4 percent), indicates organizational alignment according to Leimbach and Emde (2011:2). Lindner and Wald (2011:886) confirm that senior management commitment is crucial in the knowledge management process. Birasnav *et al* (2010:1038) note that such leadership and support is another form of investment in human capital, adding value to the organization. A majority of the respondents agreed that their line managers are supportive of training (58.7 percent); the study by Al-Eisa *et al* (2008:1226) likewise found that manager support is crucial in the transfer of knowledge. The skills and knowledge transfer procedure (Eskom PPZ265-92:10) stated in Eskom's HR policy stipulates that the line manager must be committed to the knowledge transfer process.

- ***Peer Support***

Most of the respondents agreed that they are encouraged by their colleagues to utilize skills they have learnt in training on the Project (87.2 percent). This is clearly linked to peer support. Leimbach (2010:85) defines peer support as anything that is said or done that has the effect of supporting the learners, even simple encouragement to practice newly learned skills. Cromwell and Kolb (2004:453) state that peer support creates a positive knowledge transfer process. According to Hau *et al* (2013:357), social capital amongst employees plays a major part in knowledge sharing by encouraging the learner to utilize newly learnt skills on the Project.

The respondents agreed that peer support is crucial for the learning and utilization of new skills (87.2 percent). The more the peer support, the greater the transfer of skills as indicated by Cromwell and Kolb (2004:453). Moreover, Burke and Hutchins (2007:279) state that the work environment must be conducive for peer support to be effective. Beuningen and Schmeets (2013:74) state that trust and participation have been recognized as crucial components of social capital. An organizational environment that is nurturing and supportive engenders trust and hence encourages participation. One of the elements of participation is social participation which is the extent to which people can give support. There is a mixture of local and foreign experience on the Project; however, almost half of the respondents believe that their experienced colleagues are not of a foreign nationality. This could be because the ratio of locals to expats is high and not 1:1 but is more likely due to the fact that the expatriates do not have power station experience, and are hence considered by the locals as less experienced from a power plant point of view.

- ***Learning environment***

The results of this study suggest that senior management on the Medupi Project does not provide an enabling work environment for the use of new skills as only 26 percent of the respondents agreed with this statement. This implies that the participants in this study believe the work environment (i.e. organizational climate) is not conducive for the application of new skills. Kirwan and Birchall (2006:255) state that the environment must be favorable to transfer learning. In comparison to the results pertaining to the role of senior management, respondents believe that line

management provides an enabling environment (54 percent) for the utilization of newly learnt skills. Employees report directly to their immediate line managers who are more likely to be au fait with the training needs of their staff, and able to provide suitable opportunities for applying new knowledge and skills. Eskom's internal knowledge management procedure (Eskom 240-42427008:4) states that the line manager is responsible for the implementation of the knowledge management procedure which entails providing an enabling work environment.

However, these results may not necessarily indicate that senior management is unsupportive of knowledge transfer per se but that it has been instructed by government to fast track the Project due to the current electricity situation in South Africa. Apart from the role played by management, the results of this study suggest that the Medupi Project itself does not provide an enabling environment to transfer skills. One of the reasons, noted above, is that the Project is fast track driven. Jackson and Bushe (2006:983) state that skills transfer is more favorable in a positive work environment. Farsani et al (2012:1299) state that a conducive organizational culture as a structural capital element is required in developing learning; organizations must prepare an appropriate environment for learning to take place.

Statistically significant results

The statistically significant results indicate only those statements in Section E for which chi square testing yielded statistically significant relationships with selected biographical data of the respondents. Table 4.8 Gives the p values for the above; statistically significant p values are indicated with a *.

Table 4.8: Statistically significant results (Section E)

Statement	Gender	Race	Age	Current job position on the Medupi Project	Current terms of employment at Eskom
1. My immediate Line Manager provides an enabling work environment for me to utilise the use of new skills I have learnt	0.73	0.221	.022*	0.076	.013*
2. My colleagues encourage me to use the skills I have learned in training on the Project	0.185	0.201	0.078	.044*	.004*
3. My experienced peers and colleagues are of a foreign nationality	0.227	.050*	0.86	0.248	0.122

The chi test performed confirmed that there is a significant relationship between age and respondents' views on whether or not the line management provides an enabling environment for utilizing new skills (p = 0.022), In general, the younger generation (<30 years), package managers and supervisors strongly believe that line management support is important. This could be because younger employees need to gain experience and hence are appreciative of the guidance and support of their immediate superiors, whereas those in managerial roles are more cognizant of the important role of management support in training and knowledge transfer. The nature of employment of respondents is also significantly related to responses to this statement (p = 0.013) with permanently employed staff more likely to agree on the level of support of line management. This result is not unexpected given that contract

employees are on the Project for a short period of time, whereas permanent employees are more responsive to opportunities for gaining more experience and applying new skills.

Opinion on colleagues encouraging the use of new skills is also related significantly in statistical terms to the current job position and nature of employment of the respondents. Relative to contract staff, the permanent employees believe that their colleagues encouraged them to utilise new skills ($p = 0.004$). Regarding the current job positions held, staff working directly on site vis à vis support staff such as administrative and HR employees, agreed to a greater extent that their colleagues encouraged them to use and apply new skills on the job ($p = 0.04$). The race of the respondent is significantly related to the responses on statement 3 (My experienced peers and colleagues are of a foreign nationality) with a probability value of 0.05.

4.3.5 Section F: Open ended questions

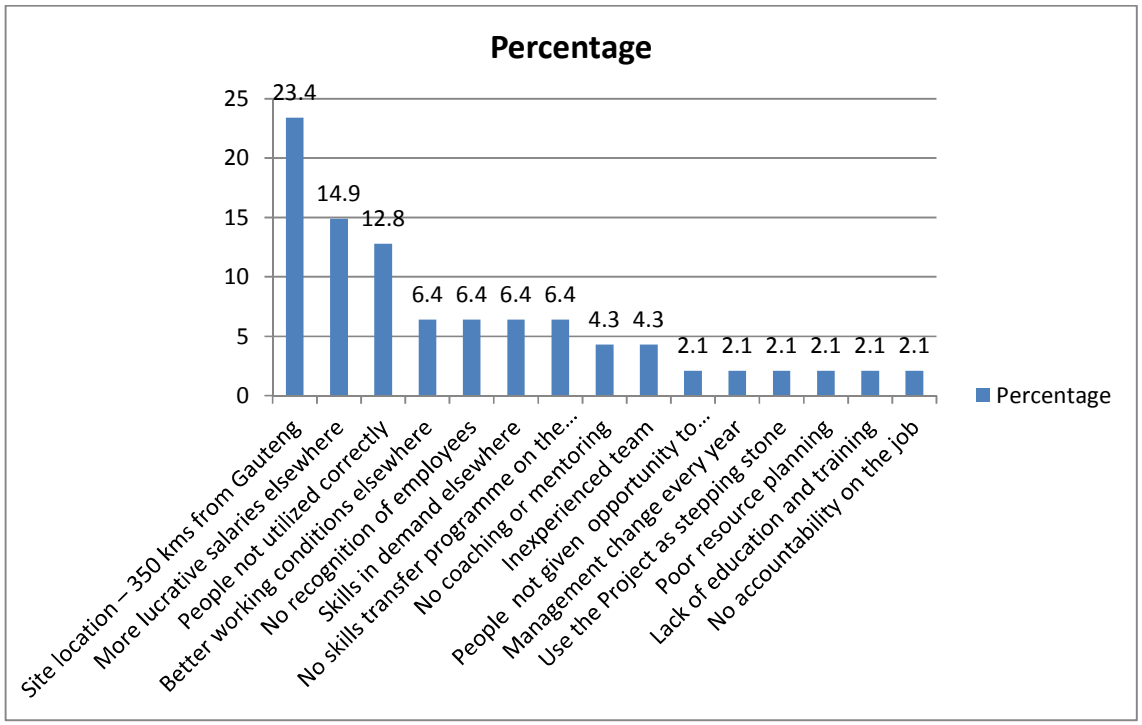
This section of the questionnaire included three open-ended questions that covered two major themes namely skills shortages and the Medupi training system (Appendix A). The respondents were also requested to make general comments on skills transfer on the Project. These open ended questions probed some of the closed-ended questions in other sections of the questionnaire and provided a richer data for analysis. The subsequent discussion is based on the two themes identified above.

Skills Shortages

Regarding the question on whether or not the respondents believe the primary reason for skills shortages on the Medupi Project is because the workforce is seeking better job opportunities elsewhere, nearly two-thirds (65.2 percent) agreed that this is the primary reason for skills shortages on the Project. Chi squared tests performed on the responses to this question found a statistically significant relationship between a respondent's gender and his/her response ($p = 0.04$). In particular, permanently employed male respondents tended to agree that skill shortages on the Project could be ascribed to high turnover and employees seeking

jobs elsewhere. Some of the reasons given for why respondents believed the workforce was seeking better opportunities elsewhere are listed in Figure 4.2:

Figure 4.2: Primary reasons for skills shortages



The 3 predominant reasons relate to site location, salary scales and incorrect utilization of personnel (as indicated in Figure 4.2). The site is located approximately 350 km. from Gauteng and many employees travel to site on a Sunday afternoon and return home on a Friday night. These employees are not with their families during the week days hence they are looking for jobs elsewhere that would not entail such a personal sacrifice. Eskom salary scales are the same whether one works on site or at head office; the only difference is that if one works on site, one receives an allowance, so the employees would prefer being at home in Gauteng and not receive the allowance. If employees are not appointed to appropriate positions, this implies incorrect staff utilization, and no or little job satisfaction, resulting in a high staff turnover and hence continual skill shortages on the Project.

The Medupi Training System (MTS)

Given the important role played by organizational training systems within an overall knowledge management policy, the second question asked, *"Do you think that new skills acquired by an employee through the Medupi Training System are relevant and can be effectively utilised on the Medupi Project?"* The MTS is documented in the Medupi Internal Training Procedure (Eskom PPZ 200 – 49029). It is a procedure that caters for all employees training needs on the Project. Less than 40 percent of the respondents indicated that a new skill acquired by an employee through the MTS is relevant and can be effectively utilized on the Medupi Project. Hence, the majority of respondents do not have faith in the MTS. Yet the latter is identified by Eskom as the primary vehicle for knowledge and skills transfer, and hence addressing skill shortages in the long term. Some of the comments made for or against the MTS are listed in Table 4.9 below.

Table 4.9: Effectiveness of the Medupi Training System

Effective because: • Linked to IDP (Individual Development Plan) • Hands on experience
Ineffective because: • Opportunity should be given to apply skills and skills be linked to job profiles • Not aware of training system • Working in silos and not sharing information • No commitment by individuals • No time to train staff on a fast track project • Used for stats purpose only, not meaningful

Regarding the effectiveness of the MTS, the majority of the respondents commented that there is no time on the Project to train staff, since it is a fast track project and the schedule deadlines are extremely tight. Thus in practice, there is limited time and opportunity to apply skills, impeding effective knowledge transfer. One of the positive

responses was that the MTS is aligned with the Individual Development Plan (IDP) that defines all the training requirements of the individual employees. The execution of the training requirements is done through the MTS.

4.4 Findings from the interviews

This section of Chapter Four reports on and discusses the responses received in the semi-structured interviews with selected respondents. There were two sets of questions which were directed at the local and the expatriate employees respectively (Appendix B). All the interviewees were male. There were 12 questions which were common to both groups and the local Eskom employees had a further 6 questions. The common questions ranged from skill shortages and motivation to learn to management support and succession planning. The additional questions for the expatriates included inter alia, the working relationships between expatriates and locals, Eskom's policy of recruiting expatriates etc. There were 2 expatriates and 4 locals from the total sample (48) who agreed to participate in the interview process. Given that the interviews were semi-structured, several ad hoc and follow up questions arose during the interview process and these are described where pertinent. The findings pertaining to skill shortages and utilization will be discussed first, followed by a presentation of the general themes arising from the interview responses.

4.4.1 Skills issues experienced on the Medupi Project

As outlined in Chapter One, an important objective of this research was to identify the nature, causes and consequences of skills shortages within Eskom in general, and their impact on the delivery and execution of the Medupi Project. This part of the discussion on the interview findings focuses on skills issues, in particular identifying the types, reasons and consequences of skills shortages for Eskom (Appendix B). The response by the organisation in terms of training, managerial support of training and the employment of contract staff and expatriates "experts" will be discussed in section 4.4.2.

Regarding the types of skills that are in short supply, the local respondents stated that there is a shortage of artisans, supervisors and contracts managers. As such, both technical engineering skills as well as management skills were believed to be in short supply, as indicated below:

Local 2…I would say the specific skills is boilermakers and artisans, so it is the technical categories I would view as being skill shortage. On the Eskom side probably contracts or construction project management skills…

Local 3…We have supervisors but I don't believe all of them are skilled enough to carry out their supervision work and then in terms of contracts managers, you might have Eskom people who understand SAP process and Eskom processes but their shortfall might be in terms of FIDIC. Then you have expatriates or external contracts managers whose experience is in FIDIC but they don't know the SAP process which creates conflict in terms of how it must be managed…

Similar to local opinion, the expatriates stated that there is a shortage of civil construction workers. Furthermore, they believed that most Eskom employees have the qualifications but no experience particularly in terms of management positions.

Expatriate 1…There is one obvious skill shortage in the civil area, there is not enough professional civil engineers to support the exercise with the occupancy certificate…

Expatriate 2…The civil group is the prime example on Medupi. I think we went through two or three different senior engineers, the last engineer was candidate A and she was an absolutely fantastic person, but she only had four years' experience and now all of a sudden she is sitting in a senior position. So she gets thrown in the management portion of it and she had too many things going on…

The locals stated that most of the employees do not have power plant experience; this includes both the expatriates and the locals. An example of this is that some of the Eskom employees work on Distribution and Transmission projects in Eskom and do not have the Generation project experience. Transmission means transmitting the

power to the national grid whilst Distribution refers to the distribution of electricity to municipalities and households. The Medupi Power Station is a Generation project, i.e. it focuses on generating electricity and the skills requirements are not the same as Distribution and Transmission. The majority of the expatriates too have never worked on a Generation Plant and hence they do not have the experience. Some of the expatriate respondents were likewise very candid about not having appropriate experience as observed below:

Local 3… In terms of expatriates some of them don't even know the power station, and that's the scary part. The complexity of building a power station is totally different from building a shopping centre, some of these guys have 20 years of shopping centre experience but they don't have power station experience…

Local 4… A lot of these guys (foreigners) are bridge and dam builders and not power station builders…

Expatriate 2… The difficulty is that Medupi is the first coal-fired power plant that Eskom has built in twenty years. So now everybody in the company is trying to develop their own skill set for building a coal-fired power plant…

The second question asked for respondents' opinions on the reasons why Eskom was experiencing skill shortages. One common point brought up by both the expatriates and the locals was upfront planning as this is related to the skills shortages on the Project. They stated that Eskom did not plan upfront for the Project hence the skills shortage. Another reason given by the expatriates was that engineers do not have enough time to develop their skills because they rotate from one discipline to the other and not gaining adequate skills.

Local 4… Upfront planning was not done because in the beginning of the project you have skills floating, you could have actually optimised those skills floating and say these are the training requirements that are needed and start planning them and build them for the future …

Expatriate 2…I don't think the engineers are being given long enough time to develop those skills where there are shortages. Typically what you would see is engineers come in and do a design and they do the design on a specific system and they develop skills. They develop skills in engineering design and some contract management and then typically on a project they would go to the field and have the opportunity to apply their skills…

The interviewees felt that employees were not held accountable for their work. For example, the engineers were not held accountable nor given due recognition for their designs; this caused them to seek better job opportunities elsewhere, exacerbating the skills shortages within Eskom. In addition, locals stated that management did not trust their own employees; they put their trust in consultants and contractors, this demotivated the employees and resulted in high staff turnover. For example, a consultant engineer and an Eskom engineer with the same qualifications share different roles; consultants are given positions of greater responsibility and accountability when compared to Eskom engineers.

Expatriate 2… So many of the engineers were not allowed to do things, they were held back. As far as skills shortages I believe that the engineers are well educated but I don't think they are held liable so they do not to use their skills where they need to, I think that's part of the problem...

Local 3… the organization lacks trust in their own people, so this is one of the issues that I would raise that Eskom lacks trust in its own people…

Respondents were also asked for their thoughts on the consequences of the various skill shortages for Eskom and the Project. The majority believed that the Medupi Project will have a late completion. This late completion will have a huge cost impact. It can further impact on the country through load shedding and black outs.

Local 3…Very much late completion and delays but also delays leading to time and cost now, time is money. It has a ripple effect because it also affects the country for electricity supply...

Local 4…The consequences could be delays of the project, uneconomical to construct the project anymore because the cost will increase drastically. Additional cost and time and you will have to get the foreigners but none of the foreigners can help us out as well...

4.4.2 Common themes emerging from the interviews

The one-on-one interview arrangement encouraged respondents to speak candidly about their experience working on the Medupi Project. There were several issues and concerns that were shared by both the local and expatriate respondents, and that emerged from the interviews. Some of these issues were also noted by previous researchers as discussed in the literature review in Chapter Two. These issues and themes will be discussed in this section. Hence this section summarizes the interviewee responses to the other questions posed to locals (question 4 onwards) and expatriates (Appendix B).

4.4.2.1 Mentoring and Succession Planning

The theme of mentoring and succession planning emerged from responses to questions relating to the existence and effectiveness of training programmes and succession planning programmes at Eskom. The locals stated that the skills gap must be identified first, it then must be linked to the Individual Development Plans or IDPs (which are discussed in more detail in section 4.4.2.8) and finally it is the line manager's responsibility to identify the skills gap within his / her department. In addition, there must be a proper mentoring system in place which can be audited.

Local 4… he has to identify gaps before he comes and say this is what I am going to do to make sure we close the gap, this is how I am going to transfer the skills and knowledge...

The expatriates stated that the less experienced employees should have mentors working with them.

Expatriate 1… in terms of mentorship and working alongside and under the guidance of a senior engineer, that is not happening…

Local 3… You can only benefit by allowing people to take responsibility in doing it, there are risks but provided you have good mentors to monitor these and guide them can you gain…

The skills and knowledge transfer procedure (Eskom PPZ265-92:6) states that the contractors shall serve as mentors whilst the Eskom employees serve as recipients. The respondents stated that there must be an experienced employee who can act as a mentor to the less experienced employee and guide that employee through the training process. Employees can only learn if they have an experienced mentor.

Expatriate 2…. I think the best bet is to get them somebody who is experienced and mentor them through the situation. Medupi would be a great project for a young engineer because you can see all the way in advance. It would be a great opportunity for young engineers to be mentored by somebody a little bit older and who knew what was going on……..if you mentor somebody and you have them on your heels all the time, if you have a good mentor that understands what to do and understands how to help people, slowly you start turning on the responsibilities to let that person make decisions with the checks and balances…

The underlying issue however, is whether or not there are appropriate mentors on the Project. Most of the respondents stated that there are no mentors on the Project.
The responses regarding the existence and implementation of succession planning were very negative, particularly from the locals who stated that there was no succession planning in place. They stated that it never worked in Eskom because the organization's Recruitment Policy does not cater for succession planning. According to Eskom policy, any individual who has been through the succession planning programme is not eligible for promotion. The Recruitment Policy stipulates that positions must be advertised before appointing anyone. Further studies may be supported by the line manager but not always supported by the Further Studies Committee. The latter is an internal Eskom committee which vets all applications from Eskom employees who wish to engage in further academic training. It

comprises members who are in management and non-management positions, and its mandate is to review the application and recommend for approval or alternatively reject the application.

Expatriate 1… I am not aware of formal succession programmes…

Local 1… Succession planning in Eskom has never worked through the talent boards that we have. We talk about promoting people once we have identified a potential successor and then you go to the recruitment policy and it's almost like Eskom's recruitment policy or procedure is preventing you from promoting somebody… You can't recruit today if you want an engineer tomorrow, it takes time to recruit and because of a lack of planning probably that was the shortfall…

Local 4…. In my previous time in Medupi there was talk about a succession plan but that never materialised….

Due to time constraints and the limited time on this fast-track project it is not possible to attend training programmes. The locals believed that the expatriates were never familiar with the Eskom system and were hiding information from the locals. It was further alleged that the expatriates are here on the Medupi Project to learn from the locals and make money. As stated in Chapter Two by Bjorkman and Schaap's (1994:150), those expatriates perceived as not professionally competent were resented for their high salaries thus hindering knowledge transfer.

4.4.2.2 Culture of the employees

Culture and possible differences in cultural awareness and understanding is a second theme that emerged from interviewee responses to questions dealing with training, and in particular, the effectiveness of training within Eskom. One of the expatriate interviewees was particularly sensitive to differences in cultural norms between foreigners and locals and how these may hinder communication, job-effectiveness and also knowledge transfer.

Expatriate 2…The difference here is there are so many different types of people, so many different types of cultures that it's not always easy for an expat to communicate with somebody from South Africa. The reason being that the cultures are so different and we don't necessarily always understand. I will give you a prime example of one of the engineers on the Medupi Project that I had a hard time dealing with because he would never look at me when I am having a conversation. It was tough to always make eye contact when having a conversation, it took 9 months before I realised that culturally, in his culture it's not proper to look at somebody that is in a higher position…

Expatriate 1…The cultural difference is a key issue, eleven national languages and English is number five on the list. The expats have the skills but the issue is the communication of the skills to locals...

According to some of the locals there was also a cultural barrier and some tension between the American and British expatriates.

Local 4… there is PB Power UK and USA, there is politics amongst the European and Americans, that's the first barrier that these guys have to go through…they actually force themselves to pretend as if they understand each other and trying to harvest our culture which becomes more difficult for them. The language barrier becomes a problem, the leadership skills become difficult, the translation becomes a difficulty on how they actually can do things here...

4.4.2.3 Training and training-related issues

Since a key research objective of this study was to address skills shortages, several questions pertained to whether and how Eskom was dealing with skills issues in terms of training initiatives and suggestions for effective training solutions. According to Kaplan and Norton (2004:55), human capital refers to the talents that employees possess. Talent is further described as the experience and the skills of an individual. Gadau (2012:669) states that human capital comprises intellect and competence. In order for the training to take place, there must be a training programme in place, and one can only train employees if one has the experience and knowledge to do so. In

summary, a mentor must be equipped with human capital for mentoring of employees or providing training to employees.

Local 3… there wasn't any programme in place to actually address training of people, skills transfer to address the shortages. People have been put in the deep end which is fine but they haven't been provided the tools or any equipment to assist them to develop themselves…

Local 1…You need to do a proper skills analysis; we need to unpack what we need to build Medupi. Now if we know what we need, that goes down into job profiles, they need to competency approve our people and say let's evaluate our people and see the person's competency and identify the gaps in terms of the training needs and requirements…

Expatriate 1…When it comes then to the more experienced resources it looks like they [Eskom] are losing interest in providing sufficient training…

Farsani et al (2012:1299) describes organizational capital as the environment provided by an organization for informal training such as on-the-job training. The expatriates and the locals confirmed that on-the-job training is crucial since Medupi is a construction project and employees are required to physically work on site.

Expatriate 1… Another element is also training on the job; you know that is where I see the biggest gap…. It is more on-the-job training and I am not even convinced that we always need to formalise it…

Expatriate 2… There is a time for training and a time for project work and you can get training in your project…

Local 2… I am a very strong believer in on-the-job training…

In the same light, one must remember that formal training programs are also recommended. In addition, the identification of the skills gap is crucial for successful training solutions.

Local 3…. The only way you can transfer is when you identify where the gaps are and currently the expatriates don't know the Eskom system, they don't know the South African system in terms of labour unions, in terms of how to approach them, Eskom systems in terms of SAP and Tender Committees… I believe that we are telling the foreigners what's going to be wrong with their decisions. There hasn't been much which they have been transferring to us. In actual fact we had to help them to make them understand how a power station is to be constructed….

4.4.2.4 Knowledge and knowledge transfer

The different types of knowledge, such as tacit and explicit knowledge for example, and the ease with which they could be transferred were discussed in Chapter Two. These concepts and related issues comprise the fourth theme of this section, and arise from responses to the question on identifying effective training solutions for Eskom (i.e. question 6 in Appendix B).

The issue of whether the human capital of those individuals working directly on a project, whether as trainees or as mentors, is related to the extent to which knowledge transfer takes place, was examined in previous studies (Wang et al, 2004). Human capital is intangible, so human capital relates to tacit knowledge and structural and relational capital relates to explicit knowledge. Dombrowski et al (2012:438) state that tacit knowledge is based on personal information including a person's experience and behavior, this type of knowledge is extremely difficult to communicate and transfer. The locals stated that knowledge was not being transferred to them by the expatriates. The expatriates had the knowledge stored in their heads and were not willing to transfer to the locals.

Local 3… If they are skilled, those that are skilled, they have the tendency to believe that they don't want to share with us. They think that South Africans are not capable of delivering on what's required. Their knowledge was in them and they didn't want to transfer it…

In addition, according to the locals, there was no formal process to transfer the tacit knowledge into explicit knowledge. Dombrowski *et al* (2012:438) state the explicit knowledge is verbal and can be stored and written; the user who attains this explicit knowledge can easily communicate and transfer it. Expatriates had to learn some explicit knowledge skills from attending workshops such as finance and contracts management training. The locals also stated that they had to provide the expatriates with other explicit knowledge, for example, on how to use Eskom processes such as the Systems Application Process (SAP) system. According to Hau *et al* (2013:357) social capital within employees plays a major part in knowledge sharing, and the impact of this knowledge sharing could be of a tacit or explicit nature.

The locals believed that the expatriates tended to withhold information to show that they are in control and they have the authority on the Project. Another reason for withholding information is to gain promotion.

Local 4… If you look into the expat, they don't know what they face, when someone from within Eskom organization comes up he becomes a threat to the expat and in such that instead of sharing knowledge the expat tries to actually sabotage that particular employee or the expat tries not to share the information…

Syed-Ikhsan and Rowland (2004:100) state that knowledge transfer and learning culture must be understood first before commencement of knowledge management programmes. Moreover, the attitudes of the individuals also play an important role in knowledge transfer; as noted above, local Eskom employees allege that most expatriates do not have a knowledge-sharing culture and are unwilling to transfer skills.

4.4.2.5 Trust between employees and employer

Trust between local and expatriate employees has been noted earlier in this section in the context of knowledge transfer. However, trust between Eskom management and its subordinates is another aspect that emerged from the interviews. This was in response to questions on employee motivation regarding skills ("are the employees

motivated to enhance / improve their skills on the project? Why or why not?") and goal-setting ("are clear goals set with employees regarding their career?").

Hau et al (2013:358) state that the three dimensions forming social capital are employee social ties, shared goals and social trust which affect the knowledge sharing. Beuningen and Schmeets (2013:74) describe social capital as all the resources to which individuals have access by utilizing their connections. Social capital plays a major role in knowledge transfer (Hau et al, 2013:357). Also, trust and participation have been recognized as crucial components of social capital. The locals stated that management did not trust their own employees; they put their trust in consultants and contractors. Although noted previously in this chapter, trust is important in an organization and deserving of recognition as an underlying issue causing tension at Eskom, as indicated in the comment below.

Local 4… although the skills are available within the organization, the organization lack trust in their own people, so this is one of the issues that I would raise to say reason been Eskom lack trust in their own people…

4.4.2.6 Staff turnover

The issue of staff turnover was raised in the questionnaire, and re-surfaced in the first interviewee's answer to another question. It was therefore decided to include the following question in subsequent interviews: "Was staff turnover a major issue at Eskom?" The general response was that staff turnover was high on the Project and this had led to poor continuity of work. Moreover, the expatriates worked 6 weeks and were off for 2 weeks; during those 2 weeks there was no continuity of work.

Local 3… the expat is a high turnover and we must remember that they come for 6 weeks and they are off for 2 weeks so you don't have that constant continuity whereas we are required to stay there every week every day permanently on site, so they have the luxury of working for a few weeks and then they go off…

The Medupi Project in general has a high staff turnover. Participants in this study believe that current employees are looking for better opportunities and are leaving

the project. The respondents confirmed that the site managers changed on a yearly basis.

Local 3… if you look along the 3 year line how many managers have been project managers then he has got new people in, I think they have been through 6 or 7 site managers now…

Expatriate 2…. I think that you know every time you turn around we would have a different engineer working for us…

Liebowitz and Megbolugbe (2003:189) state that knowledge management is the process of generating worth from an organization's intangible assets, in other words, how to build and develop knowledge internally and externally. Due to the staff turnover, the building and development of knowledge does not take place effectively within Eskom. This is also partly due to the contractual nature of employment, as suggested in the comment below:

Local 1… A lot of these guys working for PB Power are not employees of the company but they are contractors for the company. This is one of the reasons for high staff turnover because the guys are always looking for better opportunities. Not all of the foreign employees of PB Power are permanent employees of the company…

4.4.2.7 Time Constraints

The issue of time constraints arose out of an interviewee's feedback on the methods of skills transfer applicable to Eskom. It was decided to include the following question in the subsequent interviews which included, "Was there sufficient time allowed for training on the project". Given that the Medupi Project has been placed on a fast track status, the focus is on delivery and not on skills and knowledge transfer. The respondents confirmed that there is no time to transfer skills on the project.

Local 3… No time for training of its people…

Local 4… Also the project was urgent and no time for training employees...

Although Eskom's policies encourage training and skills transfer, currently this is not practical or feasible.

Local 3… In terms of Medupi, I don't think enough has been done in terms of training or setting up a programme and looking at the deficiencies and what can be done…

The employees' target dates and schedule for completion of activities is extremely tight and there is no time for training. The respondents further confirmed that skills transfer is written very well in the policies, but the actual execution of it never materialises. The Procedure for Development – Knowledge Management (Eskom 240-42427008) states "*This process entails developing an Eskom Strategy and Framework for KM in Eskom by analysing knowledge needs and the Eskom objectives. There after the KM framework is designed and built and KM values are communicated to the organisation."* There were also a few employees who were not aware of the Medupi Training System. Expatriate 2, and local 2, 3 and 4 were not aware of this system.

4.4.2.8 Individual Development Plan (IDP)

Many interviewees commented on the IDP in response to the question, "What methods of skills transfer (training) are being used to address the skill shortages in the short term?" An Individual Development Plan (IDP) describes all the training that an employee requires in the short, medium and long term, and every Eskom employee has an IDP. All training requirements and further studies are captured on the IDP. One local employee observed thet although one's line manager may support a particular training programme, it can be rejected at the Further Study Committee, which is tasked with reviewing and approving any further training of employees. Committee members do not comprise the direct line management and may not be fully aware of the training needs that are urgently required on the job. Some of the soft skills programmes included in the IDP's do not take place because of time constraints and other project priorities. The comment by one of the local employees refers to these various issues:

Local 1… There is a disconnect between what the manager supports and what your further study or bursary committee supports because a lot of the training programmes get vetted especially if it is external, by a further study bursary committee so you might find that the supervisor supports it and remember the supervisor is sometimes the third party contractor or it's a fixed term contractor that is managing our employees…

4.5 A Knowledge Transfer model for Medupi

The primary research objectives of this study are to explore perceptions regarding skill shortages, the employment of expatriate contract workers as a short-term measure to meet these skill shortages, the extent of knowledge transfer from the expatriates to the local employees and Eskom's policies and practices pertaining to training and skills development to manage skill shortages in the long term. Leimbach's (2010) Learning Transfer Model is used as a broad framework for identifying the critical factors that impact knowledge transfer within the context of the Medupi Power Station. Although the LTM posits three components as impacting knowledge transfer, it is the contention of this study that Organizational Alignment, the third component in the LTM, is one of the key determinants of the effectiveness of knowledge transfer at Eskom. In other words, the support that an individual receives from his/her superiors is the deciding factor in whether and to what degree learning and skills development occur.

Given the fact that the LTM is itself a generic model, that there are many interrelationships amongst the various factors and components of the LTM, and that the empirical context of Medupi is so complex, correlations between the various factors (responses to the statements in the questionnaire) were examined as a first step in identifying the most relevant variables for a model. The researcher then theorised the nature of these relationships based on the findings discussed in Chapter Four to identify possible dependent and explanatory variables. Regression analysis was then used to test various models and thereby identify a quantitative Knowledge Transfer model for Medupi.

The best-fit model is shown in Table 4.7. This model identifies statement 4 in section E of the questionnaire ("My immediate Line Manager provides an enabling work environment for me to utilise the use of new skills I have learnt") as a dependent variable based on the feedback in the questionnaires and the interviews that management support and on-the-job type of training were key factors in knowledge transfer in a construction environment. This was then hypothesized to depend on 7 explanatory variables as indicated in Table 4.10. These variables were chosen based on the correlations (i.e. statistical relevance) as well as the results that suggested that both individual (i.e. human capital) and organizational factors (management support) are strong predictors of knowledge transfer.

For example, the variable "senior management within the project is supportive of training for employees on the Medupi Project" has the highest predicted beta co-efficient (0.372) closely followed by "senior management within the Project provides an enabling work environment for the use of new skills" (0.303). This indicates that skills development needs to be prioritised at a senior management level before it is devolved for implementation by line management. Eskom's Individual Development Plan (IDP) policy was conceptualised at senior level and it is critical to the identification and execution of training needs. At the same time, individual motivation is equally important in determining the efficacy of training and skills transfer although the negative coefficient is somewhat unexpected (implying that line management provides (or attempts to provide) a more enabling work environment for less motivated employees, possibly in an effort to motivate employees.) The latter interpretation is more plausible given the strong positive coefficient for "I get excited when I think about trying to use my new learnt skills on the Project" indicating that enthusiastic employees view the support of their immediate superiors in a more favourable light. Finally, the more clearly are goals articulated in terms of the Project deliverables, the easier it is for line management to provide a supportive work environment (beta = 0.301).

Table 4.10: A Knowledge Transfer model for Medupi

Variable	Section/item in questionnaire	Beta coeff.	t	Sig.
Constant			-.789	.435
The skills on the Project are properly utilized	B2	-.105	-1.207	0.235
Employees are motivated to learn new skills or enhance their existing skills on the Medupi Project	C1	-.270	-2.988	.005
I get excited when I think about trying to use my new learnt skills on the Project	C3	.259	2.769	.009
Employees set goals within the Medupi Project that are achievable	D1	.175	1.875	.068
A goal can be set for each and every work task on the Project	D3	.301	3.339	.002
Senior Management within the project is supportive of training for employees on the Medupi Project	E1	.372	3.562	.001
Senior Management within the Project provides an enabling work environment for the use of new skills	E3	.303	2.568	.014

The overall fit of the model in terms of the Adjusted R squared is good at 0.717 – in other words, the model explains almost 72 percent of the variability in the dependent variable. Analysis of variance for the model yields a regression sum of squares of 40.596 with 7 degrees of freedom and an F test statistic for the regression of 17.659, the latter significant at the 95 percent level.

Although there were many issues and strong opinions regarding the role of expatriates, none of the variables that referred to expatriates show statistical

significance. This is somewhat surprising. These results could be interpreted as inferring strong theoretical support for the Knowledge Transfer model based on prior theoretical and empirical work of other researchers (i.e. human capital models, the LTM itself) and that these other factors play a more important role in knowledge transfer at Eskom than expatriates. Classroom seminars and workshops are of limited usefulness in power station construction. Knowledge transfer is more effective if immediate management has the latitude to provide a work environment that promotes on-the-job training. This is dependent on senior management's co-operation and support. Finally, as most education theories argue, learning is also contingent on individual motivation, enthusiasm and commitment.

4.6 Conclusion

In conclusion some of the common trends picked up on the survey was that expatriates believed that there are not enough skills in South Africa and that they are contributing towards closing the skills shortage. The majority of the local respondents confirmed that their experienced colleagues are not the expatriates. Another trend was that senior management does not provide an environment for the transferring of skills as this was confirmed by the majority of the respondents. One can agree that this is a fast-track Project and to create an environment for transferring of skills will be quite a difficult task. Lastly, it was believed that goals that were set on the Project were not achievable, although a goal could be set for each and every task on the Project. The Organizational Alignment which is the third component of the LTM was one of the key factors impacting on the degree to which learning and skills development occur. The best fit model identified the immediate line manager's ability to provide an enabling work environment. The major determinants of the latter were senior management support, individual motivation and Project goals that were clear and achievable. Chapter 5 deals with the conclusions and recommendations of this study.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This concluding chapter reviews the preceding chapters of the study and makes policy recommendations based on the results of the study. The overall aim of this research is to identify how skills shortages at Eskom can be managed both in the short and the long term with particular reference to the Medupi Project. The Learning Transfer Model (Leimbach 2010:83) is used as a framework to explore the factors that may influence knowledge transfer on the Medupi Project. The discussion in this final chapter focuses on four areas, namely: the nature, causes and history of engineering and technical skill shortages in South Africa; the failure of Eskom, as a major parastatal, to adopt and apply upfront planning in terms of its operations; the role played by national culture in how people interact within the work environment; and knowledge transfer within Eskom. Other findings from Chapter Four including those dealing with trust and time management issues within the organization have been subsumed in the discussion of the top 4 findings due to commonalities.

5.2 Overview of the study

Chapter One presented the introduction to the research and included the research objectives and the scope of the study. The theoretical framework and the empirical context of the study were discussed. In addition the history of Eskom, (the various Eskom divisions) and the background to the Medupi Project were described. The introduction to the research approach, sampling, data analysis and collection were outlined. Finally, an outline was provided of the key contact areas of the various chapters.

In Chapter Two, various theoretical underpinnings were explored in an attempt to ground the research. These included knowledge, knowledge management and the factors impacting knowledge transfer and knowledge management.The role of expatriates in knowledge transfer was discussed including their willingness to share knowledge and competencies. An overview was given of Intellectual Capital theory,

the Human Capital model of Kaplan and Norton, and Leimbach's (2010:83) Learning Transfer Model, which provided the framework for the empirical analysis of the research.

The research methodology used to conduct this study is discussed in Chapter Three. A mixed method approach was used that comprised quantitative and qualitative analysis. The instruments used to collect the primary data are a questionnaire and semi-structured interviews. The questionnaire was pre-tested for clarity and consistency and the final questionnaire shows reliability levels that are considered acceptable. Items in both instruments focus on issues such as management support, peer support, organization alignment and learning culture. The majority of the data is analyzed quantitatively although the responses to some of the open-ended questions are further probed in the interviews. The latter provided in-depth qualitative data. All ethical issues were dealt with in accordance to the Durban University of Technology and Eskom's policies on ethical standards. Questionnaires were emailed and hand delivered to the respondents whilst the interviews were conducted face-to-face with each individual privately.

The results of the study are presented and discussed in Chapter Four. All of the findings from the questionnaires were recorded on a spreadsheet and forwarded to the statistician for analysis using SPSS. Descriptive and inferential statistical analyses are given which included frequencies, cross-tabulations and relevant test statistics. Common themes emerged based on the responses in the questionnaires and interviews. These themes range from mentoring to staff turnover and are described in detail in Chapter Four. Implications of these themes are further discussed in this final chapter and recommendations are made which can be utilized in Eskom and in particular the Medupi Project environment to address skills and knowledge transfer issues.

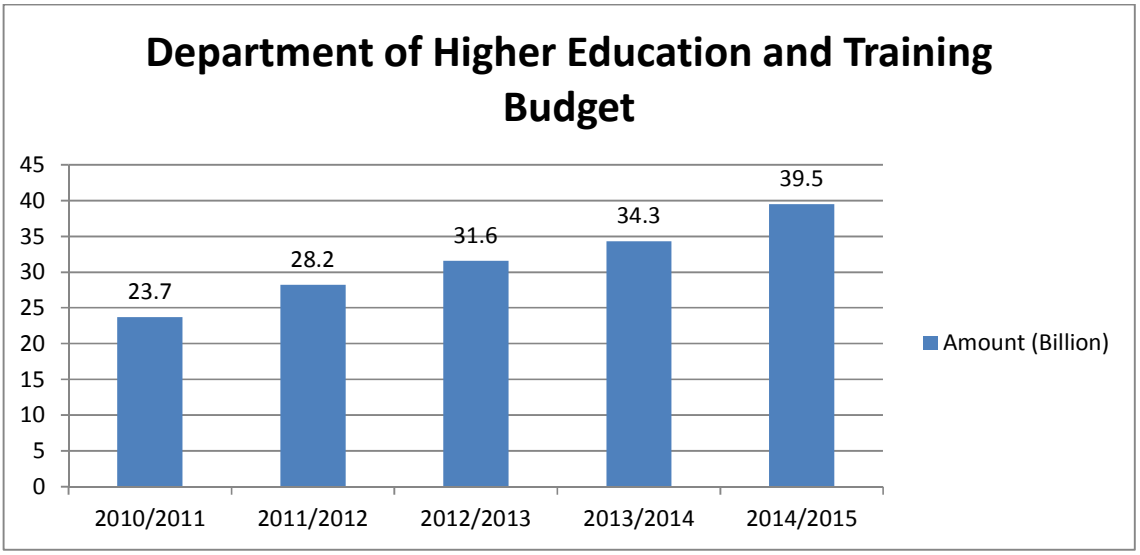
5.3 Skills Shortages

A key objective of the research is to identify the nature and causes of skills shortages experienced on the Medupi Project. The respondents stated in the interviews that there was a shortage of engineers, artisans and supervisors on the

Project. In addition, some of the employees, although having the qualifications, did not have the relevant Power Plant experience for such a complex project as Medupi. This shortage of technical skills has its roots in an overall shortage of engineering personnel in South Africa. It is also of grave concern thet almost one third of Eskom's artisans, technicians and engineers are approaching retirement (Gigaba 2011). According to Kopolo (2009:30), there was a declining trend in the number of students continuing with mathematics at high school, and this has been a contributing factor in the decline in the number of individuals who graduate with engineering degrees.

In recent years, the government has made science and engineering education a priority, as indicated in expenditures in the national budget. In 2010, the public higher education institutions produced 153 741 qualifications et all levels, with 74 612 qualifications in the human and social sciences as the highest numbers and 37 405 qualifications in science and technology being the lowest numbers. However in 2011, the higher education institutions produced 160 617 qualifications of which the highest was 46 100 from science and technology and the lowest was 32 484 being human and social sciences. (www.southafrica.info). The Minister of Higher Education and Training, Dr BE Nzimande in his 2012 budget speech stated, "*On the academic front, my department is committed to increasing the production of graduates in Engineering, the Natural Sciences, Human and Animal Health Sciences and Teacher Education in line with my performance agreement with the President"* (www.dst.gov.za). Figure 5.1 shows the Education and Training budget on a 5 year forecast.

Figure 5.1: Budget for Higher Education and Training

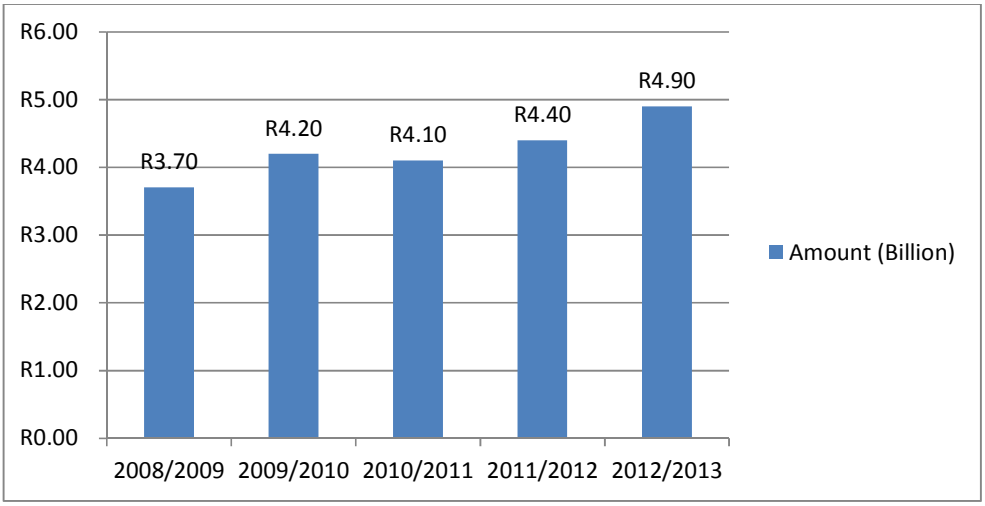


Source: own graph based on Department of Higher Education (www.southafrica.info)

Figure 5.1 indicates that the amount of funding into public higher education has been increasing steadily over the past 5 years. One of the largest increases has been in the current fiscal year with expenditure having increased by over 15 percent compared to the 2013/2014 period.

The South African Department of Science and Technology is responsible for research and innovation within South Africa (www.dst.gov.za). The Department's budget caters for 3 major areas namely; research, development and innovation; human capital and knowledge; and socio-economic partnerships. The research, development and innovation area focuses on development and implementation of research policies which include health, engineering and energy whist human capital focuses on the youth, learnerships, academies and science. Socio-economic partnerships deal with public assets and promoting sustainable livelihoods for South Africans. Spending on human capital totalled R1.7 billion in 2010/2011 and R1.9 billion in 2011/2012 (www.dst.gov.za). Figure 5.2 shows the expenditure for the Department of Science and Technology over the past 5 years (www.dst.gov.za). One can notice that the budget has increased every year with the exception of the 2010/2011 period.

Figure 5.2: Science and Technology Budget



Source: Own graph based on Science and Technology Budget (www.dst.gov.za)

Spending on science and technology shows an increasing trend in general, and human capital expenditure was almost 50 percent of total spending in 2011/2012. However, it is not clear what this spending on human capital entails e.g. scholarships in the science, engineering and technical fields, learner-ships, public-private partnerships etc.

Given the skills shortages and their impact on timeous completion of the Project, it is imperative that a proper skills and training program should be implemented on the Project. Gigaba (2013) states that Eskom had invested R780 million in training and had established 24 training centres throught the country. Several respondents in both the questionnaire and the interviews stated that they were not aware of or only vaguely aware of the Medupi Training System (MTS). Hence it is Eskom's responsibility to ensure thet all employees are informed of the various training opportunities so that they may register for training programs. Furthermore, the training should be job related, time should be allocated for the training and where possible on-the-job training should be applied. Although there was a training budget, many respondents complained that there was no time for training, given the long-standing delays and political pressure to complete Medupi.

5.4 Upfront Planning

According to the respondents, no upfront planning was done regarding skills. There were many skills “floating around” during the early stages of the Project that were not properly utilized. Henry (1997:38) defines planning as the gathering of all resources and developing a process to manage the activities during execution. Resources include people, plant and equipment; as noted in Chapter Two, this study focuses on the interactions of people (human capital) within an organization. Other aspects of planning involve considering the potentials and deciding on the options, making things happen and finally and most importantly, asking the right questions. Hence, an effective plan is fundamental for any successful project. Eskom has an internal procedure for deployment (Eskom 240-42853813:3) which states that workforce planning is a process utilised to align the organization’s priorities with the skills and capabilities of its workforce to meet the organizational objectives.

The procedure for deployment (Eskom 240-42853813:4) *“*determines the impacted areas and anticipated workforce, timing and magnitude of the project. It also assigns an importance/priority for addressing the potential impact of resources.”

The procedure specifically seeks to do the following (Eskom 240-42853813:4):
Define, confirm and prioritise workforce competencies / skills needs

- *Confirm workforce competencies / skills needs with the appropriate stakeholders and prioritise them for workforce planning*
- *Consider new demands for competencies / skills that may be imposed as a result of a change in strategic direction*

Develop an action plan for workforce planning that includes the allocation of resources, timelines and the effort required to complete each step above.

It is clear from the above thet although Eskom has a policy for skills management, this has not been implemented consistently, particularly with regards to human resources planning. Prior to commencement of the project a resource plan should be drawn up by the line managers according to the project execution plan. This resource plan must comprise all the resources required for the project; once the

resource plan is approved by senior management it should be executed and recruitment should take place. After all recruitment has been concluded, the resources should be allocated to the various disciplines on the project according to the resource plan, and thereafter the project commences. Having the correct resources prior to commencement of the project will enable the line managers to complete their tasks as per project plan. Given skills shortages locally, Eskom has been relying on expatriates to fill the skills gap in the short term, and the Workforce Deployment Procedure (Eskom 240-42853813) should be implemented in the long term.

5.5 Culture of the employees

In the literature and research on knowledge management and the factors that impact effective knowledge transfer, culture refers to values and beliefs of individuals, and is argued to be connected to learning (Gunduz and Ozcan, 2010:6). In this study, it is clear that issues and constraints pertaining to different cultures exist between local and expatriate employees (and to a certain extent amongst expatriates of different nationalities themselves). Ulvydiene (2013:217) states that people from different cultures do things differently and it is important to understand how culture influences behaviour. For example, several participants in this study note that adapting to the South African culture and understanding the various demographics and traditions within South Africa appeared problematic for certain expatriates. Awang-Rozaimie; Sahari and Ali, (2012:735) found that lack of cultural understanding may lead to uncertainty and communication problems. However, an expatriate who has wide experience dealing with people from different cultures, has a greater ability to share knowledge.

As stated by one of the expatriates, South Africa has eleven official languages and many different cultures. Merilainen (2008:85) conducted research involving expatriates working in three different companies in China. The aim was to examine the intercultural adjustment of the expatriates in China. Merilainen's (2008:126) findings suggest that intercultural adjustment in China is complex and expatriates should study and understand the foreign culture prior to the work assignment. Thus it is recommended that prior to an expatriate joining any project, the organization

should provide these individuals with relevant literature on the history, norms and practices of the country in both the social and the work environments. It is also possible that introductory lectures be provided on the South African culture and that social outings are arranged. For example, upon arrival, they should visit popular tourist destinations and then move to the real South African experience such as visiting townships and some middle class areas. Tiawijit (2007:65) conducted research with 102 expatriates employed at a multinational company in Bangkok, Thailand. Tiawijit (2007:88) concluded that cross-cultural training for the expatriates was crucial and could assist the expatriates in adjusting to a foreign country.

A large part of the workforce on Eskom construction projects comprise unskilled and semi-skilled workers and as an expatriate one has to understand how the township operates because most of the labourers live in these townships. This will give the expatriates a broad view of the South African culture and may facilitate communication and thereby improve working relations between South Africans and expatriates. Finally, Hesse (2011:49) conducted research with 102 expatriates working in non-European countries who were members of the social business network XING. The aim was to determine the different factors that influence cross-cultural adjustments. Hesse (2011:102) concludes that cross-cultural training should happen between home and host country. In addition, expatriates should be able to communicate in the host country language.

5.6 Knowledge transfer

According to the respondents in this study there is very little knowledge transfer taking place on the Project and nothing has been documented. Al-Qdah and Salim (2013:1189) state that explicit knowledge is simple to understand and easier to reproduce than tacit knowledge and comes in the form of documents and policies. In addition, tacit knowledge is stored in the heads of individuals, hard to formalize and is not easily reproduced. Since knowledge transfer and management are central to this study, the following relevant issues will be discussed: Eskom's internal policies such the skills deployment and skills transfer procedure; mentoring as a mechanism for skills transfer; and succession planning as a policy for managing skills shortages.

5.6.1 Skills Transfer Procedures

Eskom has an internal knowledge management policy, the Skills and Knowledge Transfer Procedure (Eskom PPZ265-92:2) that seeks to ensure that skills transfer is executed in the project environment. This procedure is written specifically for Eskom's Group Capital Division which is responsible for the Medupi Project. Due to the nature of the project environment and the skills shortages within Eskom, the organisation had to employ contractors, both local and expatriates to execute the works. The Skills and Knowledge Transfer procedure explicitly addresses the issue of knowledge transfer from skilled contractors to permanent Eskom employees as a long term objective. It consists of 2 phases, namely; the transfer of knowledge from contractors to Eskom as an entity in itself, and secondly, the transfer of experience and skills from contract employees to permanent Eskom employees.

Regarding the transfer of knowledge from skilled contactors to Eskom, the organisation has an approved list of contractors in the vendor list which it utilises from time to time or if and when the need arises for additional support on the projects. The transfer of knowledge shall be conducted et all phases of the project. This entails the use of shared documentation or instruction manuals for the project. The Skills and Knowledge Transfer Procedure (Eskom PPZ265-92:5) confirms that tacit knowledge shall be converted to explicit knowledge which will be shared with the rest of the project team. Since this does not appear to have been taking place as intended, it is recommended that the skills transfer procedures be monitored more closely to ensure that knowledge transfer does take place.

5.6.2 Mentoring within the organization

Regarding the mentoring process, this entails agreeing on skills transfer methodologies which will provide knowledge in the best possible manner. Contractors shall serve as mentors to individuals in Eskom. Both parties (Eskom and Contractor) shall agree on the names of key individuals including subject matter experts for the transfer of skills. Mentors could be expatriates or South Africans. The Human Resources Policy states that Eskom will provide employees' access to

mentors. The procedure for deployment states that senior management should monitor and review the process on mentoring. It further states that (Eskom 240-42853813:3):

Contractors / suppliers shall serve as mentors and coaches while individuals from Eskom shall be the recipient of identified knowledge. Selected subject matter experts or key discipline managers shall also serve as coaches and / or mentors for knowledge transfer methodologies and processes.

Regarding the effectiveness of mentoring as a mechanism for knowledge and skills transfer, Crawford, French and Lloyd-Walker (2013:1179) conducted research on generational experience at the workplace and mentoring for career development. Crawford et al (2013:1184) concluded that mentoring is key in transferring intergenerational knowledge, especially project based knowledge which is in the minds of the experts, also known as tacit knowledge. Hudson; Gray and Bloxham (2013:1296) conducted research involving 27 experienced mentors in Australia. The aim was to investigate the mentors' understanding of professional learning communities. Hudson et al (2013:1298) concluded that effective mentors are good communicators and are willing to share knowledge and resources. Regarding the Medupi Project, mentoring can work if the Project Management team implements it and follow the process until mentoring is completed and produces its desired results. Ultimately the commitment of all stakeholders may result in successful mentorship outcomes.

The knowledge transfer procedure clearly spells out what must be done for the transfer of skills; this policy is not utilized on site according to the respondents. It is very well written in the procedures but not materialized on site. All of these policies must be implemented on site by ensuring that management provides feedback and statistics on the knowledge transfer procedure. The employees should cater for the knowledge transfer in their IDP's and track the progress of all the activities on their IDP. If knowledge transfer, mentoring and succession planning do not take place then the employee should be able to escalate this issue to the training department at Head Office, which should be aware that policies are not implemented on site.

5.6.3 Succession Planning:

Succession planning refers to the identification of long term development of talent for selected employees (Virick and Greer, 2012:576). Regarding succession planning and mentoring, according to the respondents in the study, nothing is taking place on the project. One respondent stated that the Human Resources policy does not cater for succession planning because all vacancies must be advertised within Eskom and a succession plan does not warrant the individual a promotion. An employee should be identified upfront for succession planning; this would prepare the employee for the succession planning adventure. Tirdasari and Dhewanto (2012:70) conducted research involving 3 family businesses in the hospitality industry in Indonesia. The aim was to explore succession planning in a family business. Tirdasari and Dhewanto (2012:72) concluded that succession planning is effective if a successor is identified and sent for training prior to succession.

An employee should be allowed an opportunity to progress within the organization by means of succession planning. If a line manager develops a succession plan for an employee to take over the line manager's position upon retirement, that employee should be able to take over the line manager's position upon retirement based on the succession plan. This succession plan would motivate the employee to remain in the organization thus reducing staff turnover. Parker and Skitmore (2004:209) conducted research with project management companies in Australia and concluded that project management turnover disrupts performance hence succession planning can assist in alleviating this disruption. As stated above, the Human Resources policy at Eskom does not cater for succession planning.

5.7. Concluding comments

This chapter summarized the key results of the study presented in Chapter Four as a framework for providing possible recommendations and drawing conclusions. The discussion focused on four areas, namely: the nature, causes and history of engineering and technical skill shortages in South Africa; the failure of Eskom, as a major parastatal, to adopt and apply upfront planning in terms of its operations; the

role played by national culture in how people interact within the work environment; and knowledge transfer and training within Eskom. Other findings from Chapter Four including those dealing with trust and time management issues within the organization were also identified.

On the methodological front, the researcher could not identify the one theory that would explain the research. The research instruments were driven by the underlying research problem and issues on the Project and could not be pinned to a dominant theory or a pre-existing tried and tested instrument. The researcher used the Learning Transfer Model as the broad theoretical framework for guiding the items on the questionnaire as it was the best-fit model for the complex issues prompting this study. Whereas the questionnaire provided broad quantitative data, the individuals who were willing to be interviewed provided the voice for the undercurrents and deep-seated feelings about the problems at Medupi and senior management's response. Hence, the researcher realized that qualitative approaches and data can provide the Knowledge Transfer model for Medupi that emerged at the end of Chapter Four is perhaps the most telling.

Local opinions were that the expatriates were not as productive as senior management believes, both in terms of their actual contribution on the job and their ability to transfer knowledge and skills. It was the local employees' contention throughout that the expatriates do not have sufficient relevant knowledge in terms of power plant construction per se, and that this combined with a lack of understanding of the unique South African culture and "way of doing things" may lead to communication problems and expatriates being less productive than potentially possible. The Knowledge Transfer model for Medupi identifies both organizational (senior and line management) and individual commitment to learning as the determining factors in knowledge transfer. These findings and the policy recommendations emanating from the results will be forwarded to the participants and more importantly to the management team of the organization.

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7. APPENDICES

7.1 Appendix A

SKILLS SHORTAGES AND TRAINING ON THE MEDUPI POWER STATION PROJECT

Dear Participant

Please indicate with an X or write the information as required in the given space.

SECTION A: BIOGRAPHICAL INFORMATION

1. Gender:

Male		Female	

2. Race

White		Black		Indian		Coloured		Other	

If other, please specify:_____

3. Age:

Age Category	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61 +

4. Nationality: _____

5. Highest Qualification obtained:

Undergraduate Degree / Diploma	Honours / Post Graduate Diploma	Masters	Doctorate	Other (Please state)

6. Current job position/designation on the Medupi Power Station Project:

Job Title	Discipline	Indicate with X
Integration Manager		
Project Package Manager		
Lead Discipline Manager / Discipline Project Manager		
Risk Manager		
Cost Engineer		
Quantity Surveyor		
Supervisor		
Engineering Management		
Engineer		
Other		

If other, please describe: _____

7. Period employed at Eskom: _____years _____months

8. Current terms of employment at Eskom:

Contract		Permanent	

9. Number of years' experience in the construction industry: _____years _____months

10. Experience on the Medupi Power Station Project: _____ years_____months

SECTION B: SKILLS

Description	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. In terms of meeting the Medupi Project objectives, the necessary core and critical skills employed on the project are sufficient.					
2. The skills on the Project are properly utilized.					
3. The Project objectives are directly linked to the skills requirements.					
4. In terms of meeting the Project objectives, the necessary core and critical skills are available locally.					
5. Critical skills required on the Project are easily sourced from the current skills resource pool in SA.					
6. Expats largely contribute to the skills needed on the Project.					
7. Expats are adequately skilled to transfer skills needed by the Project staff.					
8. Skills are the key cause of delays on the Project.					
9. Mismatched / Less skilled employees are taking responsibility for the Project outputs.					

SECTION C: LEARNER READINESS

Description	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. Employees are motivated to learn new skills or enhance their existing skills on the Medupi Project.					
2. Before any training occurs, I have a good understanding of how it would benefit my job related development.					
3. I get excited when I think about trying to use my new learnt skills on the Project.					
4. New skills learnt from the Project are aligned to the employee's career.					
5. I am certain that I can utilize newly learnt skills on the Project.					

SECTION D: LEARNING TRANSFER DESIGN

Description	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. Employees set goals within the Medupi Project that are achievable.					
2. The structured setting of goals within the Medupi Project environment enables them to be achieved more easily.					
3. A goal can be set for each and every work task on the Project.					

SECTION E: ORGANIZATIONAL ALIGNMENT

Description	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1. Senior Management within the project is supportive of training for employees on the Medupi Project.					
2. My immediate Line Manager is supportive of training for me on the Medupi Project					
3. Senior Management within the Project provides an enabling work environment for the use of new skills.					
4. My immediate Line Manager provides an enabling work environment for me to utilise the use of new skills I have learnt.					
5. My colleagues encourage me to use the skills I have learned in training on the Project.					
6. My immediate Line Manager sets goals for me that encourage me to apply my training when working on the Project.					
7. Peer support is crucial for the learning and use of new skills.					
8. My experienced peers and colleagues are of a foreign nationality.					
9. The Medupi Project provides an enabling environment for skills transfer and learning.					
10. The Eskom recruitment policy supports fast and efficient employment of staff.					
11. The Medupi Training system (if in use) on the Project supports skills transfer.					

PLEASE SHARE YOUR THOUGHTS ON THE FOLLOWING:

- Do you think a primary reason for skills shortages on the Medupi Project is because the workforce (permanent and contractors) are seeking better job opportunities elsewhere? Please explain.

  _____
  _____
  _____
  _____
  _____
  _____

- Do you think that new skill acquired by an employee through the Medupi Training System are relevant and can be effectively utilised on the Medupi Project? Please explain.

  _____
  _____
  _____
  _____
  _____
  _____

- Is there anything else you wish to share regarding the skills shortages on the Medupi Project and how Eskom should address the situation?

  _____
  _____
  _____
  _____
  _____
  _____

THANK YOU FOR PARTICIPATING IN THIS RESEARCH

7.2 Appendix B

Interview Questions: All employees

1. What are the specific skill shortages being experienced on the Medupi Project?
2. Why is Eskom experiencing these skill shortages?
3. What are the consequences for Eskom and for the Medupi Project of these skill shortages?
4. What methods of skills transfer (training) are being used to address the skill shortages in the short term?
5. Are these methods effective? Why or why not?
6. What are your suggestions regarding effective training solutions for Eskom?
7. Are there any succession planning programmes to address the skills gap on the project in the long term?
8. In your opinion, does your manager support the training programmes on the project? Why do you think this is the case?
9. If answer is yes to question 8, does your manager allow you time off from the project in order to attend the training programmes?
10. Are the employees motivated to enhance / improve their skills on the project? Why or why not?
11. Does the new skill learnt from internal / external training add value to your current job and is it transferrable to the workplace?
12. Are clear goals set with employees regarding their career?

Additional Questions for local (South African) employees

1. Do you work directly with foreign/contract workers? If so, how would you describe your working relationship?
2. Do you think the local employees are learning/acquiring skills by working with the foreigners? Why?
3. Are there other benefits (apart from skills transfer) to you from working with foreign/contract workers? What are they?
4. How could skills transfer from foreign/contract workers to the locals be made more effective?
5. Do you think Eskom's policy of hiring foreigners is good/bad? Why?
6. Apart from employing foreigners on the Medupi Project, what other strategies could Eskom have used to ensure the project delivers?

7.3 Appendix C

Date:

18 February 2013

Enquiries:

Mr Len Turner

Telephone:

+27 11 800-5184

To: The Registrar

DUT

ETHICS CLEARANCE; CONFIRMATION OF ESKOM INTELLECTUAL PROPERTY RIGHTS AND SECURITY CLEARANCE FOR D TECH RESEARCH - MR YAGAMBRAM RAVU

This memorandum serves as an Ethics Clearance; Confirmation of Eskom Intellectual Property Rights and Security Clearance for the continuation of D Tech research by Mr Y Ravu. The research topic is "The management of skill shortages within Eskom: A case study of Medupi Power Station."

Mr Ravu has followed due internal processes in terms of gaining permission for this research.

It must be noted that this general clearance is for a limited period only, which will be for the rest of the financial year 2013 till end 2017, and in no way waives Eskom's Intellectual Property Rights. The researcher is permitted to publish the research in academic journals and other publications, and to make the final dissertation available to the DUT electronic repository.

Yours sincerely

Len Turner

Chief Consultant

Talent and Skills Management

7.4 Appendix D

LETTER OF INFORMATION

Title of the Research Study: Management of skill shortages within Eskom: A case study of Medupi Power Station

Principal Investigator/s/researcher: Sunny Ravu, M Comm (Project Management)

Co-Investigator/s/supervisor/s: KM Parker, PhD and M Reddy, PhD

Brief Introduction and Purpose of the Study: The purpose of this study is to investigate the management of skills shortages within Eskom, through a case study of the Medupi Power Station Project. Project Management, Construction Management and Engineering skills are in very short supply within South Africa, and Eskom is thus forced to form joint ventures with international construction companies in an effort to source highly skilled personnel from other countries. The concern is that these skilled contract personnel will soon leave the project once they have fulfilled their employment obligations. The research uses the Learning Transfer Model as a basis for exploring the factors that determine the success of learning and skills transfer from the highly skilled contract employees to Eskom's more permanent local employees.

Outline of the Procedures: There will be questionnaires and follow up interviews at a later stage. These will take place at the Medupi site and Eskom Megawatt Park offices at times that are convenient to the participant.

Risks or Discomforts to the Participant: None

Benefits: The results may be used to improve skills transfer throughout the Eskom projects.

Reason/s why the Participant May Be Withdrawn from the Study: The participants will be participating on a voluntary basis. There will be no consequences should the participants wish to withdraw from the study at any time.

Remuneration: None

Costs of the Study: Costs to the researcher are covered by the DUT to an amount of R15 000.

Confidentiality: The questionnaires are anonymous and no individual names/identities will be disclosed in the reporting of the results based on aggregated quantitative data (questionnaires) and qualitative data (interviews).

Research-related Injury: N/A

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher, S Ravu (tel no. 011 800 5587), my supervisor, KM Parker (tel no. 031 373 6824) or the Institutional Research Ethics administrator, L Deonarian on 031 373 2900. Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031 373 2382 or dvctip@dut.ac.za.

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, _____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: IREC 018/13,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature**

I, _____ (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**

_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**

_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**