UNIVERSITY OF KWAZULU-NATAL

Exploring challenges in recruiting and retaining civil engineers within the KwaZulu-Natal Department of Transport

by

Sibonisiwe Maggie NGCOBO

217071341

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Master of Public Administration

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College of Law and Management Studies

Supervisor: Prof TI Nzimakwe

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DECLARATION

I, **Sibonisiwe Maggie NGCOBO,** declare that

(i) The research reported in this dissertation, except where otherwise indicated, is my original research.

(ii) This dissertation has not been submitted for any degree or examination at any other university.

(iii) This dissertation does not contain any other person's data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

(iv) This dissertation does not contain any other person's writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

a) their words have been re-written but the general information attributed to them has been referenced; and
b) where their exact words have been used, their writing has been placed inside quotation marks, and referenced.

(v) This dissertation does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the bibliography section.

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Signature

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Date

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Date 2 November 2020

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ABSTRACT

The KwaZulu-Natal Department of Transport (KZN-DOT) is a provincial department and its core function is the construction, upgrading, maintenance of road infrastructure and the control of the provincial road network. The availability of competent, qualified, skilled, experienced engineering team in the field of engineering is critical for the achievement of KZNDOT objective. However, the shortage of engineers has been identified frequently as one of the key features that inhibiting the achievement of KZNDOT objective. In light of the above context the study was conducted with attempts to explore the challenges faced by the KZNDOT in recruiting and retaining engineers which are typically required for the achievement of the balanced road network for the KwaZulu-Natal province for social development and economic growth. The research was conducted at the KwaZulu-Natal Department of Transport. A qualitative research design was used and case study as the strategy whereby one–on-one interviews were used to collect data from the sampled respondents in order to understand the research problem. Data collected was analysed according to six phases of thematic analysis. Results of the study shows that engineers play critical role for the implementation and the delivery of road infrastructure projects. However, the challenge was that there is a shortage of engineers and undeniable challenge in recruiting and retaining engineers within the KZNDOT. It was clear from the findings that the current recruitment and retention policies are not yielding any results to curb the high vacancy rate of engineers as the department is experiencing the infrastructure backlog, poor performance reporting and under expenditure. Also, that there is a high staff migration because the department competes in the same limited pool of engineers with other levels of government and private sector. The study concluded that current policies and programs are not effective in addressing the challenge of recruiting and retaining engineers. Key recommendations were made based from the findings of the study among other was the review of policies. Also, for the department to consider to approach DPSA through the Office of the Premier for the consideration of a holistic, standardized and balanced remuneration model that allows the department to be on par with municipalities and private Sector with the aim of eliminating competition between these sectors and eliminate employee migration.

Key words: Recruitment, retention, civil engineers, technical staff, road infrastructure, KwaZulu-Natal Department of Transport

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LIST OF ABBREVIATIONS/ACRONYMS

CPD	Continuous Professional Development
DPSA	Department of Public Service Administration
ECSA	Engineering Council of South Africa
EXCO	Executive Committee
HR	Human Resource
HRM	Human Resource Management
KZNDOT	KwaZulu-Natal Department of Transport
MANCO	Management Committee
MOU	Memorandum of Understanding
OSD	Occupational Specific Dispensation
SA	South Africa
SETA	Sector Education & Training Authority
TIRS	Transport Infrastructure & Regional Services
WSP	Workplace Skills Plan

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CHAPTER ONE

INTRODUCTION AND OVERVIEW OF THE STUDY

1.1 INTRODUCTION

The KwaZulu-Natal Department of Transport (KZN-DoT) is a provincial department and its core function is the construction, upgrading and maintenance of road infrastructure, and the control of the provincial road network. It was established to ensure an equitable, balanced road network that will promote economic growth and social development within the province of KwaZulu-Natal (KZN). For this objective to be achieved, it requires a qualified, competent, skilled and experienced technical team in the field of engineering, which includes civil engineers, engineering technicians, artisans and mechanical engineers. However, the KZN-DoT faces a challenge in attracting and retaining civil engineers, who are regarded as scarce and in possession of the critical skills required to enable the department to achieve its mandate. This study seeks to explore why the KZN-DoT has such a challenge recruiting and retaining civil engineers. The study will also investigate factors that might contribute to this phenomenon. The background of the broad research problem will be used as the starting point in order for the researcher to be able to explore this phenomenon, and the phenomenon in the South African context will be compared with that of other global communities.

The phenomenon will then be narrowed down to the KZN-DoT where the study will be conducted. The relevant literature will be reviewed in order to compare, contrast and identify gaps in the findings of other authors/researchers on this phenomenon. It will be then followed by the research objectives, questions, theoretical framework or hypothesis if necessary, and the significance of and justification for the study will be presented. The chapter will further outline the research methodology that will be employed to conduct the study. Ethical consideration and clearance will be sought before the empirical study commences, and limitations that might arise during the study will be taken into consideration. Furthermore, findings, a conclusion and recommendations will be provided by the researcher at the end of the study.

1.2 BACKGROUND OF THE STUDY

The shortage of scarce and critical skills, specifically in the field of engineering, has been a global phenomenon over the last decade which has caused negative economic growth for many countries, industries, governments and other public or private employers (Van der Walt, Thasi, Jonck and Chipunza, 2016:146). Likewise, Petterson (2016:1) points out that the South African Institution of Civil Engineering (SAICE) has identified the shortage of civil engineering professionals as a worldwide problem and acknowledges that engineers with expertise are able to work across the world to apply their knowledge. Engineering has been considered as a scarce and critical skill in South Africa, and the shortage of engineers in general signifies a capacity and scarce skills disaster for the country (Lourens, 2015:36). The KZN-DoT is one of the provincial departments which was legislatively established in terms of Section 7 (Subsections 2 and 3) of the Public Service Act No. 103 of 1994 (RSA, 1994), and its core function is to provide an equitable, balanced road network in order to promote the economic growth and social development for the people of KwaZulu-Natal province.

During his budget speech in 2017/18, former Minister of Finance Pravin Gordhan allocated 10.8 billion Rands for the Provincial Roads Maintenance Grant, after considering the increase in road traffic volumes (Gordhan, 2017:18). The KZN-DoT was then allocated 8.5 per cent of the provincial budget by MEC for Finance for KwaZulu-Natal, Belinda Scott, in her 2017/18 budget speech and the bulk of that budget allocation was for the construction of roads and the maintenance of the provincial road network (Scott, 2017:18). In order for the KZN-DoT to ensure that the mandate given to it is achieved, it requires a team of qualified, experienced, competent and professionally registered engineers to implement these capital projects. However, the Department is currently severely under-resourced in terms of these engineers and is experiencing challenges in attracting and retaining such engineers.

1.3 RESEARCH PROBLEM / STATEMENT OF THE PROBLEM

The KZN-DoT's core function is to provide an equitable, balanced road network to ensure road safety for road users and to promote economic growth and social development for the province of KZN through a sound road network infrastructure. The KZN-DoT must align the priority projects and programmes according to global, national and provincial policy frameworks which all seek to address the triple global challenges of poverty, inequality and unemployment. For the KZN-DoT to effectively build the province's road network infrastructure it needs to be

fully capacitated with qualified, registered and experienced civil engineers. This is because civil engineers are responsible for the planning, designing, construction and maintenance of all engineering projects related to roads and bridges within the department.

Currently there are forty (40) vacant engineer's posts, with just three (3) permanently employed engineers, whilst twenty (20) candidate engineers are employed on contract because they are not yet professionally registered as engineers and have been placed on a mentorship programme for exposure to the field so that they can develop the experience and competency that will enable them to obtain their professional registration. Since the candidate engineers are not professionally registered and still on the mentorship programme, they cannot approve any road designs until they meet all of the inherent requirements for their positions, as stipulated in the Occupational Specific Dispensation Policy document (Resolution 5 of 2009). Over the past four years, three permanently employed engineers have exited the department due to retirement, thus drastically reducing the number of professionally registered engineers to just three to manage, monitor, support and provide construction and engineering projects. Attempts to recruit and retain engineers have been a challenge. If this study is not conducted the department might outsource the whole function to consultants, which might compromise the quality of the roads standards and create delays in starting projects, which will ultimately affect the budget allocation for this vital function. Also, the departmental targets might not be met so the performance output required might not be reported, which might then lead to the issuing of qualified reports by the Auditor General.

1.4 RESEARCH OBJECTIVES

The main aim of the study was to explore the factors that pose a challenge in attracting and retaining a qualified, competent, skilled and experienced technical team by the KwaZulu-Natal Department of Transport.

The objectives of the study were:

- To establish the contributing factors that hinder the recruitment and retention of engineers within the KwaZulu-Natal Department of Transport;
- To determine the significance of the recruitment and retention of engineers for infrastructure development by the KwaZulu-Natal Department of Transport;

- To assess the impact of vacant posts for civil engineers on achieving the objectives of the KwaZulu-Natal Department of Transport;
- To explore the effectiveness of the current intervention and measures in place in addressing the shortage of engineers within the KwaZulu-Natal Department of Transport; and
- To evaluate the turnaround or exit strategy intended for implementation to address the shortage of engineers in the KwaZulu-Natal Department of Transport.

1.5 RESEARCH QUESTIONS

The study attempted to answer the following key research questions:

- What are the factors that hinder the recruitment and retention of engineers within the KwaZulu-Natal Department of Transport?
- To what extent is the recruitment and retention of engineers necessary for infrastructure development in the KwaZulu-Natal Department of Transport?
- To what extent has the vacant post of civil engineers affected the achieving of objectives in the KwaZulu-Natal Department of Transport?
- What are the current interventions and measures in place to address the shortage of civil engineers in the KwaZulu-Natal Department of Transport?
- What is the turnaround strategy that the department has undertaken in addressing the shortage of engineers within the KwaZulu-Natal Department of Transport?

1.6 LITERATURE REVIEW

According to Mateus, Iwu and Allen-lle (2014:491), one of the structural limitations in connection with economic growth and unemployment in South Africa is the skills shortage. Mateus *et al.* (2014:491) further claim that the reason for the skills shortages in the country is the apartheid system, where skills were deeply separated along racial and gender lines which left blacks, especially females, in complete denial of access to skills development. Draai (2013:869) also concurs that the occurrence of scarce and critical skills was influenced by a number of socio-political issues which include the apartheid history of the country. The lack of highly skilled, qualified and expert practitioners in other fields has also been exacerbated by the prohibition of specific groups from having access to certain professions.

Currently there is still a scarcity of individuals with over eight years' experience in engineering due to the large number of professionals who have migrated to other countries due to the uncertainty of the political climate in South Africa during the post-democracy period (Barnard, 2013:67). Mateus *et al.* (2014:64) also make the case that a number of skilled South African professionals migrated to other countries because of uncertainty at the beginning of the new political dispensation. And so too does Van Dyk (2013:62), highlighting that the dire skills shortage is the result of employees with critical skills leaving organisations to find better opportunities beyond the borders of South Africa.

However, Sebola (2015:181) argues that the scarce skills shortage still closely links to the previous education system which was influenced by apartheid policies that promoted better education that benefited the white minority over the majority of the African populace. Sebola (2015:182) also highlights that the country relies on a highly skilled labour supply from international communities, while acknowledging the educational discourse that the development of South African teachers during and after apartheid is considered as a critical issue for debate. Mateus *et al.* (2014:492) also point out that the schooling structure must be to blame for the skills shortages in South Africa. Even though there have been several school reforms like curriculum changes in schools, the country still faces considerable skills shortages. The inadequate provision of childhood development, the low standard of education, declining Grade 12 pass rates, declining FET college enrolments, the shortage of resources, under-qualified teachers, poor teacher morale and weak management of schools all contribute towards the shortcomings in this area. Rasool, Botha and Bisschoff (2011:2; 2013:13) believe that all of these characteristics mean that there is no realistic hope of adequately addressing the skills shortages in the country.

Twalo (2010:836), however, makes the case that the Education for Self-Reliance Model is beneficial for the education system as a whole and to address the skills shortage, despite the many shortcomings in the system. Twalo (2010:836) explains that this model has responses to certain socio-economic questions for South Africa, as it can be used to reveal the South African education system. Twalo (2010) argues that it can address questions about the purpose of schools in the post-apartheid South African context, in relation to skills scarcity and job creation. In 2014 the Department of Higher Education and Training (DHET) released a statement that South Africa was in short supply of skilled professionals and listed the top 100

occupations that were affected by this skills shortage (DHET, 2014). This report revealed that education and training provision in South Africa had not yet been aligned with the required needs of the economy and that of the citizens. Oke and Aigbavboa (2018:304) explain the significance of this, stating that the resulting skills shortages have a significant impact on the development and socioeconomic growth of the country.

The mobility of skilled individuals has increased due to globalisation. Globalisation serves as an attractive force because of the international standards that are applicable to certain professions. Mateus *et al.* (2014:492) attest that globalisation and the move to a service economy made the movement of skilled people between countries easy.

Strydom (2014:28) argues that with the failure to pay attention to retaining talent, the most talented individuals in institutions are often lost because they attract the attention of head-hunters and are lured away by more attractive offers. Van der Walt *et al.* (2016:147) asserts that employee retention is becoming critical regarding skills shortages and this is evidenced by the high vacancy rates, increased costs associated with recruiting new talent, and changes in employees' attitudes. The author further says that scarce skills have created competition in employee attraction and retention, and this is regarded as the greatest challenge in human capital management.

1.6.1 Legislative Framework

Affirmative Action and Employment Equity Act No. 55 of 1998

The Affirmative Action Policy (AAP) was one of the intervention mechanisms which was introduced in 1994 to redress the imbalances of the past regarding the positioning, placement or development of potentially competent individuals with more population representation, while the Employment Equity Act (EEA) was established to address the imbalances of the past by creating equal job opportunities and fair treatment by eliminating unfair discrimination in employment (Samuel, 2012:174).

Samuel (2012:176) adds that the perceived injustice that was inherent in the implementation of AAP and EEA prompted high performing employees to voluntarily quit their jobs. Also, Samuel (2012) asserts that the unintended consequence of employment equity was the leakage from the economy of white graduates with scarce skills, and while EEA is a strategy to redress

previous the inequality in employment opportunities, the country cannot afford to lose many engineers.

Individuals that were affected by this policy presumed that their skills and talents were not appreciated by the government or organisations, and this resulted in many South African whites leaving the country to seek greener pastures (Rasool, 2012:13; Samuel, 2012:179; Van der Walt 2016:146). Nevertheless Nxumalo (2010:3), supported by the former Secretary-General of the African National Congress (ANC), Gwede Mantashe, and David Botha, Executive Director of the South African Institute of Civil Engineers (SAICE), suggests that there must be flexibility in the policy to assist South Africa to build a skills base as the effect of AA on the skills shortage has become critical.

In conducting this study, the aim by the researcher was to contribute to existing literature. Also, the researcher was able to incorporate the findings of this study with the existing findings of other scholars when making recommendations that might assist the KZN-DoT to address the challenge of the phenomenon at hand.

1.7 THEORETICAL FRAMEWORK

As the study lies in the Human Resource Management domain, the Human Capital Theory and the Economic Development Theory was employed during the study. The achievement of any organisation's strategic goals and the economic growth for any country relies not only on its physical resources but also on its human capital as they have competences, knowledge, skills and capabilities (Ekwoaba, Ikeijie and Ufoma, 2015:23). Ekwoaba *et al.* (2015) also claim that human capital significantly contributes to an organisation's success and constitutes a significant source of competitive advantage because of their collective skills, abilities and experience, coupled with the ability to deploy these in the interests of the organisation. In this modern age all human behaviour is based on the economic self-interest of individuals as they function freely within competitive markets. The Human Capital Theory emphasises the importance of education and training in order to compete in the new worldwide economy. Education and training have allowed the human capital to migrate for better job security, enrichment and recognition, which has left organisations like the KZN-DoT struggling to recruit and retain the engineers that are significant for the achievement of its objectives as it requires their specialised skills.

The Economic Development Theory was developed due to the problems of economic development, which are complex and multidimensional (Dang, 2015:11). The goal of the theory is to create economic growth in its simplest form, for a country to improve the quality of life of the citizenry, have sustainable development and achieve the Millennium Developmental Goals (Dang, 2015:12-14).

This study employed the Structural Change Theory. Structural Change Theory has been described by economists as the process by which the reallocation of labour from the agriculture to the industrial sector is the key source for economic growth. There are two approaches in this model, which are the Two-Sector (Lewis) Model and the Structural Change and Patterns of Development Model (Chenery). The Structural Change and Patterns of Development Model will be the focus of this study. The analysis of this model has identified that the acquisition of physical and human capital is among the conditions that are vital for economic growth, apart from savings and investments.

The pattern recommended by the Structural Change and Patterns of Development Model caused policy makers to shift their attention to human capital (Dang, 2015:17). The objective of the KZN-DoT is to provide and maintain the road infrastructure that will create economic growth for the people of KZN province, which is in line with the strategic framework and policies for sustainable development like the National Development Plan, the Provincial Growth Development Plan and the United Nations 2030 Agenda for Sustainable Development, aiming for the eradication of the triple challenges mentioned above. Human capital, which are engineers, are required for the road infrastructure development as they are responsible for the designing and construction of capital projects, providing the technical framework, planning and implementing the maintenance and rehabilitation of road infrastructure, projects, and budget management of all infrastructure projects. This theory recognises that the pattern of development can differ from one country to another depending on the factors, including the country's resources, endowment size, government objectives and government policies.

1.8 SIGNIFICANCE AND CONTRIBUTION OF THE STUDY

Currently the KZN-DoT is facing the challenge of recruiting and retaining the engineers that are required for ensuring the achievement of the main objective of the department, that of providing an equitable and balanced road network in order to promote the economic growth

and social development of the province of KwaZulu-Natal. The study is motivated by the fact that the researcher has witnessed first-hand the department's struggles to attract and retain engineers. This failure to secure and retain these engineers has played a key role in the minor and major infrastructure development projects, as it has led to an over reliance on engineering consultants over time. The over reliance on consultants has the potential to compromise the road standards in the province and has a major impact on the budget for projects, as much of the budget allocated is consumed by consultants' fees instead of the service delivery projects themselves.

The study further explored and assessed the department's current policies and procedures, as well as any other factors meant to assist the KZN-DoT, to determine if there are any negative factors which have contributed to the department's difficulties in attracting and retaining engineers. The qualified audit results obtained for the past three years imply that the lack of engineers (scarce skills) owing to the high vacancy rate has caused the poor management of capital projects and poor performance output reports for not reaching the departmental targets set (Auditor-General South Africa, 2017). If the study is not conducted the department might continue failing to deliver on its mandate, the provincial economy might not grow to address the triple challenges of poverty, inequality and unemployment, and the KZN-DoT might continue getting qualified audits at the end of the financial year. This will perpetuate the bad image of the department and the failure of management and may result in the KZN-DoT being placed under administration.

It is likely that the study will contribute by identifying the factors and gaps that pose a challenge in recruiting and retaining these engineers and provide recommendations to counter them. The study might assist policy practitioners and management to assess and evaluate the effectiveness of the implementation of the current policies regarding the recruitment, retention, training and development of scarce skills.

1.9 JUSTIFICATION AND RATIONALE FOR THE STUDY

The KZN-DoT has been advertising vacant posts for engineers since 2012 but has been unable to attract suitable candidates because the academically qualified applicants do not meet the inherent requirements outlined in the Occupational Specific Dispensation policy document (Resolution 5 of 2009). The importance of undertaking this study is that it will assist in

establishing the factors contributing to the KZN-DoT's inability to attract and retain scarce skills. Also, the researcher investigated the effectiveness of the current intervention measures aimed at overcoming this scarcity and will investigate if the current policies are being implemented effectively. Should the study not be conducted, any gaps that exist might never be identified and addressed. This may lead to cuts in budget allocations for road infrastructure capital projects, and the closure of departmental construction units as the work might be outsourced to consultants, which might in turn compromise the standard of the road in the province. Added to this, outsourcing has to follow the Supply Chain Management process, which is a very lengthy process which results in project delays.

1.10 RESEARCH METHODOLOGY

1.10.1 Research Design

This study was undertaken using an exploratory approach as the researcher sought to explore, describe and gain insight into the phenomenon, in order to produce a comprehensive explanation of the underlying factors and challenges facing the KZN-DoT when recruiting and retaining engineers

1.10.2 Research Approaches/Paradigms

The researcher used qualitative research approach which allowed the researcher to collect data that is rich in textual as it uses open-ended questions and indicate how the target population is experiencing the phenomenon.

1.10.3 Study Site

The study was conducted at the head office of the KZN-DoT Transport Infrastructure and Regional Services (TIRS) which is physically located at 224 Prince Alfred Street, Pietermaritzburg, KwaZulu-Natal. This site was chosen because it has the target population that has the specific characteristics that the researcher was looking for.

1.10.4 Target Population

The technical personnel at the TIRS branch were used as the target population. In addition to the employees at the DoT TIRS branch, the Skills Development Officer, Human Resource Practitioners, Management and executive members of the Engineering Council of South Africa also formed part of the targeted population. A sample was then drawn from this population.

1.10.5 Sampling Strategies

The researcher employed purposive, non-probability sampling methods based on the research questions and objectives, as the study needed maximum variation in sampling.

1.10.6 Sample Size

The sample size was determined using purposive sampling, and thereafter eighteen (18) participants were selected.

Table1.1: Research Participants

Research participants	**Target population**	**Number of participants**
Candidate Technicians (recently registered but on contract	5	2
Candidate Technicians (not registered, on contract)	51	2
Chief Engineers (permanently employed)	2	2
Candidate Engineers (on contract)	12	4
Management	4	2
Skills Development Officers	6	2
Human Resource Practitioners	3	2
Engineering Council of South Africa members (professional registering body for engineers and technicians)	Unknown	2
Total	83	18

Source: Researcher's own contribution

1.10.7 Data Collection Methods

Primary and secondary data were used and interrogated for the sake of this study. One-on-one interviews were conducted and used as the main approach to collect the primary data.

Secondary data were collected from historical files, policies, previous literature, the Internet, legislative frameworks and selection and recruitment meeting / interview minutes.

1.10.8 Data Quality Control

As the study was qualitative in nature, the concept of trustworthiness was used to measure its reliability and validity, and these were measured in terms of the dimensions of credibility, transferability, dependability and conformability.

1.11 ANALYSIS OF DATA

As the study was a qualitative study, the researcher employed thematic analysis to search for themes or patterns that appear across the data. Also, the researcher determined the perspectives and experiences of the target population, which involved a detailed reading of the collected data, identifying key areas of focus and classifying information to make a conclusive analysis.

1.12 ETHICAL CONSIDERATION

Ethical clearance was requested from the UKZN research office, and commencement of the study was dependent on the granting of ethical approval by this office. Gatekeeper's permission was sought from the Head of the KZN-DoT. The researcher was obligated to ensure that no person will be harmed or suffer adverse consequences from the research activities that were to be conducted, by upholding the ethical principles which are confidentiality, consent, respect for participants / persons and loyalty. The rights of the respondents were to be respected and protected, and no person was to be forced to participate in this study. Informed consent templates were signed by participants and kept for record purposes by the researcher. Participants were assured of their anonymity and confidentiality, and that these would be maintained throughout the study. The researcher would ensure that the participants have a clear understanding (verbal and written) of the research objectives, of how the data will be used, as well which data collection instruments (recording device) were to be used in the study. All collected data were scanned and filed manually in a secure location.

1.13 STUDY LIMITATIONS

The sample may not be an adequate representation of the desired population, and targeted participants may not want to participate in the study. The researcher also notes that time and availability will potentially be a limitation as the targeted population are mostly technical

employees who work on sites, so are not office bound. Those in management positions may also have limited time for interviews as they often have to attend strategic meetings. The researcher would have a meeting with the targeted population before the study begins, to introduce the purpose of the study, to assure the participants of their anonymity and to indicate how the study might contribute to addressing the phenomenon. Additional time was to be made available to accommodate those participants who are not readily accessible, and that might delay the study somewhat.

1.14 DEFINITION OF TERMS

Recruiting – is the procedure of discovering and appointing the most qualified applicant, to fill a vacant post in an organisation (Sinha and Thaly, 2013:142).

Retaining- to keep people who possess skills, expertise and capabilities that are crucial for the realisation of organisational objectives (Wirba, 2017:6).

Civil engineer – is a person whose training or profession is in the planning, designing, construction and maintenance of roads, bridges and similar structures (Peterson, 2016:2).

KwaZulu-Natal Department of Transport - is the provincial department responsible for the provincial road networks (RSA, 1996).

1.15 STRUCTURE OF THE DISSERTATION

The chapter outline is given below, based on the preceding research, objectives and questions.

Chapter One presents the research topic and the general introduction to the research. Also, it provides the background for the study, the research statements and the justification for and significance of the study. Further to the brief review of the study-related literature, it presents the research objectives and questions, addresses the research design and methodology to be used, and outlines how the data will be analysed and presented. Finally, the limitations of the study are outlined and relevant concepts are clarified.

Chapter Two deals with the review of the relevant literature and provides a theoretical perspective of the potential causes of the challenges regarding the recruitment and retention of

engineers. It also includes constructs that are related to the concept of employee recruitment and retention.

Chapter Three outlines the research methodology that will be used to conduct the research, and entails the research design, sampling, the methods of data collection and the data analysis technique to be used. The chapter also highlights the reasons for the preferred research method that will be used by the researcher to undertake the study.

Chapter Four presents the collected and analysed data from the study.

Chapter Five concludes the study by presenting the findings of this study in comparison with the literature and addressing the objectives of the study. A conclusion is then drawn from the analysed data. Recommendations based on the findings of the study are then presented to assist the KwaZulu-Natal Department of Transport in addressing the challenges faced in the recruitment and retention of engineers. Lastly, recommendations for future research are presented.

1.16 CONCLUSION

The chapter presented the overall purpose of the research, by outlining the background of the study and the research problem, by providing the research objectives, by providing the research questions, and by stating the significance of and the rationale for conducting the study. The chapter also provided the reader with a synopsis of the literature review, the research methodology to be employed in the study, and the key terms were defined. Potential limitations that could arise during the study were also presented. Lastly the structure of the dissertation was outlined.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

According to Creswell (2014:28), literature enables a researcher to share in the results of other studies that are closely related to the one they are undertaking. Creswell (2014) further explains that literature offers a framework for establishing the importance of research and provides a benchmark against which the outcomes and findings of new studies can be measured. Mouton (2013:87) adds that reviewing of existing works or the available body of knowledge assists a researcher to see how other scholars have investigated a research problem similar to their own. Saunders, Lewis and Thornhill (2012:74) also point out that a literature review assists a researcher in developing a good understanding and in gaining insight into similar research and the trends that have emerged regarding particular phenomena.

As such, this chapter will scrutinise the current literature on previous research conducted in this field of study. Reviewing the existing studies will enable the researcher to develop a systematic approach to analysing the factors contributing to the shortage of scarce skills, as well as identify interventions and strategies that can be adopted to curb the challenges in recruiting and retaining staff with scarce skills, particularly civil engineers.

2.2 THEORETICAL FRAMEWORK

Theory is the methodical description of the concepts, constructs and dealings of a specific process or phenomenon in each discipline, according to Du Plooy-Cilliers, Davis and Bezuidenhout (2014:37). These authors state that it is also a statement that explains how and why concepts are related. Furthermore, a theory forms the academic basis of every discipline and allows the information to be transformed into knowledge. Babbie (2011:6) concurs that theory is a proclamation describing the connection among between concepts, and also claim that theories offer explanantions about the patterns that are discovered in humans' social lives. As this study lies in the Human Resource Management domain, the Human Capital Theory and the Economic Development Theory have been employed.

2.2.1 Human Capital Theory

The achievement of any organisation's strategic goals and economic growth does not rely solely on its physical resources; the organisation also relies on its human capital as they have competences, knowledge, skills and capabilities (Ekwoaba *et al.*, 2015:23) required to achieve these ends. Furthermore, these authors claim that human capital significantly contributes to an organisation's success and also constitutes a significant source of competitive advantage because of their collective skills, abilities and experience, coupled with the ability to deploy these human assets in the interests of the organisation. Oaya, Ogbu and Remilekun (2017:32) make the case that currently organisations are more focused on securing suitable human capital because these employees are crucial and the most valuable assets of any organisation, as it is the performance of individual employees that will translate to the overall performance of the organisation.

Oaya *et al.* (2017) further argue that it is the individual employees' performance that converges to form the overall performance of an organisation. Almendarez (2011:1) points out that the Human Capital Theory stresses the importance of education and training as instruments that are essential for developing the productive capacity of the populace in order for them to compete in the new global economy. Almendarez (2011) also argues that this has allowed the human capital to migrate for better job security, enrichment and recognition, and this has left some organisations struggling to recruit and retain their staff, when they require staff with specialised skills for the achievement of their objectives. In the case of this study, civil engineers are the human capital who have the specialised skills necessary for the achievement of their organisation's objectives.

Similarly Boon, Eckdart, Lepak and Boselie (2018:36) assert that human capital is an asset that might assist organisations achieve competitive gains because: "(i) a firm's stock of human capital can be a key determinant of the quality of outputs and /or efficiency of operations (i.e. human capital resources are valuable); (ii) human capital resources are heterogeneously distributed among firms (i.e. human resources can be rare); and (iii) factors such as specificity, social complexity and casual ambiguity can hinder the flow of and replication of human resources (i.e. human capital resources can be difficult to imitate)". It is possible to see how Mamabolo, Kerrin and Kele (2017:3) agree with previous authors that human capital is the skills and knowledge demonstrated as the capability to perform a function in order to generate economic value.

Mamabolo *et al.* (2017) also claim that skills and knowledge can be human capital outcomes attained through investments in formal and informal training, applied learning and work experience, which lead to productivity and success. Gillies (2014:83) concurs with other authors that lately the meaning of human capital has broadened somewhat and is no longer simply knowledge or skills, but also comprises "competencies", "attributes" and "attitudes" such as "reliability, honesty, self-reliance and individual responsibility." The author emphasises that education remains centre stage as the main actor in developing human capital, so remains vital for "economic success" (Gillies, 2014). Devadas (2015:20-21) adds to the claims by Mamabolo *et al. (*2017), and point out that production and productivity have a number of facets. It is not merely the aspect of it being the responsibility of the labour force to ensure production and productivity. It also incorporates the number of heads or staff available to do the job, the number of working hours required and available to complete tasks or projects, and to a large extent the calibre of the labour force. The calibre of the labour force or human capital is determined by their knowledge and skills related to the job at hand, and this knowledge and skills can be further enhanced and developed.

Devadas (2015) further claims that with the conversion by several western countries, including the USA, from industrial zones to more progressive societies, knowledge and skills have become vital determents in enhancing outcomes at both the micro and macroeconomic levels. Also, human sophistication is a matter of education combined with other factors, and the progressive economies in these western countries (including the USA) have spent a massive amount of money on education. Wirba (2017:4) attests to this fact and argues that the Human Capital Theory's viewpoint suggests that the workforce is highly educated and inclined to learn more efficiently at work. Furthermore, the theory emphasises that the attainment of people with extraordinary skills, knowledge, experience and attitudes is a priority criterion in organisations nowadays.

2.2.2 Economic Development Theory

Economic Development Theories have been developed due to the problems observed with economic development. These are complex and multidimensional, with the goal of creating economic growth in its simplest form for a country to improve the quality of life for its citizenry, achieving sustainable development and achieving the Millennium Developmental Goals set out by the United Nations (Dang and Pheng, 2015:11-14). These authors mention

that there are two main theories of economic development, and they are: the Classical Theories of Economic Development and the Contemporary Theories of Economic Development. The researcher used the Classical Theories of Economic Development, which consist of four models: (i) The Linear Stages of Growth Model; (ii) The Structural Change Model; (iii) The International Dependence Model; and (iv) The Neoclassical Counter-Revolution Model. For the purpose of this study the researcher employed the Structural Change Model. The Structural Change Model has been described by The Economist as the process by which labour is reallocated from the agriculture to the industrial sector, as the key source for economic growth.

There are two approaches in this model, which are the Two-sector Model (of Lewis) and the Structural Change and Patterns of Development Model (by Chenery). The Structural Change and Patterns of Development Model is the focus of this study. The analysis of this model has identified that the acquisition of physical and human capital is among conditions that are vital for economic growth, apart from savings and investments. The pattern recommended by the structural change economists in earlier years has evolved, and the attention of policy makers has begun to change towards placing emphasis on human capital. The course of the structural changes and the patterns of development can differ between countries, and these changes and patterns are reliant on each country's specific sets of factors, comprising of the "country's resource endowment and size, its government's policies and objectives, the availability of external capital and technology and the international trade environment" (Dang and Pheng, 2015:17:18).

2.3. Recruitment

According to Sinha and Thaly (2013:142), recruitment is an important function of human recourse management which is defined as the "the process of searching for the right talent and stimulating them to apply for jobs in the organization. It is also the process of discovering the sources of personnel to meet the requirements of the staffing agenda and attracting the adequate number of employees, as to be able to make the effective selection among the application". According to Terea and Ngirande (2014:48), attraction and retention of quality employees has arisen as the major challenge in human capital and it is due to the competition of scarce skills. The authors further claim that this has led to a high turnover rate in most organisations, but particularly in public institutions. Likewise, Clearly (2017:3) also makes the case that attracting

a qualified and experienced workforce is becoming progressively difficult as companies all contest within the same pool of talent.

Clearly (2017) further observes that it has become difficult to engage engineering candidates as the majority of graduate engineers are now moving into other segments of life, leaving an ever-decreasing flow of knowledgeable and skilled engineers moving through the pipeline. Kepha, Mukulu and Waititu (2014:132) claim that recruitment is fundamental to any management practice and its failure can impose difficulties for any institution and result in adverse effects on its profitability or outputs and inappropriate levels of skills or staffing. Kepha *et al.* (2014) also emphasise that recruitment and selection permits an organisation to acquire the personnel it needs in order to realise its objectives. These authors qualify that the existence of an organisation is dependent on it realising certain objectives through human capital, which are acquired by recruitment and selection.

2.4. Retention

Retention is defined by Govaerts, Kyndt, Dochy and Baert (2011:37) as an effort made by an employer to keep desirable workers in order to realise business goals. Similarly, Tunje (2014:4) suggests that staff retention is the ability of the company to retain its workforce and prevent it from exiting the company, thus reducing staff turnover. Wirba (2017:6) defines the importance of employee retention in Small and Medium Enterprises (SMEs) from a customer's perspective, defining it as a "customer liking documentation, assurance, trust, willingness to recommend, and repurchase intentions, with the first four being emotional-cognitive preservation constructs, and the last two being behavioural intentions". Retention of employees and low workforce turnover helps in driving production efficiency and customer value (Schroeder, Goldstein and Rungtusanatham, 2013:104), and the retention startegy has to encompass the workforce at various levels within the organisation. This is because the loss of skilled individuals can disrupt business at any level, and besides the loss of production efficiency and customer value, staff turnover can also lead to increased staff replacement costs inside the organisation (Waruiru and Kagiri, 2015:3148).

Strydom, Schultz and Bezuidenhout (2014:28) argue that failure to pay attention to retaining talent is detrimental because the most talented individuals in institutions are often lost when they attract the attention of head-hunters and are lured away by more attractive offers. These authors further state that failure to recognise the link between the retention and acquisition of

talent weakens an organisation's ability to measure the success of its management initiatives. Van der Walt *et al.* (2016:147) concur that employee retention is becoming critical in terms of skills shortages, and it is evidenced by high vacancy rates, increased costs associated with recruiting new talent, and changes in employee attitudes. Van der Walt *et al.* (2016) add that scarce skills have created competition in employee attraction and retention, and regard this competition as the greatest challenge in human capital management.

According to Van der Walt *et al.* (2016), skilled employees now operate in a world that is characterised by unprecedented levels of talent mobility, and the extent to which an organisation can retain skilled employees is greatly challenged by its ability to ensure job satisfaction. Mbah and Ikemefuna (2012:277) have found that the unmanaged exiting of employees from an organisation for various reasons also has a negative impact on the individual staff members that choose to remain with the organisation or are unable to leave, as it affects them socially and psychologically. Mbah and Ikemefuna (2012) also report that employee turnover is costly from a business outlook, and state that voluntary leaving of staff signifies an exodus of human capital assets from an organisation. On top of replacement costs, this exodus affects perfomance output in some manner. Output either decreases or it is sustained at the cost of overtime, and it is having to work overtime that affects the remaining employees (Mbah and Ikemefuna, 2012).

2.5. CAUSES OF SKILLS SHORTAGES: CIVIL ENGINEERS

According to the Asia-Pacific Economic Co-operation (APEC) Human Resources Development Working Group (2014:3), "skill shortages exist when employers are unable to fill or have considerable difficulty filling vacancies for an occupation, or significant specialised skill needs within that occupation, at current levels of remuneration and conditions of employment, and in reasonably accessible locations". Furthermore, the APEC report asserts that there is substantial evidence from all points of the world indicating that attracting skilled human resources will remain a major barrier to global competitiveness. The international trends advocate that the skills shortage is a global phenomenon, and employers globally have expressed their hopelessness regarding the shortage of skilled professionals in various sectors of the economy (Chetty, Bird and Lawless 2016:3).

Chetty *et al.* (2016) claim that Australia is faced with service occupation and skilled trade deficits, and Europe is concerned with skills imbalances for anticipated growth, while in the United States there is a mismatch between the needs of industry and graduate attributes. All these concerns are echoed in South Africa, but with the inclusion of the HIV/AIDS epidemic and increasing demands driven by growth, combined with supply pressures. Mateus *et al.* (2014:63-64) also make the point that over and above sharing all the challenges that are being experienced by other countries, Africa and South Africa also have to contend with HIV/AIDS. HIV/AIDS poses massive socioeconomic development challenges as it has been estimated that 71 per cent of the deaths between the ages of 15-49 are as a result of AIDS. There is thus devastation in the young and middle-aged populace who should be filling the skills gaps.

Van der Walt *et al.* (2016:146) report that the shortage of scarce and critical skills, specifically in the field of engineering, has been a global phenomenon for decades which has caused a negative economic growth for many countries, industries, governments and other public or private employers. Van der Walt *et al.* (2016) also state that the South African economy has been crippled by the severe skills shortages, particularly in the mining sector as this sector is regarded as the key driver of the country's economy. Van der Walt *et al.* (2016) elaborate on this, stating that the Mining Qualifications Authority in 2014 identified 149 occupations in which skills shortages were being experienced. The skills shortage affected 3,054 positions, and the occupations most severely affected were those of mining engineer, geologist rock engineer, mechanical engineer and surveyor.

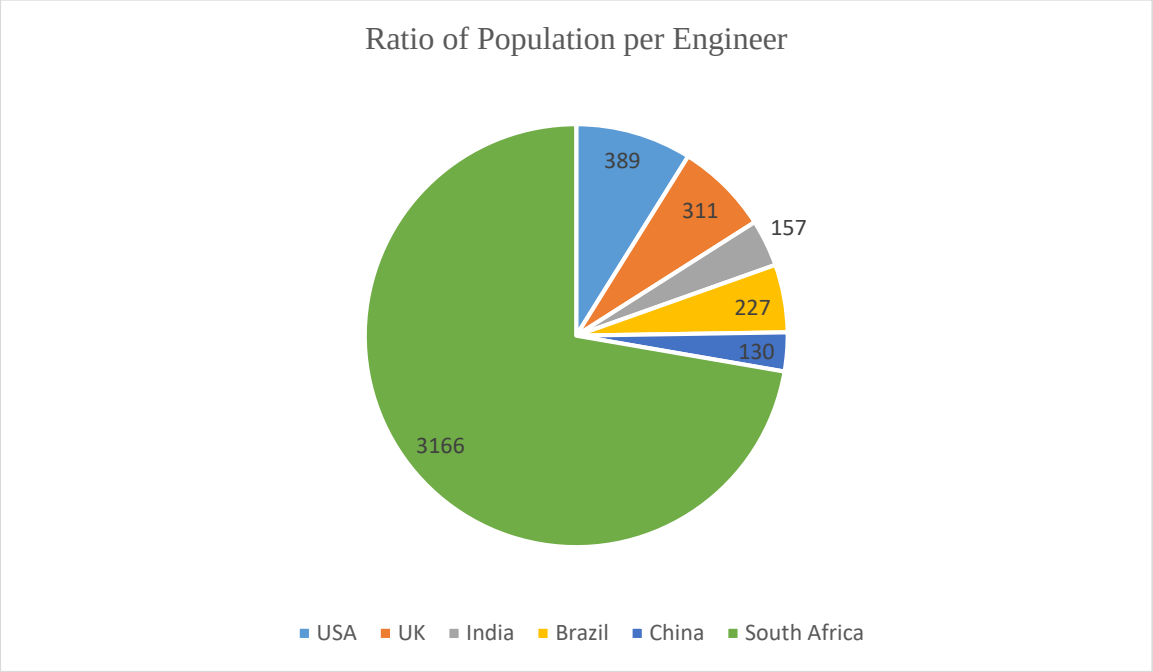
Forty-one per cent of the critical-skills shortages in the nation have been experienced in engineering divisions, comprising but not limited to the categories of technician and artisan. Peterson (2016:1-2) points out that according to the National Scarce Skills List that was released in 2014 by government, engineers topped the list of critical scare skills, and two years down the line engineers are still in short supply. Peterson (2016) adds that according to the South African Institution of Civil Engineering (SAICE), the shortage of civil engineering professionals is a worldwide problem and acknowledges that engineers with expertise are able to work across the world to apply their knowledge. This accounts for some of the loss of skills in the country, however, Peterson (2016) also claims that there are unemployed engineers in the country despite the dire need for engineering capacity to fulfil the needs of SA outlined in the National Development Plan.

According to Peterson (2016), SAICE reports that it continuously receives requests from civil engineering professional for assistance in finding jobs, but the engineering students are unable to secure sustainable jobs for in-service training and post-graduation experience. Estache and Garsous (2012:1) report that globally countries, employers and institutions continuously express their unhappiness regarding the shortage of skilled professionals for economic activities in various sectors, particularly in infrastructure. Countries like Australia, members of the European Union, and in Central Europe, the USA and Africa are all faced with skills shortages in broad occupational areas (Mateus *et al.,* 2014:63). According to Watermeyer and Pillay (2012:47), SAICE has published a book which scrutinises the imbalances within the civil engineering profession, and this publication concludes that the "critical skills shortage is mainly for experienced civil engineering professionals, particularly mid-career civil engineers responsible for production".

Watermeyer and Pillay (2012) in their book further suggest that in order to address the demand in civil engineering, 285 engineers and 374 technicians need to be produced annually. The Engineering Council of South Africa also confirms the needs for more engineering graduates in its first newsletter that was published in 2010, where its President is quoted saying: "currently South Africa has one engineer for every 3 100 people compared with Germany with one engineer for every 200 people and in countries like Japan, UK and USA the ratio is 1:310". This implies that South Africa needs to produce ten times more engineers in order to compete favourably. Watermeyer and Pillay (2012:48) continue, pointing out that the Engineering Council of South Africa (ECSA) has proclaimed that "the international benchmark of an average population per engineer shows that South Africa lags behind other developing countries".

In South Africa, 1 engineer services 3 166 people, compared to Brazil's 227 and Malaysia's 543 people per engineer. Patel (2017:1) also makes the point that according to ECSA, the global standard of engineers per population indicates that South Africa has 1 engineer per 2600 people compared to global norms, where 1 engineer serves 40 people. Patel (2017:1) also claims that there are just above "16 000 registered specialized engineers in the country. The discrepancy in the benchmark points to one thing: South Africa is severely under-engineered". The diagram below indicates the comparison ratio of population per engineer in different countries.

Figure 2.1: Population per Engineer Comparison in Selected Countries



Source: Adopted from Nxumalo (2010:3)

Maelekanyo, Tshilongamulenzhe, Coetzee and Masenge (2013:1-2) also make the point that the challenge of the skills shortage in South Africa is threatening job opportunities and hindering the country's long–term economic growth, adding that the skilled workforce is a crucial determinant of universal competiveness. However, Maelekanyo *et al.* (2013) have established that there is a lack of structured and sufficiently monitored practical work exposure in the workplace, and that quality checks do not thoroughly check what is actually happening during the training of newly graduated engineers and artisans completing their work experience after leaving university and technical college. This lack of subject matter often reduces the process of quality assurance and these graduates do not gain enough experience to function effectively in the field. Following on from this, Heyns and Luke (2012:107) point out that the resulting unavailability of a skilled workforce is the key limitation to the growth of business operations in South Africa. Furthermore, Heyns and Luke (2012) have also found that the shortage of skills is a global phenomenon for both developing and developed countries, and it has become difficult for many countries to retain their available talent. The following are the purported factors that have caused the shortages of scarce skills in South Africa.

2.5.1 Apartheid and Democracy Dispensations

According to Mateus *et al.* (2014:491), the biggest limitation of economic growth and unemployment in South Africa is the skills shortage. These authors assert that the reason for the skills shortage in South Africa is the apartheid system, where skills were separated along racial and gender lines and left blacks, especially black females, without access to skills development. Likewise, Draai and Oshonoyi (2013:869) attest that the advent of the scarcity of critical skills was influenced by a number of socio-political issues, which included the apartheid history of the country. Draai and Oshonoyi (2013) also assert that the lack of highly skilled, qualified and expert practitioners in various fields is exacerbated by the previous prohibition of specific population groups from having access to certain professions. However, in addition to this the current scarcity of individuals with over eight years of experience in engineering is also due to a large number of engineering professionals having migrated to other countries due to the political climate in South Africa post-democracy (Barnard, 2013:67).

2.5.2 Migration / Brain-drain and Globalisation

Mateus *et al.* (2014:64) also make the case that several skilled South African professionals migrated to other countries because of uncertainty following the introduction of the new political dispensation. Van Dyk, Coetzee and Tebele (2013:62-63) concur with this by highlighting that the dire skills shortage is the result of employees with critical skills leaving their organisations to find better opportunities beyond the borders of South Africa, otherwise known as a "brain-drain". Van Dyk *et al.* (2013) go on to suggest valuable ways to overcome the skills shortages in South African organisations: Gain cognisance of the relationship between the employees' organisational commitment and their perceived job embeddedness; and assess the diversity of employees in terms of their tenure, race, job level, gender and marital status, because employees and their motivators for employment with specific organisations will differ. Van Dyk *et al.* (2013) suggest that such information can be used to influence the design of effective strategies for retaining scarce and critical skills in the multicultural South African organisational environment.

Rasool *et al.* (2012:13) assert that the mobility of skilled individuals has increased due to globalisation. Globalisation serves as an attractive force because of the international standards that are applicable to certain professions. Also, Rassool *et al.* (2012) point out that the incentive deals offered by developed countries like Canada, the USA, New Zealand and Great Britain

draw highly-skilled and highly educated South Africans with advanced occupational skills. Mateus *et al.* (2014:492) agree that globalisation and the move to a service economy have made the movement of skilled people between countries easy. Mateus *et al.* (2014) conclude that the brain drain has led to the loss of knowledgeable and technical individuals, and this has had a negative impact on the economy of the country.

2.5.3 Education system

In addition to the "brain-drain", Sebola (2015:181) argues that the scarce skills shortages still closely link to the previous education system which was influenced by apartheid policies that promoted better education to benefit the white minority at the expense of the majority of the African populace. As a result the country continues to rely on a highly skilled labour supply from international communities and Sebola (2015:182) states that the development of South African teachers is a critical issue that needs to be addressed. Similarly, Lourens (2015:38) states that the briefing document from ECSA also acknowledges the influence of schooling on racial representation and the number of students in engineering in the following statement:

> *South Africa faces a shortage of high-level engineering skills and there is an ongoing need to transform the profession to ensure greater representation. Currently the pipeline of qualified candidates from the school system into science, engineering and technology (SET) fields in higher education is constrained by the poor quality of schooling, and many entering students, although in the top decile of their cohort, are academically under-prepared and financially disadvantaged. Currently less than a third of all engineering students in Bachelor programmes graduate within the regulation time and under two thirds graduate within six years. For African students and for range of reasons, throughput and graduation rates are even less satisfactory. Just under a third of African students graduate in five years, as opposed to 64% of white students.*

In relation to these concerns, Lourens (2015) persuades the Higher Education Department to implement actions to draw more learners to the engineering field and to develop methods and interventions to assist underprepared learners to effectively complete their engineering courses.

Mateus *et al.* (2014:492) also point out that the schooling structure must be blamed for the skills shortages in South Africa. Rasool *et al.* (2011:2; 2012:13) argue that although there have been several school reforms such as curriculum changes in schools, the country still faces numerous challenges and considerable skills shortages. They argue that the education system is characterised by low education standards, inadequate provision of childhood development, declining Grade 12 pass rates, declining enrolments in FET colleges, shortages of resources, under-qualified teachers, poor teacher morale, and weak school management. According to the South African Civil Society Information Service (SACSIS), all these challenges are impediments to the production of skills that the economy needs (Rasool *et al.*, 2011:2; 2012:13).

Nyatsumba (2017:3) also makes the point that the present education system is failing the country, taking into consideration the number of pupils writing Mathematics and meeting the basic requirements for admission to engineering programmes. Nyatsumba (2017) adds that the mandatory subjects required for acceptance into engineering courses are Mathematics, Physical Science and English, and that there is a lack of career guidance for students about the minimum entry prerequisites and the duration of higher education courses for all of the professional engineering qualifications and disciplines.

Twalo (2010:836) reports on the Education for Self-Reliance Model, arguing that it still benefits the country despite its problems. Twalo (2010) explains that this model has responses to certain socio-economic questions in South Africa as it can be used to reveal the South African education system. Twalo (2010) argues that it can address questions about the purpose of schools in the post-apartheid South African context in relation to skills scarcity and job creation. In 2014 the Department of Higher Education released a comment that South Africa was in short supply of the top 100 occupations that were listed. This report revealed that education and training provision in South Africa had not been aligned with the required needs of the economy and that of the citizens, and Oke and Aigbavboa (2018:304) caution that skills shortages do indeed have a significant impact on the development and socioeconomic growth of a country.

2.5.4 Skills Mismatch

A skills mismatch exists when skills are not available in areas where they are needed most. Todd (2013:3) reports on this, stating that some scholars and consultants debate on the existence of a persistent shortage of skilful workers. A skill mismatch can arise when there is a geographical mismatch between the available talent / skills; when talent resides in areas with a slight demand for their skills or in areas with an excess of the same talent, or when the best and brightest employees (talent) do not live where their proficiency is needed (Todd, 2013). Mavomaras (2013:1) concurs with Todd (2013) regarding the two main reasons why specific parts of the economy experience a shortage in skills: Firstly, there might just not be enough people with the exact skill required. Secondly, the skills might exist but there is a skill disparity issue. According to TRS Staffing Solutions (2017:1-2), there are a multitude of factors that contribute to organisations finding it difficult to attract qualified and experienced engineering candidates, and one of them is that engineering graduates are drawn to other sectors.

Fundamentally, engineering graduates are not being orientated to the exhilarating prospects within their particular field, and they may be being exposed to opportunities in other careers / fields. Ngcwangu and Balwanz (2014:16) have ascertained that individuals have skills in various fields that might be transferable across professions and fields, so engineers may move away from working at the "coalface". In the modern economy, it is likely for a person to have multiple careers: for example an engineer may possess a post graduate degree and switch to a career in corporate management, academic study or in a government regulatory group.

2.5.5 Engineering Qualifications Accreditation in Africa

Legoabe and Worku (2017:153) assert that in South Africa the profession of civil engineering is regulated by statutes within the built environment, and all engineering training programmes and qualifications must be accredited. According to Mohamedbhai (2015:18), accreditation is "the formal recognition of an education or training programme through a quality assurance process, to ensure that it meets the criteria prescribed for the type of programme". In the majority of African countries, the regulation of the practice of engineering is done by a single statutory body. In Nigeria the body is named the Council for the Regulation of Engineering in Nigeria (COREN), in Kenya, Tanzania and Uganda it is the Engineers Registration Board (ERB) and in South Africa it is the Engineering Council of South Africa (ECSA), which is the best known engineering regulatory body in Africa (Mohamedbhai, 2015).

ECSA was established according to the Engineering Professions Act No. 46 of 2000, to regulate the civil engineering profession in South Africa and to regulate statutorily the professional standards and administer these standards to benefit the country, the profession and civil engineering practitioners (Legoabe and Worku, 2017:153). Likewise, in Canada the engineering profession is also regulated, and in order to become a professional engineer, an engineer must be licensed within the provincial/territorial authority in which they are employed (Karakatsanis, 2012:2). Legoabe and Worku, (2017) further state that this licence allows the engineer to practice engineering and it obliges these engineers to be accountable to the public as it is paramount to maintain skills and competencies, and to obey a code of ethics.

The fundamental functions of these councils are the accreditation of engineering curriculums, registration of professionals in determined categories and regulation of the practice of registered individuals or organisations (Mohamedbhai, 2015:18-19). Chikarara (2016:34) has established that there has been a decline in ECSA engineer registration over the years and an escalation in the registration of the lower categories of technologists and technicians. Chikarara (2016) also states that ECSA registration is not compulsory as international and local engineers can be employed without registration, but emphasises that engineers must register as certain engineering work is reserved for certified professional engineers.

Chikarara (2016) observes that Zimbabwean engineers struggle to obtain professional registration with ECSA as the process to become a registered professional engineer is vague, highly subjective, unnecessarily long, and complex. Chikarara (2016) claims that ECSA's re-accreditation process under-values their working competencies and educational qualifications. Legoabe and Worku (2017:152) conducted a study on South African municipalities and determined that there is a lack of interest in professional registration by the civil engineers employed by municipalities, due to the perception that ECSA lacks power over these unregistered engineers and the municipalities, that there is no provision of financial subsidy assistance for annual membership fees, and because of the need to maintain Continuing Professional Development (CPD) points. The table below indicates the current registration status.

Table 2.1: Current Registration Status of Engineering Respondents at Municipalities

Status	Percentage
Not registered	34%
De-registered	28.2%
Registered with ECSA	15.4%
Registered with other councils	1.8
Registered technicians	8.9%
Registered technologists	6.41%
Registered engineers	5.12%

Source: Legoabe and Worku (2017:162)

2.5.6 Affirmative Action and Employment Equity Acts

Rasool *et al.* (2012:13) claim that many skilled workers have been pushed out of the country because of the Affirmative Action (AA) and Employement Equity (EE) policies and Acts. Rasool *et al.* (2012) established that the implentation of these policies became major sources of concern for white people as they were affected by these policies and presumed that their skills and talents were not appreciated by the government or the organisations they worked for. As a result many white South Africans left the country to seek employment. Furthermore, Rasool *et al.* (2012) refer to the survey that was conducted by the Southern African Migration Project, which indicates that around 83 per cent of white individuals and 20 per cent of black individuals are guilty of contravening the government's AA policy, but Van der Walt *et al.* (2016:146) postulate that AA is one of the reasons there is currently a paucity of critical skills being experienced in South Africa.

Samuel (2012:176) voices a similar view to that of the previous authors and asserts that "one of the unintended consequences of employment equity is the 'leakage' from the economy of white graduates with scarce skills. While employment equity is a strategy to redress historical imbalances, our country cannot afford to lose too many engineers. The question of a possible moratorium on EE needs to be thoroughly and maturely debated, based on research into the loss of scarce skills professionals within the context of 'biding constraints' on economic growth and the consequent lack of service delivery to the poor". The effect of AA on the skills shortage has become so critical that the secretary of the African National Congress (ANC), David Botha,

the executive director of the South African Institute of Civil Engineers (SAICE) and Nxumalo and Nordengen (2010:3) are of the same view that there must be flexibility on this policy to assist South Africa to build a skills base.

2.6 ROAD INFRASTRUCTURE FOR ECONOMIC DEVELOPMENT: THE ROLE OF ENGINEERS

According to Mamabolo (2016:30), in South Africa service delivery is a constitutional obligation and the provision of roads must be fulfilled in terms of legislative contexts such as the Constitution of South Africa of 1996, the Municipal Structures Act No. 32 of 2000 and the Road Infrastructure Strategic Framework. Generally the construction industry plays a crucial role in South Africa's economy, more so than many other industries, and is an important contributor to economic growth. It is viewed as a dire sector of the economy that yields building and civil engineering structures and directs the extent to which investment determination in a resource based country is converted into investment output (Windapo and Cattell, 2013:65). Oseghale, Abiola-Falemu and Oseghale (2015:156) also agree that the central position for any country's economy is the construction industry and it is a vital contributor to the progression of development.

Oseghale *et al.* (2015) further claim that the construction industry is identified with the creation of jobs at various skill and professional levels. Sibiya, Aigbavboa and Thwala (2015:1) claim that the construction industry is the division of the economy which is liable for the planning, design, construction, maintenance and lastly destruction of structures and works. Aigbavba and Thwala (2015) continue, claiming that it is fundamentally a service delivery industry, attaining inputs and outputs from numerous segments of the economy. Ivanova and Masarova (2013:263) make the point that road infrastructure is considered as the crucial prerequisite for the social and economic development of every state. Ivanova and Masarova (2013:264) further point out that road transport and its infrastructure permits the transport of communities as well as goods; raw materials, semi-finished and finished goods planned for sale.

In terms of communities' transport, road infrastructure impacts the flexibility and movement of the workforce, and is shown in the employment levels of every state. Estache and Garcous (2012:1) also agree with other authors that infrastructure has a great impact on economic growth in a developing country like South Africa. There is much circumstantial and technical

evidence that a country's infrastructure, when of good quality and in good supply, can directly increase the productivity of human and physical capital and hence the growth of the country. For example, it will "(i) Improve education and markets for farmers and others' outputs by cutting costs; (ii) Facilitate private investments; and (iii) Improve jobs and income levels for many". During the State of the Nation address on the 9th February 2017, former President Zuma committed to boosting economic growth by improving infrastructure (The Mercury 2017:10).

This was also echoed by Pravin Gordhan, the former Minister of Finance, in his budget speech on 22nd February 2017 when he emphasised that his budget continued to prioritise both national and provincial roads' economic infrastructure requirements. The former Minister allocated R10.8 billion in 2017/18 for the Provincial Roads Maintenance Grant after considering the increase in road traffic volumes (Gordhan, 2017:18). The KZN Department of Transport was allocated 8.5 per cent of the provincial budget by Belinda Scott, MEC for Finance for KZN province, in her 2017/18 budget speech and the bulk of that budget allocation was for the construction of roads and the maintenance of the provincial road network (Scott, 2017:17). Mamabolo (2016:32) claims that the socio-economic conditions of the South African citizens can only be realised by the quality of the country's road infrastructure.

Mamabolo (2016) reports that the quality of the road infrastructure essentially has numerous impacts on socio-economic activities and advancement, which has been highlighted by previous authors. The infrastructure quality is a: (i) Trade Determinant - improving trade among countries and sectors to generate probabilities of promoting economic growth and directly reducing poverty; (ii) Transport Cost Determinant - quality road infrastructure opens up opportunities for investors, particularly in rural areas, for the delivery of products that eliminate the risk of delayed and damaged goods; and it (iii) Advances the economy - improvement of rural roads infrastructure is vital for rural people, for the economy and for the advancement of their general welfare. Karakatsanis (2012:1) concurs with Mamabolo (2016:39), stating that in Canada infrastructure also assists in connecting the communities, drives the economy and keeps the citizens healthy and safe.

Kaming and Raharjo (2014:540-541) have established that in Indonesia, the current continuous deterioration of infrastructure has an immense impact on industry's cost of conducting

business. These authors assert that the grading principles of infrastructure should be based on the view that:

> *1) Infrastructure should be planned, designed, built, operated and maintained in a sustainable, cost-effective, efficient and equitable manner over its life cycle. 2) Infrastructure decisions should balance the costs and benefits on the economy, society, and the environment by simultaneously optimising the following objectives: a) Economic growth, efficiency, and effectiveness; b) Health, safety and security; c) Access and social justice; d) Environmental responsibility; e) Liveability, connectivity, and amenity; f) Infrastructure should be provided by both the public and private sectors to optimise taxpayers and infrastructure stakeholders' best value; g) Infrastructure provision should give due consideration to demand management, and the long term; h) Maintenance and renewals; i) Government should have the skills to effectively oversee the provision of infrastructure.*

Kaming and Rarjo (2014) add that in Indonesia the rural roads remain in bad condition and are not continuously maintained, which contributes to the high number of fatal accidents that cost the country as it loses talents and economically active citizens. This same aspect also applies to South Africa, therefore, the road infrastructure should not only be looked at in the context of the economy but also from the perspective of the safety of citizens' lives (Mamabolo, 2016:39).

Orthman (2013:731) claims that the unique nature and feature of construction projects needs a complex understanding of design principles and the technical skills required, skilled human capacity, professional managerial competences, and large-scale investment. South Africa as one of the developing countries experiences challenges in providing this crucial knowledge, skills, know-how and finances, which limits the expansion of the construction industry. The lack of adequate, quality infrastructure and its operational maintenance has been recognised by Ekolu (2016:1) as one of the major factors that prevent sustainable development in Africa. Ekolu (2016) views poor infrastructure as a two-pronged challenge; a shortage of engineers on one hand and a lack of competence and technical skills on the other.

Engineers play a vital role in all aspects of public infrastructure, whether in water treatment facilities, bridges and roads, public transit utilities and the electricity grid in terms of planning,

developing/building and maintenance for the Canadian public infrastructure stock (Karakatsanis, 2012:1). Karakatsanis (2012) claims that the engineering profession utilises its expertise, skills, experience, competencies and knowledge to assist in creating a safer, more sustainable and prosperous future for Canada, and the same can be said for South Africa. However, as engineering is considered as a scarce and critical skill in South Africa, the shortage of engineers in general signifies a capacity and scarce skills disaster for the country (Lourens, 2015:36)**.** Likewise, according to the report that was published by the Royal Academy of Engineering in 2012 titled "Engineers for Africa: Identifying Engineering Capacity Needs in Sub-Saharan Africa" concludes that there is a severe scarcity of skilled and experienced engineers (Mohamedbhai, 2014:5).

Grayson, Collier-Reed, Pearce and Shay (2013:1) claim that engineers are vital for South Africa to achieve its social development and economic goals. Watermeyer and Pillay (2012:46) also point out that engineers play a crucial role in the providing and maintenance of infrastructure which is:

> *(i) "The detailed planning, design, construction and optimisation or condition assessment of infrastructure; (ii) The development of short, medium-and long-term infrastructure plans at both a portfolio and project level, and the administration of works contracts for the acquisition, refurbishment, rehabilitation and maintenance of infrastructure; (iii) The strategic planning and management of the operation and maintenance of infrastructure; and (iv) Specific duties relating to health, safety and environmental aspects of infrastructure as provided for in legislation".*

Similarly, Mohamedbhai (2015:2) claims that there is a serious need for engineering capacity for several reasons in Sub-Sahara Africa, and one of these reasons is for its infrastructural development to supplement its economic growth route. Mohamedbhai (2015) further explains that infrastructural development comprises the construction of roads, buildings, airports, bridges, harbours, etc. Engineering activities, particularly for infrastructural structures, carry risks to society that can be resulted by poor design, poor construction, poor operation or poor maintenance. Given the vital role played by engineers, South Africa requires a pool of engineers with certain skills and knowledge, but these do not need to be the same for every engineer. Diversity in the skill set and specialised knowledge within the pool of engineers is

crucial for South Africa in order to address the country's need for engineers who are competent to function in different roles (Grayson *et al.*, 2013:2).

2.7. EFFECT OF VACANTS POST ON ACHIEVING OBJECTIVES

According to the Constitution of South Africa of 1996, provincial and local government are spheres of government that are tasked with the delivery of basic but essential services to the provincial populace, for the maintenance of sustainable livelihoods by eradicating poverty and reducing inequality (Provincial Treasury, 2014:93). Furthermore, both provinces and municipalities manage wide-ranging public road works, and support or provide transport services. Also, these spheres of government are directly involved in managing the aspects of forecasting and providing a regulatory system that controls land use, effects infrastructure rollout and expedites economic activity. The achievement of sustainable livelihoods requires these government spheres to provide social and economic development within the province, and this requires capacitation by skilled officials who are permanently appointed based on merit and not on political affiliations (Draai and Oshoniyi, 2013:868).

However, Draai and Oshoniyi (2013:869) add that the South African government is stricken by a shortage of scarce skills, which is prevalent in all levels of government. Posts remain vacant for lengthy periods, mainly because there is a shortfall in the number of suitable individuals to fill these posts. This arises either because such persons are unavailable altogether or because those that are available do not meet the specified criteria to function effectively in these roles, and this lack of effective staff has led to several service delivery protests. Draai and Oshoniyi (2013) assert that an unexpected vacancy can lead to misunderstandings and loss of efficiency as the search for a replacement is conducted. The absence or loss of an employee causes an inconvenience that can be avoided with anticipation of such eventualities and the development of serious succession planning initiatives (Eshiteti,Okaka, Maragia, Odera and Akerele, 2013:158).

Darshani (2017:78) agrees that a search for a replacement for a sudden vacany can lead to a loss of efficiency, confusion and inconvienience, and that this can largely be avoided with succession planning. Legoabe and Worku (2017:154-155) have established that over the past few years municipalities have consistently failed to spend their budgets for infrastructure maintenance because they lack the technical human capacity and readiness to adequately

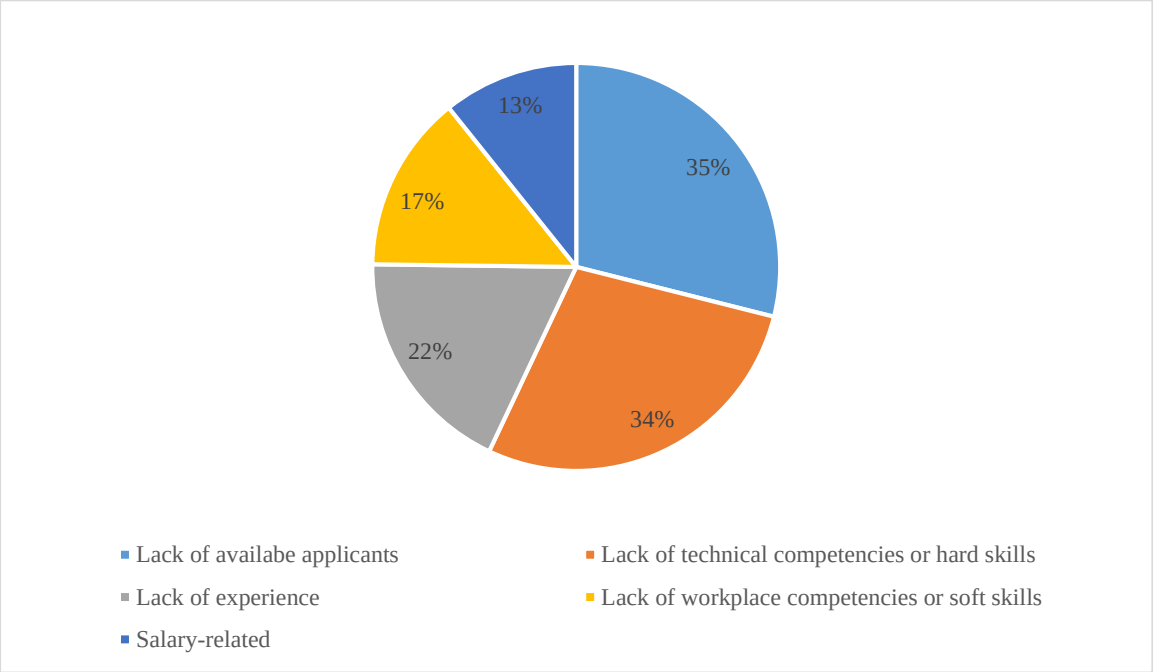
maintain both new and current infrastructure. Mashamaite (2014:234) agrees that the lack of expertise in most local municipalities is evidence of the critical skills shortages in the field, such as in project management, engineering and financial management, and these shortages have led to the service delivery backlogs around the country. Also, Mashamaite (2014) adds that maladministration and lack of capacity to complete development projects has undermined the capabilities of municipalities to provide the basic services and complete development projects, which are constitutional rights for poor communities.

A study that was conducted on the factors influencing employee selection in the public service in Kenya reveals that there are also complaints there that the quality of service is constrained in the public service due to a shortage of staff. The shortage of staff there is due to the Kenyan government's failure to recruit, develop and retain staff (Karanja, Ndunga and Mugambi, 2014:3). The South African Institution of Civil Engineering (SAICE) has conducted a survey and determined that more than one third of the 231 local municipalities do not have even a single civil engineer, technician or technologist, and that there are more than 1000 vacancies for engineering practitioners in local government (Wall and Rust 2017:4).

Likewise, Steyn (2015:1) states that Manpower South Africa's tenth annual talent shortage survey sampled 750 local companies and found that there was increased difficulty in filling engineering positions. When the employers surveyed were questioned about why they had difficulty filling the vacancies for technical skills, the results showed that 52 per cent reported the cause as environmental or market factors; 47 per cent cited a lack of technical capabilities or hard skills; and 46 per cent reported a shortage and sometimes total lack of suitable applicants for positions. Steyn (2015) thus recognises that the lack of technical skills has a negative impact on various components of the country's economy. The high level of poverty among the youth of South Africa has resulted in them being unable to pursue secondary and tertiary education. This has in turn hampered their employment prospects and the development of their skills.

Dlamini and Malaudzi (2016:121-122) concur that the lack of capacity seems to be a universal phenomenon, as both developed and developing countries struggle to attract the right individuals for vacant positions. Dlamini and Malaudzi (2016) also note the following top five reasons cited by most organisations as challenges in the filling of vacant positions:

Figure 2.2: Challenges in Filling Vacant Posts in Most Organisations



Source: Nxumalo (2010)

Lawless (2017:1) also makes the point that there is a shortage of civil engineers, technologists and technicians, and that 28 per cent of the country's municipalities have no internal civil engineering capacity at all. As a result, South African municipalities struggle to deliver, operate and maintain local government infrastructure in a sustainable manner. Todd (2013:3-4) also reports on Manpower's 2012 Talent Shortage Survey, where it has been shown that 34 per cent of institutions worldwide encounter difficulties filling critical posts, particularly in the field of skilled trades such as engineering and IT personnel. The survey also points out that of the 40 000 employers surveyed in 41 states, the top two sectors require competent workers in a skilled trade such as engineering, and companies report a lack of candidates and a general deficiency of technical skills that hinders recruitment.

The survey concludes that the shortage of such talent might raise the possibility of a diminished capacity for innovation and slower growth. Kauzya (2010:4) claims that according to public/civil service reform documents in various African countries, the public service has for ages been undergoing difficulties in attracting and retaining competent staff, let alone proficient ones. Kauzya (2010) further asserts that even though the situations are different for each country, all of them recognise that attracting and retaining professionally knowledgeable, competent, committed, proficient, and motivated personnel in the public service is a daunting

prospect in African countries. Kauzya (2010) warns that the current levels of talent in the public service in many countries in Africa cannot keep up with and realise the developmental aspirations of the continent.

The Pew Charitable Trusts (2014:1) agrees with Kauzya (2010) that the governments' human resource practitioners face the challenge of attracting and retaining employees with the right skills to deliver government services effectively and efficiently. The lack of human capacity in Africa's poor road network is a significant contributing factor to this challenge (Nxumalo and Nordengen, 2010:1). Nxumalo and Nordengen (2010) further state that the shortage of professional skills prevents the proper supervision of road networks, leading to wasteful or non-expenditure of the budgets allocated to road infrastructure. Furthermore, Nxumalo and Nordengen (2010) claim that the lack of skilled technical capacity required for the construction of new roads and bridges, maintenance and the upgrading of the existing road infrastructure makes these tasks more costly as there is no proper, timeous routine management. Despite this Sub-Saharan Africa (SSA) has in recent years, experienced robust economic growth, which has been accompanied by increased investments from new partners.

However, the shortage of domestic skilled labour has handicapped the foreign investment projects and made it crucial to import foreign skills, and this hinders shared prosperity. The development of human capital is therefore paramount for Africa to be able to sustain the economic growth and be competitive with the rest of the world, especially in the areas of applied science, engineering and technology (Mohamedbhai, 2014:4). Maelekanyo *et al.* (2013:1) concur that the challenge posed by skills shortages severely impacts economic growth and employment creation and agree that the critical determinant of global competitiveness is a skilled workforce.

2.8. CURRENT INTERVENTIONS

2.8.1 Migration policy

Rasool *et al.* (2012:403-404) report that the South African government in 2002 realised that the economy needed more skilled employees in the areas of information technology, engineering and finance, hence the Immigration Policy was enacted. This policy, the Joint Initiative on Priority Skills Acquisition of 2006, became part of the government's economic strategy. Also, there was recognition by government that the immigration of skilled foreign

employees would partly assist in overcoming the issue of the skills shortage and subsequently integrate South Africa into the worldwide economy (Rassool *et al.* 2012).

2.8.2 Skills Development Act No. 97 of 1998

According to Ngcobo and Govender (2015:270), the Skills Development Act No. 97 of 1998 was enacted to develop and build the skills of the South African workforce, and each sector was required to compile a skills plan so that the scarce and critical skills could be identified and addressed. In order to compete in the global economy, the skills shortage had to be addressed, and each organisation had to compile a Workplace Skills Plan (WSP). The organisations then had to submit these WSPs to Sector Education and Training Authorities (SETAs), who then compiled a Sector Skills Plan (SSP). The SETAs were then able to identify where the skills shortages were and offered institutions discretionary and mandatory grants for specifically recruiting and training staff to address the scarce skills shortages. Nkiwane and Barnes (2017:139) argue that this eductation and training system can produce the skills required to a certain extent in South Africa, to reduce unemployment, help the current workforce to develop their skills levels, improve productivity and augment career pathing.

Nkiwane and Barnes (2017) also established that the Human Resource Development Strategy (HRDS) 2030 emphasises the importance of education and skills advancement as the greatest means of adressing the triple challenges. Furthermore, Nkiwane and Barnes (2017) argue that Africa faces the challenge of an incompetently equipped workforce which requires up skilling to be able to keep up with the Fourth Industrial Revolution. The HRDS has been augemented by the National Skills Develoment Strategy (NSDS) which is intended to address the energy and resources required for the training and education to deal with the skills development challenges encountered by the country and make sure that the skills development programmes attain measurable impacts (Department of Higher Education and Training National, 2011:4).

According to Florence and Rust (2012:6029), the skills gaps within an organisation can be identified through post-training evaluation, which also allows the organisation to discover feasible ways to narrow these gaps. Florence and Rust (2012) further argue that the work setting can be modified in order to offer newly trained individuals a chance to transfer their new skills from the classroom to the workplace. These authors caution that the non-existence of full training assessment procedures undermines the significance of continuous learning and hinders

the culture of advancement and growth. Ramana and Nallathiga (2013:6) suggest that unskilled employees in the construction industry be considered the same as those who are skilled to perfom the jobs in the sector, rather than utilising unemployed unskilled individuals looking for jobs. Ramana and Nallathiga (2013) maintain that skills development eductaion can play a crucial role for the workforce and societies by empowering them with the main inputs which matter in employability, as well as capacity building.

2.8.3 Implementation of Occupation Specific Dispensation for Engineers

The determination for the Occupation Specific Dispensation (OSD) has been made by the Minister for Public Service and Administration, in terms of section 3(3)(c), read with section 5(4) of the Public Service Act of 1994, GPSSBC Resolutions 3, 5, 6 and 9 of 2009, effective from July 2009. The OSD comprises of engineers and associated professions, as indicated in the relevant Agreements, which make it an inherent job requirement that the incumbent of the job must hold a prescribed qualification and meet the statutory requirements as determined by the relevant professional registration councils (Public Service and Administration Department, 2011:3). Levin (2013:3) asserts that the "general objective of the implementation of OSD in the Public Sector was to introduce revised salary structures per identified occupation that cater for career pathing, pay progression, seniority, increased competencies and performance, with the view to attract and retain professionals and other specialists".

Furthermore, Levin (2013) claims that OSD was intended to develop the Public Service's capability to attract and retain skilled people. The National Development Plan (NDP) was adopted by the South African government as a framework for addressing the triple challenges in the country, which are high unemployment, inequality and poverty (Chetty *et al.*, 2016:3). Chetty, *et al.* (2016:3) further claim that the Strategic Integrated Projects (SIPs) Skills Plan was established from 2012 to 2014 to address the skills dimension of the National Infrastructure Plan (NIP), as one of the pillars of the NDP. However, even before the implementation of the SIPs Skills Plan, it was envisaged that there would be the challenge of a critical skills shortage for the implementation of the NIP. Therefore, establishing the skills that would be required was a key priority in the roll out of the NIP that required training in advance of the projects to ensure that skills were available as and when required.

Funds were raised from the SETAs and the National Skills Fund (NSF), and there was an overwhelming commitment to participate from provincial and regional bodies, employers and institutions alike. Mabusela (2011:677-678) purported that at the 30th Southern African Transport Conference (SATC) in 2011, Peter Copley of the Development Bank of South Africa, jointly with Mac Mashiri of the CSIR, gave a presentation stating that the skills shortage could be addressed with three proposed interventions: i) The importation of skills from outside South Africa; ii) Increasing throughput at institutions of higher learning; and iii) Recalling retired, experienced engineers to play mentorship roles to young engineers and planners. Mabusela (2011) further highlighted that the government also initiated the Joint Initiative for Priority Skills (JIPS) to increase the number of engineers produced, and another positive attribute of the JIPS was the appointment of retired engineers to pair up with and mentor young engineers in targeted local municipalities.

2.9 TURNAROUND STRATEGIES / INTERVENTIONS

2.9.1 Mentorship Programmes

Lin (2017:1) claims that an engineering shortage has also become a burgeoning issue in the United States, which has led to a challenge in how to effectually recruit and retain engineering students. Without a sound strategy for improving the attraction and retention of these engineers, however, efforts might be in vain. A mechanism called the Fen Academy was thus created to help high school students become exposed to engineering by inviting the students to colleges to create some interesting projects. Lin (2017) claims the initiative has resulted in attracting better students to choosing engineering as their career choice, and this has led to colleges conducting fundraising with local corporations for scholarships to fund these students.

The sustainability of economic growth, competitiveness and the development of human capital in Africa is vital, particularly in the field of applied sciences, engineering and technology (Mohamedbhai, 2014:4). Mohamedbhai (2014) advises that an initiative entitled the "Partnership for Skills in Applied Sciences, Engineering and Technology (PASET)" was proposed by the World Bank for Africa, with the purpose of capacity building in higher education, and vocational and technical training in African countries by designated partner states in Asia and Latin America. Most of these partner states are already engaging in human capital advancement in Africa, generally through scholarships (Mohamedbhai, 2014).

Daries (2015:5) has established that the following interventions are in place in some organisations, but require some expansion: internship programmes for qualified engineers, technologists and technicians, particularly as funds can be accessed from the SETAs; in-service training for student technicians; secondment of trainee engineers with consultants on projects as part of contractual agreements with universities and colleges in order for them to acquire the required design and project supervision skills for registration; employment of external mentors to oversee the training needs and the advancement of trainees; and the formalisation of practical training and trainee rotation so that a variety of experience is obtained.

Even though in South Africa engineering is regarded as a scarce and critical skill, the ongoing shortage of engineers epitomises a capacity and scarce-skills disaster for the country (Lourens, 2015:36). Lourens (2015) also points out another problem that is facing the country - the lack of women engineers. Generally, there is under-representation of women in the engineering classroom and engineering profession (Lourens, 2015:36-37). Lourens (2015) has identified that the Women in Engineering Leadership Association (WELA) was established at South African universities in 2011 to encourage and support women pursuing the field of engineering. Lourens (2015) points out that WELA's main objective is to concentrate on the academic, professional and individual advancement of women engineering students (WES) at universities.

Another goal is to promote engineering as a desired career choice for women and to develop retention and growth strategies for women already studying in the field of engineering. Again Lourens (2015) points out that the registration of the WELA Leadership Development Programme (LDP) in 2013 as an official university development programme integrated collaborative efforts by internal and external stakeholders, both in and outside the universities. The LDP comprises of a combination of the universities' values, graduate skills requirements by industry, contribution from women engineers, women engineering students and other national and international leadership development programmes. The underlying premise of the WELA LDP is to advance the feelings of self-efficacy of women engineering students (Lourens, 2015).

Lourens (2014:2) points out that the decreasing trend of woman entering the engineering field created apprehension in terms of the overall lack of engineering skills, knowledge and

competencies besides the under-representation of women in engineering. The initiatives to improve the retention rate of women engineering students through WELA increased the percentage of women pursuing engineering studies in South Africa from 9.4 per cent in 1996 to 20.2 per cent in 2005. WELA was developed to incorporate and increase self-efficacy in traditionally male-dominated fields like engineering, science and technology, and has thus resulted in positive outcomes for women in these fields. Lourens (2014) explains that self-efficacy was identified in a study that was conducted in five institution across the USA attended by women engineering students, and this plays a crucial role in attracting and retaining females on traditionally male-dominated occupation paths.

2.9.2. Talent Management

Oosthuizen and Nienaber (2010:41) established that the survey that was conducted by the Society for Human Resource Management (SHRM) showed that talent management was recognised as an important initiative, but merely received lip service from respondents. Talent management in its broadest sense may be regarded as "the implementation of integrated strategies and systems to increase workplace productivity by developing improved processes of attracting, developing, retaining and utilising people with the required skills and aptitudes to meet current and future business needs" (Oosthuizen and Nienaber, 2010:41). This definition implies its importance in terms of business outputs (performance) currently and in the future, which are interwoven with extra explicitly specified competitive advantages. Oosthuizen and Nienaber (2010 conclude that given the skills shortage in South Africa, talent management is anticipated to persist as a business imperative, especially in the science, engineering and technology arena.

Strydom *et al.* (2014:29) concur that talent management is a set of intergrated company initiatives directed at refining availability and flexible utilisation of outstanding capable (high-potential) workers who can have a disproportionate influence on business perfomanace. Talent management involves a whole set of methods to identify, implement and manage individuals for successful implementation of the business strategy that a company needs (Vaseghi and Moayedi, 2016:941). Vaseghi and Moayedi (2016) also claim that the process of talent management that is effective on the life cycle of an employee is catergorised into three major sections that are: (i) Attraction of talent - involves all issues that are relevant by identifying individuals needed by the company who are highly skilled and competent for employment, plus in whom the company should invest; (ii) Align and retain talent – placement of individuals into

a job according to their proper and relevant skills for the job; (iii) Developing talent - for an organisation to keep up its skills so that it can respond to expectations and future needs, it must invest more in its workforce by creating opportunities for learning and development.

Talent can be identified during the recruitment and selection process, but existing employees might feel undervalued or discriminated against if too much emphasis is placed on recruiting new talent instead of up-skilling them and it can be useless for the advancement of the business (Torrington, Hall, Taylor and Atkinson, 2014 :318-319). Torrington *et al.* (2014) highlight that the talent search can be conducted by means of "psychometric tests, interviews, role play, business games and direct experiences of work tasks at higher or different grades". Torrington *et al.* (2014) also suggest two strategic approaches to talent management: firstly, aligning roles with people (that is fitting talented people to current job roles); secondly, aligning people with roles (that is fitting talented people to current job roles). Torrington *et al.* (2014) claim that these strategic methods are crucial and there must be vigorous interaction between the two approaches.

2.9.3 Succession Plan

The future plans of any organisation might change due to various reasons, such as retirements, promotions inside the organisation, severe illness, death, or any voluntary departure from the organisation (Deshwal, 2015:58). Similarly, Mhlongo and Harunavamwe (2017:8) concur that key employees in managerial and other critical positions have been lost by companies due to deaths, dismissals, retirements and resignations. Darshani (2017:77) adds that changes in an organisation can also be due to an ageing workforce, global competition, mergers, acquisition volumes, and technology that requires the act of creating a pool of talent to lead and take the business to a higher level. Mhlongo and Harunavame (2017:8) have established that changes at times require companies to reinstate retired individuals or employ externally due to a shortage of suitable internal replacements. The departure of a retiring workforce and co-workers exiting the organisation can have substantial consequences for companies (Hall-Ellis, 2015:95).

Therefore, it is the responsibility of an organisation's human resource component to make an effort to manage the workforce effectively and efficiently through numerous policies and procedures (Darshani, 2017:77). Darshani (2017) claims that the human resource department

must generate and retain a suitable and competent workforce that will provide the maximum contribution to the success of the organisation. Mehrabani and Mohamad (2011:37) assert that the future attainment of a company is determined by how it evaluates and understands the importance of the people it has, what type of people it has, and what resources it will need in the future. According to other studies related to succession planning, as the situations of organisations change for various reasons that are mentioned above, proactive succession planning will offer a guarantee that the organisation will have a backup pool of talent ready to undertake new roles (Mathur, 2011:58).

Durst and Wilhem (2012:639) state that all companies, irrespective of their magnitude or size, will at some time be confronted by the need for succession and it is critical to instil stability in the business through succession planning. Succession planning is one of the human resource tools that can help organisations to determine their present and future needs (Mathur, 2011; Durst and Wilhem, 2012), and Adewale, Abolaji and Kolade (2011:234) advise that succession planning is an exercise that can provide seamless leadership conversion throughout the business. Garg and Weele (2012:97) make the case that "succession planning is a deliberate and systematic effort by any organisation to ensure leadership continuity in key positions, retention and development of intellectual and knowledge capital for the future, and encouragement of individual advancement".

Preparation for when vital staffs retire or are on vacation and sick leave makes good business logic (Darshani, 2017:78), as the business knowledge is not lost when they are absent. Neo, Hollenbeck, Gerhart and Wright (2012:429) concur that when succession planning practice is implemented, it can pinpoint and develop the right high potential individuals to fill fundamental positions as they become vacant within the company. Eshiteti *et al.* (2013:158) also point out that succession planning is an important element of a company's determination to improve quality, counter the challenges of global competition and social evolution, and incorporate technological advances.

2.9.4 Talent Pipeline Model

Cherika and Prezzama (2015:82-83) use the results of a survey conducted online by a human resources organisation and their experience to state that there is a high cost associated with turnover of staff with technical talent, that calls for companies to think about new innovative

ways to achieve retention of such staff due to the high demand for their technical talent. These authors suggest a talent pipeline as a solution for both the employers and new on-boarding recruits, as it can lead to high performance, lower turnover, intensified engagement, and allow the companies to evaluate how well the top talent can fit into their future. There is, however, a challenge in employing candidates who are early career hires, as companies need candidates with theoretical knowledge as well as practical and real-world experience. The solution for these early career hires is the Talent Pipeline Model that involves a process of multi-year training, competition and experience cycles, to place these individuals on a trajectory to becoming professionals in the workforce (Cherika and Prezzama, 2015).

In order to execute this model effectively it takes a comprehensive approach based on several key actions: a) Partnership: collaborative discussion on outcomes for education and professional career paths that brings together diverse stakeholders between industry, government and academia; b) STEM (science, technology, engineering and mathematics) outreach: vigorous engagement with community associates and STEM teachers is used to develop formalised and all-inclusive educational prospects for learners of all levels/age groups; c) Internship and work experience: to provide practical/hands-on experience in jobs to experience real world problems; and d) Training, learning paths and certifications: assist in growing skills in new areas or further improve current skills in particular areas of interest. Cherika and Prezzama (2015) further highlight various examples of talent pipeline approaches that have been adopted by corporations: apprenticeship programmes, internship-based projects and gamification-based hiring techniques.

2.10 CONCLUSION

The literature that has been reviewed in this chapter has shown that the problem with recruitment and retention of scarce skills is a worldwide phenomenon for various reasons. Civil engineers, who are the focus point of this study, tend to be a challenge for organisations to attract and retain because both the public and private sector recruit from the same limited pool of civil engineers and there are various factors described in the existing literature that limit the size of this pool. The literature has indicated that when an organisation is unable to attract and retain employees, it will encounter challenges that negatively affect its performance output, budget spending, the achievement of its organisational mandate, and in turn the economy of the country because of the role that civil engineers play in infrastructure development. Different

literature has revealed and identified the need for developing strategies that will assist organisations in attracting and retaining engineers.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 INTRODUCTION

The inclusion of this chapter is critical in order to assist the reader in understanding the research processes employed when conducting this study. Therefore, it details the research paradigms/worldviews and research designs used. Also, it includes the research strategy, the data collection tools that were used to obtain the required data from the research interviews, the targeted population for the study, sampling techniques and the sample size. This chapter also explains which data analyses method will be used to analyse the research data and how it will be presented. Finally, it also specifies the ethical issues that need to be considered and the limitations that might inevitably be encountered.

3.2 AIMS OF THE RESEARCH

According to Rajasekar, Philominaathan and Chinnathambi (2013:5), research is largely categorised into two main continuum, that is: i) Basic, fundamental or pure research which is an inquiry into simple principles and causes for the occurrence of a specific event or process or phenomenon; and ii) Applied research, where the researcher resolves certain problems using well known and recognised theories and principles. The fundamental aim of applied research is to establish a solution for a real problem, which guarantees a solution for instant use. The applied research approach was followed for this study, as it was undertaken to explore the challenges faced by the KZN-DoT in attracting and retaining engineers, with the aim of providing recommendations to address the phenomenon. Rajasekar *et al.* (2013:6) further highlight other kinds of research, which comprise of action research (information discovery to advance the worth of action in the social world), explanatory research (probing explanations for occurrences and phenomena), exploratory research (finding more facts on a topic), and comparative research (finding similarities and differences among events, methods, and techniques).

3.3 RESEARCH METHODOLOGY

Thomas, Nelson and Silverman (2011:3) state that research is "a careful and systematic means of solving problems" and attaining new knowledge. Similarly, Gratton and Jones (2010:4) define research as a "systematic process of discovery and advancement of human knowledge".

Almalki (2016:289), like Thomas *et al.* (2011) and Gratton and Jones (2010), suggest that research can be considered as being "the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis and interpretation of data". Considering the definitions that have been provided by Almalki (2016), Thomas *et al.* (2011) and Gratton and Jones (2010), it can be concluded that research is an arranged activity intended to establish new facts and evidence about a problem. Therefore, research methodology is described as the general plan that indicates how the research questions will be answered (Saunders *et al.*, 2012:165). Neuman (2014:2) asserts that "methodology means understanding the entire research process, including its – organisational context, philosophical assumption, ethical principles, and the political impact of new knowledge from the research enterprise".

Wagner, Kawulich and Garner (2012:52) also assert that research methodology is "the study of procedures for carrying out research". According to Almalki (2016:290), it offers the focus and approach for the study and is the procedure with which researchers identify the methods that will be employed in order to address their particular question. Rajasekar *et al*. (2013:3) elaborate that it is the science of how a research assignment can be approached and describes the phases that the researchers go through whilst they choose the best ways of addressing their research problem, and the reasoning behind their thinking.

3.2.1 Research Paradigms /Worldviews

Bryman (2012:630) uses the term 'paradigm', which describes a cluster of beliefs and commands by scientists in a specific discipline that influences what needs to be studied, how the research should be conducted, and how the results should be interpreted. Bryman (2012) further names three dominant traditions in research, namely the positivist, interpretivist and critical realist traditions. Saunders *et al.* (2012:132) also use the term 'paradigms', and explain that they help the researcher to differentiate between study philosophies that relate to the political or ideological orientation of researchers towards the social world they investigate. Unlike, Bryman (2012), Saunders *et al.* (2012) identify five major philosophies that are positivism, critical realism, interpretivism, postmodernism and pragmatism, but conclude that they are interrelated.

However, Cresswell (2014:6) adopts the term 'worldview', which means a basic set of principles that guide the actions of researchers, adding that it is the general philosophical angle

about the world and nature of the study that the researcher brings to the study. Saunders *et al.* (2012:124) claim that at every stage of research a researcher will make numerous types of assumptions, which include epistemology, ontology and axiology. Furthermore, these authors argue that these assumptions will certainly shape how the researcher understands his/her research questions, methods employed, and how the findings can be interpreted. According to Cresswell (2014:6), epistemology and ontology are the broadly considered research methodologies. Ritchie, Lewis, Nicholls and Ormston (2014:4) suggest that in order to comprehend the various methods adopted by qualitative researchers, it is imperative to understand the philosophical arguments underpinning the advancement of social research in general. Ritchie *et.al* (2014) concur with previous authors that the matter of how the social world can be examined increases the number of philosophical questions which relate to ontology and epistemology.

3.2.1.1 Epistemology

Epistemology is the philosophy of how the researcher acquires knowledge and beliefs in order to generate, understand and utilise knowledge that is considered to be acceptable and valid (McManus, Mulhall, Ragab and Arisha, 2017). Similarly, Ritchie *et al.* (2014:6) claim that epistemology concerns the methods of knowing and learning about a specific field of interest and focuses on matters like how one can acquire reality and what forms the foundation of one's knowledge. Epistemology encompasses different and occasionally complimentary philosophies such as positivism, interpretivism and realism (Saunders *et al.*, 2012:2). O'Gorman and Maclntosh, (2014: 58) concur that epistemology focuses on the way that valid knowledge can be obtained. However, O'Gorman and Maclntosh, (2014) identify four epistemological positions which are positivist, critical realist, interpretivist and action research. O'Gorman and Maclntosh (2014:58-59) furthermore assert that there are other philosophies articulating epistemology, but these four philosophies mentioned allow the researcher to define personal ideas in his/her own way that constitutes reliable knowledge.

3.2.1.2 Ontology

Mack (2010:5) cites the definition of ontology, given by Grix (2004:59), as the study of "claims and assumptions that are made about the nature of social reality, claims about what exists, what it looks like, what units make it up and how these units interact with each other". According to Saunders *et al.* (2012:127), ontology assumptions outline the way in which a researcher sees

and studies research objects that might include organisations, individuals' working lives, management and organisational events and artefacts. McManus *et al.* (2017:3) purport that it epitomises anything that there is to know about the world reality, which consists of underlying physical and ecological systems and is occupied by individuals whose sentiments are based on their values. McManus *et al.* (2017) further suggest that there are two perspectives associated with ontology: objectivism and subjectivism.

The basic position that governs the concepts of ontology is based on interpretivism/constructivism, which takes on a subjective ontological worldview that reality is socially constructed (Saunders *et al.,* 2012:130). Constructivism often combines with interpretivism and is also called social constructivism. Social constructivists believe that human beings seek to comprehend the world they reside and work in (Cresswell, 2014:8). Furthermore Creswell (2014) argues that people develop subjective meanings for their encounters which are diverse and multi-faceted, which directs the researcher to consider the complexity of views rather than separating meanings into a few themes. In this study the researcher employed the constructivism worldview as the study sought to explore the views of participants on the challenges faced by the KZN–DoT regarding the recruitment and retaining of engineers.

The objective of this research was dependent on the participants' views of the topic being examined, as the researcher wanted to probe and tease themes from the participants in the study. Vos, Strydom, Fouche and Delport (2012:7) assert that the social constructivist respondents become enthusiastically involved in the research process and may be observed as partners in the entire undertaking. Therefore, it was appropriate to utilise the constructivist worldview as it is mainly linked with qualitative research designs, as the study intended to use open-ended questions to allow participants to liberally share their views (Vos *et al.,* 2012:8). In contrast to positivism wherein the researcher upholds a detached and non-interactive position, constructivists involve the respondents from the beginning to the end (Vos *et al*., 2012:6).

3.3. RESEARCH DESIGN

According to Kumar (2011:95), the research design comprises the plan, configuration and approach of the investigation conceived to acquire answers to research questions or problems. Similarly, Bryman (2012:89) asserts that the research design offers a framework that the

researcher utilises to collect and analyse data. Wagner *et al.* (2012:21) point out that the research design can be described as "… the architectural blueprint that [should be] followed in the construction of a building". However, Babbie and Mouton (2011:49); Saunders *et al.* (2012:165); Creswell (2014:12) and Du Plooy-Cilliers, Davis and Bezuidenhout (2014:14) state that research designs are types of inquiry within qualitative, quantitative and mixed methods approaches which give specific direction to the procedure in a research design. All of these authors differentiate research designs according to their approach, worldview/philosophical assumption, characteristics, strategy and their approach to theory.

Saunders *et al.* (2012:163) further assert that the research design encompasses clear objectives resulting from the research question(s), indicates the sources where the data will be collected from, which data collection tool will be used, how the collected data will be analysed, and deliberates on ethical issues and limitations that might be encountered. According to Cresswell (2014:3-4) and Daniel (2016:92), research designs are categorised as qualitative, quantitative and mixed method. According to Cohen, Manion and Morrison (2011:4), the research method is commonly believed to exist in paradigms and groups of scholars.

A **quantitative research design** is used to test objective theories to examine the relationship between two variables. It also generates or uses numeric data and uses closed-ended questions generally associated with a positivism worldview, especially when used with predetermined and highly structured data. It is mainly associated with experiments and survey strategies (Creswell, 2014:4). A **qualitative research design** seeks to explore and understand the meaning that individuals or groups ascribe to a societal or human phenomenon, uses open-ended questions, and is associated with interpretivism as it needs to make logic of the subjective and socially constructed meanings expressed about a phenomenon. This design is used to build theory and studies the participants' meanings and the relationships among them by using a variety of data collection techniques and a variety of strategies (Creswell, 2014:4). A **mixed method design** is inquiry involving multiple methods and the use of quantitative and qualitative data collection techniques and analytical procedures. It may use a deductive, inductive or abductive approach to theory development, and techniques are combined in different ways from simple, concurrent to more complex and sequential forms (Creswell, 2014:4).

This study used a qualitative approach as it attempted to create the logic of the people's experiences, insights, views, attitudes and behaviours in a cultural context. Furthermore, it was appropriate for this study because it is "typically used to answer questions about the complex nature of phenomena, often with the purpose of describing and understanding the phenomena from the participants' point of view" (Pacho, 2015:44). Pacho (2015) further argues that the purpose of qualitative research is to strive for a better understanding of multifaceted situations, and the work is often exploratory in nature. Qualitative research is exploratory in nature and Strydom (2013:151) defines exploratory research as "a form of research that generates initial insights into the nature of an issue and develops questions to be investigated by more extensive studies".

Pacho (2015:44) asserts that qualitative research is empirical, inductive and interpretive of a circumstance within a context. However, Pacho (2015) also contends that qualitative research approaches are thoughtful of social construction of meaning and dependent on the understanding and analysis of what individuals do and say, without creating extensive use of measurements or numerical analysis. According to Daniel (2016:92), qualitative research comprises critical instruments that can assist with problem solving. Also, according to Vos *et al.* (2012:5), a qualitative research design allows the researcher to collect data that is rich in text and that indicates how the target populace is experiencing the phenomenon being studied. Furthermore, the multiple data collection instruments used in qualitative research to collect primary data from participants in their natural settings include observation, open-ended questions, in-depth interviews (audio or video), and filed notes (Vos *et al.*, 2012; Daniel, 2016:92).

De Vaus (2014:6) claims that the qualitative research design offers rich data about real life people and circumstances. Therefore, the reliance of a researcher on collecting non-numerical primary data makes qualitative research appropriate for providing factual and descriptive information (Johnson and Christensen, 2012:29-37). Leedy and Ormrod (2014:141) assert that the expressions and experiences displayed by participants during data collection are easily understood, even when there is little or no information about the participants. Also, individual thoughts and behaviours are viewed in a social context in the qualitative research approach, which covers an extensive series of phenomena in order to comprehend and appreciate them comprehensively (Daniel, 2016:93). The close relationship that is built between the researcher

and the participants in this approach allows participants to engage freely and enables them to contribute to shaping the research (Daniel, 2016).

It should be also noted that qualitative data relies on multiple data sources rather than on a single data source, hence the researcher in this study collected secondary data by reviewing documents which were obtained from the Human Resource Management Directorate, as per Yin (2011:23). The information obtained from these documents was imperative in assisting strengthening and verifying the information gathered during interviews and answered some of the questions which were not thoroughly covered during interviews.

3.4 RESEARCH STRATEGY

Saunders *et al.* (2012:177-178) define a research strategy as the plan by the researcher for how the research question is going to be answered. Saunders *et al.* (2012) argue that there are a number of possible research strategies due to the different research traditions, which are principally linked with quantitative, qualitative and mixed method strategies. According to Cresswell (2014:13-14) narrative, phenomenological, ethnography, grounded theory and case studies are the strategies that are associated with a qualitative approach. Furthermore, these strategies may be used independently, or a combination of strategies may be used in research.

In a **narrative strategy,** the researcher seeks to preserve chronological links and the sequencing of events, as told by the participants in the study (Saunders *et al.*, 2012:198; Creswell, 2014:14). A p**henomenological strategy** enables the researcher to describe the life experiences of individuals about a phenomenon, as defined by the participants (Creswell, 2014:14). **Ethnography** is the earliest type of qualitative strategy that originated from colonial anthropology, where the shared patterns of behaviours, language and actions of an integral cultural group are studied by a researcher in a setting over a period of time using observations and interviews. **Grounded theory** is a probe from sociology, in which the researcher draws on theory from current studies by doing a literature review (Du Plooy-Cilliers *et al.,* 2014:178). A **case study** provides a thick and elemental description of a social phenomenon that occurs within the real world (Yin, 2014:4). It seeks to understand a problem within a specific circumstance. Also, it allows a deep exploration within a natural environment and hence provides a full and comprehensive understanding of a particular and lived experienced of a participant (Du Plooy-Cilliers *et al.,* 2014:178-179).

A case study was a good choice as the strategy for this study because of its capacity to generate insights from intensive and in depth-research of the study phenomenon in its real-life context, as it led to rich, empirical metaphors and the development of theories (Saunders *et al.* 2012:185). It could also extend the body of knowledge on what is already known about the phenomenon being studied through previous research (Yin, 2014:12). The author further claims that the unique strength of the case study is its capability to deal fully with various evidence beyond what might routinely be available such as documents, artefacts, interviews and observations in a conventional historical study.

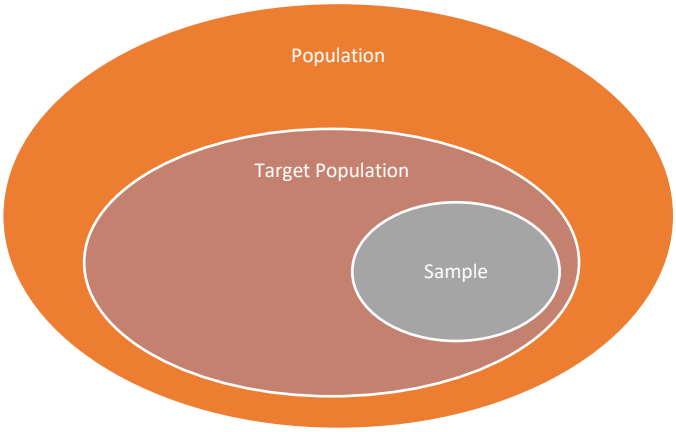
According to Pacho (2015:45), a case study allows the researcher to gather broad data on the individual(s), programme(s), or events on which the research is based. A case study was also chosen for this study because it emphasises detailed contextual analyses of a limited number of conditions in which the researcher explores in-depth the data related to the background, current status and relationships by comparing the views and notes gathered from the participants during the interviews. In this study the case was the KZN-DoT and the units of analysis were individuals, and the processes of recruitment and retention. Additionally, it was an embedded case study as it used different embedded units that were selected from the sampling.

3.4.1 Study Area

The study site is the physical location where a study is conducted to collect the desired data. This study was conducted at Inkosi Mhlabunzima Maphumulo House, the KwaZulu-Natal Department of Transport's Head Office, which is physically located at 224 Prince Alfred Street, Pietermaritzburg, KwaZulu-Natal. The site was chosen because it had the target population that had the specific characteristics that the researcher was looking for. The researcher collected data by conducting interviews after obtaining ethical clearance from the Ethics Committee of the University of KwaZulu-Natal and a gatekeeper's letter from the Head of the KZN Department of Transport. A period of four working weeks was allocated to conduct one-on-one interviews with the participants. Figure 3.1 below demonstrates how the sample was drawn from the population.

3.4.2 Target Population of the Study

Figure 3.1: Demonstration of how a sample is drawn from the population



Source: Adapted from Saunders *et al.* (2012:275)

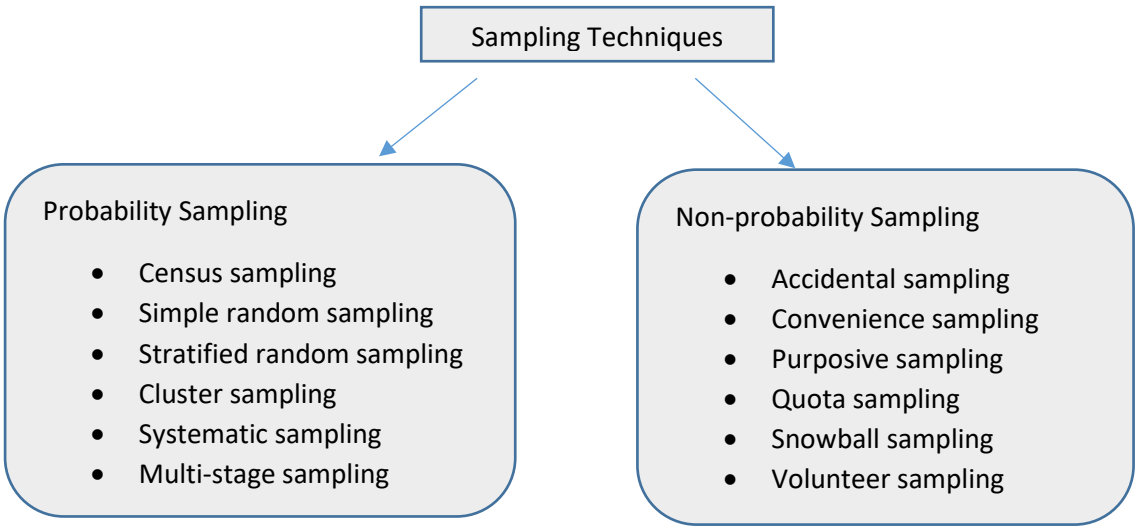
The study population is defined by Wiid (2013:186) as the entire group of people or entities from whom information can be obtained. Likewise, Taherdoost (2016:18) claims that the population is the whole set of cases from which the researcher's sample is selected. The target population is then the actual centre or target of the research, from which the sample is chosen and from which outcomes of the drawn sample can be generalised or mentions can be made (Bryman, 2012:187). The researcher selected as the study population topic-specific individuals who were relevant in the arena of study as they were participants grounded in their specialised expertise and affected by the phenomena; involved with the processes of recruitment, retention and policy formulation. The target population for this study consisted of technical personnel within the Transport Infrastructure and Regional Services Directorate, Skills Development Officers, Human Resource Practitioners, Management and Engineering Council of South Africa executive members. A sample was drawn from this target population.

3.4.3 Sampling

Gentles, Charles, Ploeg and Mckibbon (2015:1776) point out that sampling in qualitative research is "the selection of specific data sources from which data are collected to address the research objective". Wotela (2017:231) asserts that sampling is the method of choosing or drawing participants from the study population, with the aim of representing the population

from the target population. A researcher is required to decide on the broad sampling technique before deciding on the specific type of technique (Taherdoost, 2016:20). Figure 3.2 below indicates the sampling methods and the sampling techniques. Saunders *et al.* (2012:275-276) claim that there are two sampling techniques available to select a sample from a target population, which are probability or representative sampling (random) and non-probability sampling (non–random). Normally (but not always), probability sampling is utilised with a quantitative strategy, whereas non-probability sampling is utilised with a qualitative strategy (Wotela, 2017:233).

Figure 3.3: Sampling Techniques



Source: Adopted from Taherdoost (2016:20)

Wotela (2017) purports that one goal of the quantitative strategy is to generalise the outcome of a study to the rest of the target population, while the qualitative research strategy aims to find details on the research problem. Saunders *et al.* (2012) also mention that probability sampling is commonly associated with survey and experiment strategies. In the probability method, each unit or person in the target population has the same, fair chance of being elected to respond or being subjected to the research data collection instrument (Wotela, 2017:232). Simple random, systematic, stratified, cluster and multi-stage sampling are techniques used for probability sampling (Taherdoost, 2016:21). Also, Taherdoost (2016:22) claims that non-

probability sampling is always linked with the case study research design and qualitative research.

Taherdoost (2016) further claims that case studies are expected to focus on small samples and are anticipated to scrutinise a real-life phenomenon, not to establish numerical interpretations in relation to a larger population. Furthermore, Taherdoost (2016) mentions that a sample of respondents or a case does not need to be representative or random, but instead the purposive inclusion of some cases or persons rather than others. Non-probability sampling gives a range of alternative techniques to select samples and the selection of the sample is based on the judgement of the researcher (Saunders *et al.*, 2012:295).

Therefore, the sample selected by the researcher met the population parameters for the study. There are six non-probability methods that are used if a study's findings are not generalised to the larger population, particularly in exploratory and qualitative research. **Accidental sampling** does not use the sampling setting but instead consists of elements that are incorporated purely because they happen to be in that place at the right time. **Convenience sampling** is mostly used to pre-test questionnaires. With **purposive sampling,** the sample is purposefully chosen based on the list of characteristics set by the researcher on who can offer the best information to accomplish the objectives of the research (Du Plooy-Cilliers *et al.*, 2014:142). In **quota sampling,** the sample is drawn to match the ratio of different characteristics stipulated in the population parameters. A list of the parameters is made and then proportions are allocated for each of these characteristics (Babbie, 2011:167).

Snowball sampling is often used when the members of a population are difficult to locate but they are listed in databases or records (Babbie, 2011:167). In **volunteer sampling** participants volunteer to participate in the study rather than being chosen, but this method is not dependable and tends to give rise to a lot of erroneous research results (Saunders *et al.*, 2012:303). After much consideration, this researcher used purposive sampling to select the sample for this study. The researcher looked at the population and at the research question and established which characteristics of the population were suitable for this research. According to Saunders *et al.* (2012:301), purposive sampling is often associated with small samples such as case studies, therefore in this study the researcher employed the case study method as the research strategy, and purposive sampling was a relevant option.

The main underlying factor of qualitative research is to purposefully choose participants and the site (or documents and visual materials) that will best assist the researcher to comprehend the phenomenon and answer the research question (Yin, 2014:189). Paton (2015:264-265) asserts that "the logic and power of purposeful sampling lie in selecting information-rich cases for in-depth study. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry. Studying information-rich cases yields insights and in-depth understanding". Furthermore, Paton (2015) asserts that the term 'purposive sampling' specifically relates to qualitative research for case selection. Yin (2011:88) also points out that purposive sampling is defined as a sample that is selected in a deliberate manner and is prevalent in qualitative studies.

Van Manen (2014:353) suggests that purposeful sampling is sometimes used to indicate that interviewees or participants are chosen on the basis of their knowledge and verbal eloquence to define a group or (sub) culture they are associated or related with. Again, it is possible to see that Gentles *et al.* (2015:2) concur with Van Manen (2014) that purposive sampling, which is also called judgmental sampling, is considered as the choice of participants because of the qualities the participants hold. Purposive sampling suggests that cases, units or members: "(i) Should be typical of the target population; and (ii) Should be strategically relevant to the research". Also, the selection must be "based on the requirements of the research questions or theoretical considerations" (Neuman, 2011:530).

Above all, availability and willingness of the participants to partake during the interview sessions was crucial, as well as their ability to communicate their experiences and views in an articulate, expressive, and insightful manner. The participants that were chosen for this study displayed that they had sufficient diverse characteristics that would provide the maximum variation possible during the gathering of data. An e-mail was sent to the targeted population to notify them about the purpose of the study, and their participation was requested.

3.4.4 Data Collection Methods

Data is an important element of research and there are various research methods that can be used to acquire and analyse data, depending on the research approach the researcher has chosen. Any research is based on the data collected by the researcher in order to present evidence supporting the findings of the study. Leedy and Ormrod (2010:94) define data from a practical

approach: “Data are those pieces of information that any particular situation gives to an observer”. According to Zikmund, Babin, Carr and Griffin (2010:19), data is defined as “facts or recorded measures of certain phenomena (things or events)”, while Elmasri and Navathe (2011:4) posit that data are “known facts that can be recorded and that have implicit meaning”, thus suggesting a descriptive approach.

Ellis and Levy (2012:407) argue that all the definitions that have been given by previous authors offer an understanding of the connotation of data in a scholarly enquiry setting, but none of these definitions seem to effectively capture the role of data in research. When producing data for a qualitative study there are different data collection instruments that can be used, which include observation, in-depth interviews, focus groups, documents, archives, and historical research. Therefore, ‘data collection instruments’ refer to the techniques researchers employ to collect data for a study (Pacho, 2015:47). Pacho (2015) also purports that researchers might use “observations, in-depth interviews, written documents, audio-visual materials, electronic documents such as e-mail messages and websites, and anything else that can help them answer their research question. Clark *et al.* (2010:257) also point out that qualitative data collection tools include in-depth interviews, observations, documents and archives, historical research and focus groups.

In-depth interviews are considered as the main approach to data collection in qualitative research (De Vos *et al.*, 2012:342). This approach includes the posing of open-ended questions and follow-up enquiries that are intended to acquire a deeper understanding of respondents’ experiences, insights, views, feelings and knowledge (Rosenthal, 2016:510). Interviewing methods include one-on-one, face-to-face interviews, telephone interviews, email and Internet interviews, open-ended questions as part of a questionnaire and focus groups (Cresswell, 2014:191). For the purposes of this study one–on–one interviews were employed, using an interview schedule which gave the researcher the opportunity to probe or ask more questions for clarity (Prinsloo, 2015:3).

Most of the participants that were interviewed for the study were technical employees from the Transport Infrastructure and Regional Services office, members of management, employees from Human Resource Management and executive members of ECSA. The questions proposed were made available prior to the interviews and the respondents were asked similar questions.

There were some modifications made to some of the questions as the interviews progressed, in order to address certain issues that arose during the interviews. Interviews were scheduled for each participant and 30 minutes was allocated per interview. Each participant was interviewed individually. Interviews were audio recorded with the consent of all participants and the researcher took notes which were reviewed after the interviews were completed. The audio recorded interviews were transcribed for further analysis. Before the interviews began the researcher ensured that each interview was conducted in an environment preferred and chosen by the interviewee, which was convenient, private, secure and comfortable for them.

The objective of the study, confidentiality and the method that would be used during the interviews was discussed with the participants before the consent forms were signed in each other's presence. The recorded audio files and notes were kept in a safe and lockable place following the interviews, for a prescribed period for future reference. Secondary data was reviewed from the relevant documents which were provided by the participants, including historical files, policies, previous literature, Internet sources, the legislative framework and selection and recruitment meeting minutes, as per Creswell (2014:190). The use of secondary data from previous literature assisted by establishing how big the phenomenon was and by identifying gaps that had been overlooked about the phenomenon. Personal details of the participants were not captured, to ensure their anonymity. However, the researcher required demographic information (age, sex, and race) and participants' classifications and the roles they played in the selection and retention of scarce skills.

3.4.5 Data Analysis

De Vos (2011:397) and Creswell (2014:194-195) define qualitative data analysis as the procedure of bringing order, structure and meaning to a massive amount of data. The process involves taking the raw data and reducing it; sifting important information from trivia by identifying major patterns and creating a framework for communicating the essence of what the data reveals. In a qualitative research approach data can be analysed by using thematic analysis.

Thematic analysis: Saunders *et al.* (2012:579) suggest thematic analysis as a foundational method for qualitative analysis. It can be used in realist research that wants to comprehend the factors behind human attitudes and actions. An interprevist study may use thematic analysis to

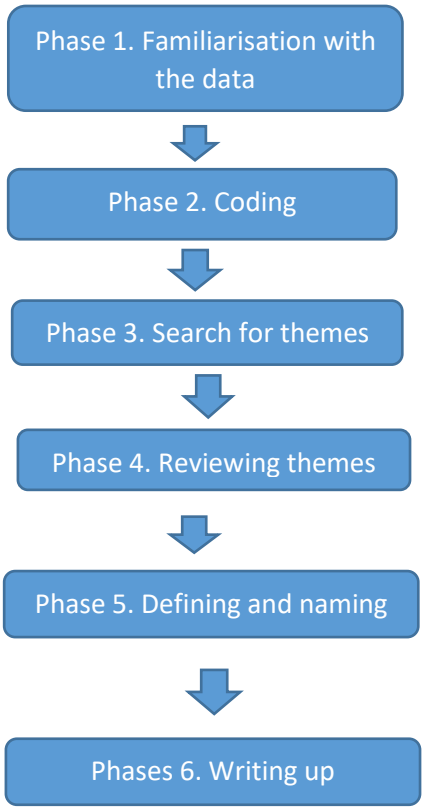
explore different interpretations of a phenomenon (Saunders *et al.,* 2012:579). Du Plooy-Cilliers *et al.* (2014:234-247), on the other hand, suggest the use of qualitative content analysis. **Qualitative content analysis** is used to search for and identify obvious and covert themes and patterns embedded in a certain text. It pays attention to the range of meanings of the phenomenon illustrated, that are unique themes rather than statistics significant of the occurrence of texts or concepts. **Discourse analysis** determines how ideas are conveyed to construct a reality by means of looking at the language used by participants. In c**onversational analysis**, participants can switch roles between being a speaker or listener. It highlights the subjective thoughts and understandings that people display in their everyday communications. **Multimodal analysis** attempts to interpret and use body language and other modes of communication used as part of a conversation. It deals with all types of modes that the researcher recognises as being significant in the communication process. **Semiotics** is concerned with something that can be measured as a sign, hence it is defined as the science of signs and codes and the meanings they express.

After data was collected the researcher made use of thematic analysis, since this study was qualitative in nature. Thematic analysis is the procedure of recognising patterns or themes in qualitative data (Marguire and Delahunt, 2017:3352). Marguire and Delahunt (2017) also claim that thematic analysis is the first technique that should be erudited as "it provides core skills that will be useful for conducting many other kinds of analysis. Similarly, Vaismoradi, Turunen and Bondas (2013:400) also assert that thematic analysis as an independent qualitative descriptive method is mostly defined as "a method for identifying, analysing and reporting patterns (themes) within data". Again Vaismoradi *et.al* (2013) point out that it is introduced as a qualitative descriptive approach that offers core skills to researchers for directing many other types of qualitative analysis. Thematic analysis includes a researcher coding the collected qualitative data to classify themes or patterns for further analysis, connected to his/her research question (Saunders *et al.,* 2012:579).

The main reason that the researcher chose this method was that it could yield an insightful analysis that replied to the research questions. Thematic analysis was a useful method for the researcher when scrutinising the perspectives of the different respondents; indicating similarities and differences, and creating unexpected insights (Nowell, Norris, White and Moules, 2017:2). Furthermore, it was also useful for summarising the main features of the large

data set, as it forced the researcher to follow a well-structured method when handling the data, and it assisted with the production of a rich and organised final report. The primary data that was collected through interviews with the participants was transcribed and the following six phases of thematic analysis demonstrated below on Figure 3.3 was followed.

Figure 3.4: Phases of Thematic Analysis



Source: Adopted from Marguire and Delahunt (2017:3354)

3.4.6 Data Quality Control

Validity and reliability are crucial concepts in contemporary research as they are used for augmenting the accuracy of the assessment and evaluation of researched work (Mohajan, 2017:2). Mohajan (2017) asserts that it intensifies transparency and lessens chances to insert researchers' bias in qualitative research. Furthermore, Mohajan (2017) has established that without evaluating the validity and reliability of a study, it will be challenging to refer to the effects of measurement inaccuracies on theoretical connections that are being measured. **Validity** is "concerned with the integrity of the conclusions that are generated from the piece of research", and in qualitative data it can simply be addressed with the depth, honesty,

richness and scope of the data attained, the respondents selected, the extent of triangulation and the detachment or objectivity of the researcher (Pacho, 2015:50 -51).

Pacho (2015:50-51) refers to **reliability** as "the degree to which a procedure gives consistent results". It can be considered as a fit between what is considered as data and what really occurs in the normal setting that is being researched, meaning the level of accuracy and comprehensiveness of the reporting. Du Plooy-Cilliers *et al.* (2014:252-253) assert that in qualitative research, researchers prefer to use the concept of 'trustworthiness' to measure the reliability and validity of a study, and there are of four dimensions of trustworthiness, namely credibility, transferability, dependability and conformability to ensure that the qualitative research is accurate. In terms of **credibility,** the researcher must ensure that the results of the study are believable from the participants' perspectives, rather than focussing on how much data is collected. Nowell *et al.* (2017:3) claim that credibility can be attained through activities such as prolonged engagement, persistent observation, data collection triangulation and researcher triangulation.

In addition to this, Babbie (2011:277) recommends peer briefing, member checking and referential briefing. Credibility in this study was ensured through prolonged engagement during data collection during the in-depth interviews. **Transferability** requires the researcher ensuring that the degree to which the outcome of the qualitative research can be transferred to other settings with other respondents is acceptable. When conducting this study, the researcher ensured transferability with a solid description of the probe, and the respondents were selected purposefully using 'purposeful sampling' as the sampling technique (Singh, 2014:409-410). The **dependability** of the findings is achieved when the researcher is consistent in terms of the way in which the research is conducted, analysed and presented, so that if similar research is done it will achieve similar results (Anney, 2014:278). It was ensured in this study by asking similar questions of the participants and by the fact that they were interviewed individually. During data analysis coding–recoding was also maintained, thus ensuring dependability of this study. According to Anney (2014:279), **conformability** is "concerned with establishing that data and interpretations of the findings are not figments of the enquirer's imagination but are clearly derived from the data".

Anney (2014:279) also purports that conformability of qualitative research is realised through an audit trail, a reflective journal and triangulation. Conformability in this study was established by conducting an audit trail, with records kept of the raw data that was collected during interviews using recordings and transcripts. This assisted the researcher to systemise, narrate and cross-reference the data, as well as simplified the reporting of the research process.

3.5 ETHICAL CONSIDERATIONS

According to Saunders *et al.* (2012:239), during the design and planning stage of the study, when looking for access to the research site and to the potential participants, the researcher must take cognisance of the research participant's/respondent's rights and follow a code of ethics. Ethics are the "standards of behaviour" that guide the researcher's "conduct in relation to the rights of those who become the subject" of the study or may potentially by affected by the study in some way. Du Plooy-Cilliers *et al.* (2014:263) explain that ethics is a moral or professional code of conduct that sets the standard for the attitudes and behaviour of the researcher/s and participants. Berg and Howard (2012:61) suggest that researchers "do no harm", when collecting and reporting on data from someone else, as this has the potential to cause physical and psychological damage to the person/s that the data is collected from, if not handled ethically.

Wotela (2017:234) explains ethical considerations as follows: (i) During the research process, the researcher must ensure that the participants and respondents are not harmed or stressed; (ii) Participants and respondents should not be misled, which means that the researcher must provide them with honest and comprehensive information about the study; (iii) The privacy of the participants and respondents must be not invaded; and (iv) Signed informed consent forms must be provided by the research participants and respondents before they participate in the study. Therefore, the handling of research partakers is the most crucial and fundamental issue that researchers confront when dealing with ethics (Johnson and Christensen, 2012:103). Pearson, Albon and Hubball (2015:4) also argue that if the study involves collection of data through interviews or other techniques including people, it is imperative that participants are treated with respect, dignity, and with caution throughout.

Pearson *et al.* (2015) further emphasise that confidentiality must be ensured, and this is normally achieved by protecting the individuals' identities and the names of the research sites,

and this anonymity must be maintained throughout. Permission to conduct this study was requested from the Head of the KwaZulu-Natal Department of Transport, before the study commenced. This ensured that it was a legal exercise. Also, before the data was collected the researcher sought approval for the study in the form of an ethical clearance letter from the Ethics Committee at the University of KwaZulu-Natal. Therefore, the researcher was obligated to ensure that no person was harmed or suffered any adverse consequences from the research activities. This was achieved by upholding the ethical principles of confidentiality, consent, respect for participants/persons and loyalty. The respondents' rights were respected and protected and no person was forced to participate in the study.

The informed consent forms were signed by the participants and the researcher, in front of each other, and these were kept by the researcher for record purposes. Participants were assured that anonymity and confidentiality would be maintained throughout the study. The researcher also ensured that the participants had a clear understanding (verbal and written) of the research objectives, how the data would be used, as well as which data collection instruments (recording device) would be used during the interviews. All data collected was scanned and filed manually in a secure location.

3.6. LIMITATIONS OF THE STUDY

Limitations can be defined as problems that may arise during a study, or limits that are out of the researcher's control such as time constraints, lack of financial resources, and limited access to information/participants (Du Plooy-Cilliers *et al.*, 2014:275). The limitations encountered during this study process were methodological shortcomings and administrative problems. The qualitative approach of the study was very time-consuming because of the open-ended nature of the interviews used to collect the data, and the length of time required to transcribe and analysis the data, as opposed to just entering numbers into statistical software. Therefore, text as data was more difficult to reduce to identify patterns than numbers as data would have been (Castleberry and Nolen, 2018:807). When planning the study, the researcher considered the amount of time required for the whole process. There was also uncertainty on the part of the researcher as data/information was collected using purposive sampling and there was no prior guarantee that in-depth information would be gathered, that each element of the population would be represented, or that the chosen sample would not be hesitant to participate (Pacho, 2015:46).

In order to mitigate limitations, the researcher sent an e-mail to the sample requesting their participation in the study, introduced the purpose of the study, and assured the participants of their anonymity before commencing with the data collection aspect of the study. The researcher also indicated how the study could contribute to addressing the phenomenon being investigated. The researcher developed a relationship with the participants, which enabled the gathering of very detailed and rich data. Time was identified as a limitation as most of the sample were technical employees who worked on sites, and managers who often attended strategic and other meetings. Provision for additional time had to be made to accommodate the non-availability of participants, which caused delays during data collection.

3.7 CONCLUSION

Overall the chapter focused on explaining how the study was conducted, by outlining the research methodology that was employed by the researcher to address the research questions. Also, it included the research strategy, the data collection tools that were used to obtain the required data from the research interviews, the targeted population for the study, the sampling techniques used and the sample size. This chapter also explained which data analysis method was used to analyse the research data and how it will subsequently be presented. Finally, it also specified the ethical issues that needed to be considered and the limitations that could be encountered.

CHAPTER FOUR
DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The chapter's aim is to present the data and provide an analysis of this data collected from the respondents who were identified by the researcher as the targeted group. The sample that was drawn from the target group to enable the researcher to address the research objective is indicated in Table 4.1. The data is grouped according to similarities and differences in the responses that were provided by the respondents. The data is then analysed by coding and grouping and categorising the same responses according to the objectives of the study.

4.2. DATA PRESENTATION AND ANALYSIS

The main aim of the research was to explore the challenges in recruiting and retaining civil engineers within the KZN-DoT. Data was collected from the participants who were purposefully chosen from the KZN-DoT population, by targeting the Transport Infrastructure and Regional Services Branch and other relevant participants. The target population totalled 83, and 18 were chosen as the sample. Unfortunately only 15 participants were interviewed due to the work schedules of the other participants which limited their availability, but this fortunately did not pose any negative impact on the data collected. Table 4.1 below illustrates the target population and the sample from which the data was collected for the purpose of this study.

Table 4.1: Target Population

Research participants	Target population	Number of participants
Candidate Technicians (recently registered but on contract)	5	2
Candidate Technicians (not registered, on contract)	51	2
Chief Engineers permanently employed	2	2
Candidate Engineers (on contract)	12	4

Management	4	2
Skills Development Officers	6	2
Human Resource Practitioners	3	2
Engineering Council of South Africa members (professional registering body for engineers and technicians)	Unknown	2
Total	**83**	**18**

The researcher conducted the interviews using an interview guide, which comprised of a general opening question and then 12 standard open-ended questions. In addition, the participants were given an opportunity to provide any final comments at the end of their one-on-one interviews. The researcher was thus able to acquire additional information associated with the research topic. Furthermore, the researcher got a chance to hear the respondents' views with regards to their interviews and the questions asked. The interview questions were aimed at responding to the research objectives, which were as follows:

- To establish the contributing factors that hindered the recruitment and retention of civil engineers within the KwaZulu-Natal Department of Transport;
- To determine the significance of the recruitment and retention of civil engineers for infrastructure development by the KwaZulu-Natal Department of Transport;
- To assess the impact of vacant posts for civil engineers on achieving the objectives of the KwaZulu-Natal Department of Transport;
- To explore the effectiveness of the current interventions and measures in place to address the shortage of civil engineers within the KwaZulu-Natal Department of Transport; and
- To evaluate the turnaround strategy intended to address the shortage of civil engineers in the KwaZulu-Natal Department of Transport.

The interviews were conducted by the researcher, based on the pre-determined themes related to the research objectives. These objectives were addressed by the questions posed by the

researcher during the interviews. The researcher grouped the questions and responses that were interrelated according to pre-determined themes, however, new themes emerged in the respondent's responses.

Core Function of the KwaZulu-Natal Department of Transport

The KZN DoT was established legislatively in terms of the Public Service Act No. 103 of 1994 as amended, section 7 (subsections 2 and 3). It was established with the aim to:

- "Provide access and mobility within KwaZulu-Natal through the planning and provision of access roads and bridges (including pedestrian bridges) to communities, particularly the previously marginalized rural areas, with the aim of improving the quality of the lives of our people. In so doing we strive to achieve an equitable, balanced road network;
- Effectively manage the road infrastructure network through the planning, construction, repair and maintenance of a balanced road network that supports the Provincial Growth and Development Strategy and the Provincial Spatial Economic Development Strategy in order to promote the economic and social development of KwaZulu-Natal;
- Promote an integrated land transport system through the creation of a well-managed, integrated land transportation system that is accessible to all the people of KwaZulu-Natal;
- Promote a safe road environment through the provision of a safe, regulated road environment through education, enforcement, engineering and evaluation". (Department of Transport, 1994:1)

A general question was posed to the respondents with regards to the core function of the KZN DoT, and the researcher established that the respondents were aware of the Department's mandate. The respondents mentioned the following:

Respondent 6:

> *The core function is construction and maintenance of the roads infrastructure, which is basically and mostly falls within the civil engineering discipline, where we need to design, construct the roads. Road infrastructure, specially transport infrastructure for the whole province, meaning KwaZulu-Natal. It just takes mainly the construction of*

new infrastructure and the maintenance of the existing infrastructure of the road network within the province as well. That's basically the core function.

This was supported by **Respondent 12**:

According to my perspective, the mandate for the Department is to build and maintain roads. To ensure safety and effective travelling of communities and goods, to ensure economic growth of South Africa.

Similarly, **Respondent 7** supported **Respondent 12** with the following:

The core function for the Department is to provide safe road infrastructure for the country's economic activities to be possible, and also to maintain that infrastructure in a viable condition.

Furthermore **Respondent 9** asserted:

The Department of Transport looks after the provincial road network in terms of maintenance and building new roads, providing access roads for communities. Law enforcement and manage development that happens around our infrastructure and public transportation.

Likewise, **Respondent 11** was in support of **Respondent 9,** stating:

The core function of the Department of Transport is firstly building and maintaining roads and bridges. Secondly, Road Traffic Inspectorate that is law enforcement and thirdly will be the road safety.

Objective One: To establish the contributing factors the hindered the recruitment and retention of civil engineers within the KZN-DoT.

Theme One: Recruitment and Retention Policies

Question one asked the respondents if the Department had recruitment and retention policies and if they had special conditions that applied to engineers. Question five asked about their perceptions of the recruitment and retention policies, and different views were shared by the respondents.

In responding to the availability of recruitment and retention policies within the KZN DoT and their perceptions of the policies, 12 of the 15 respondents were aware of the policies, however some of the respondents referred to the Occupational Specific Dispensation as one of the recruitment and retention policies in place. The majority of the respondents shared different views of the recruitment and retention policies within the KZN DoT, however the following sub-themes emerged: Occupational Specific Dispensation, Recognition of Qualification and Remuneration Policy Review.

Sub-theme 1.1: Occupational Specific Dispensation (OSD)

Even though the participants indicated that the OSD was meant for the attraction and retention of engineers, they were commonly dissatisfied with the implementation of this policy. Respondents indicated that the OSD dictated stringent conditions that had to be taken into account when appointing technical employees. Some of the respondents mentioned the following:

Respondent 8 said:

> *The only policy that I am aware of is the OSD policy. OSD details the levels of entry to professional registration. It details the employment requirements and determines the employment conditions and progression levels. It is a national policy that is determined by the DPSA and adopted by the DoT. Not aware of any provincial of Departmental policies*.

Respondent 14 indicated:

> *The Department does have the policies of recruitment and retention, but the confusion started when the OSD was implemented. HR personnel seem to highly consider the OSD in terms of recruitment and retention. I feel like there must be a discussion in the form of a workshop with relevant stakeholders (i.e. engineers, technicians, HR, MANCO and EXCO members) to have input to clarify and analyse the OSD document in order to have a common understanding of the conditions in the OSD document. This might help to iron out differences with the DPSA intervention. My personal perception is the Department needs to have an understanding in terms of what is the current need,*

and review the policies in order to address the current situation, as now we are in the fourth revolution. It will assist to identify the needs to amend the gap.

In support, **Respondent 3** stated:

Yes, according to me it does have a recruitment policy, which is the OSD. Yes, most definitely it does have special conditions. For my case, the OSD dictates that we are employed under contract until we are professionally registered with the Engineering Board which is ECSA, until I'm professionally registered. I'm under a four-year contract for me to get the necessary experience towards my ECSA registration. Maybe for starters the requirements should not be so stringent. Maybe assist us in getting the necessary experience cause currently in order to register with ECSA one needs to have specific experience like designs and site experience, but what we currently doing is signing payment certificates and attending meetings within the Department so we are not getting the necessary experience which is required for ECSA registration. So I think these policies really need to be reviewed and assist us in getting the necessary experience.

Respondent 15 added:

There are two policies that are selection and recruitment and the retention policy. There are conditions under which we recruit engineers. There are points that get allocated, as per the retention policy. It is a management tool that is used to retain engineers. As I just state that when it comes to our policies within the public sector, they are mainly legislative prescripts that we cannot really go beyond. I really wish that we could get the DPSA on board with us, as we have tried several number of times where we request the DPSA to review the OSD document that was supposed to assist in attracting and retaining engineers. However, the document is not really addressing the challenges that the Department is faced with. I wish the DPSA could come on board in assisting, and also the DPSA should work hand-in-hand with the private sector so that the Department is on par with the private sector, otherwise it will always struggle to attract and retain engineers.

Sub-theme 1.2: Policy review

Respondents felt these the policies were not working for the Department and they needed to be reviewed because if they were not, the Department would continue to have challenges in recruiting and retaining the engineers. The following were some of the responses from the respondents.

Respondent 5:

> *I think the Department does have policies, however, the policies are not specific to engineers but general, as they apply to all employees. It states all processes and procedures that need to be followed during recruitment. As far as a retention policy… not sure, haven't seen it. According to me, those policies are not effective they are just on paper. The function to communicate policies lies with the Head of Human Resources.*

Respondent 3 supported the answer provided by **Respondent** 5 by saying:

> *I think they really need to be reviewed. These are the policies which were implemented, maybe sometimes before some of us were born. Time has changed and maybe they need to go to the drawing board and review these policies, because clearly they are not working for everyone.*

Respondent 13 echoed the same sentiment:

> *Yes there are policies, but these policies sometimes are not working and need to be evaluated and monitored because the technicians and engineers are always leaving the Department. Maybe the Department needs to review such policies in order to establish why the engineers and technicians are leaving the Department. These policies that are already mentioned, the Department needs to review them. Also, when the Department reviews these policies different stakeholders must be involved, particularly HR and engineering management teams. It must not be HR only who draws up these policies, without the consultations. As TIRS performs the core activity of the Department, senior management from TIRS must be part of decision making on these policies before they are implemented. I don't think there is a tool. If there was one, the Department should have established why technicians and engineers are migrating. As it is now, every month the people are leaving the Department.*

In supporting all of the above, **Respondent 12** said:

Personally I believe that if your model does not tell you how the current situation within the engineering industry is, it means the policies will not be effective. In short, if policies do not address the current challenges and concerns then the policies are not effective.

Sub-theme 1.3: Remuneration and recognition of qualifications

The respondents reported that remuneration and recognition of qualifications was also linked to the shortage of engineers within the KZN DoT, and needed to be reviewed. When comparing the private sector and the municipalities, the respondents indicated that their counterparts left the municipalities because they were offered lucrative salaries and positions in the private sector, where their qualifications and the fact that they belonged to the scarce skills category of employees were recognised. The respondents expressed the following views with regards to remuneration and recognition of their qualifications.

Respondent 13 stated:

Currently there is no job security within the Department as we are employed as contractors. Another issue is the salary scale for the technicians, particularly those who have a Bachelor of Technology (B Tech) degree as there is a huge gap with the engineers who have a BSc Degree. Lack of recognition regarding the qualification, particularly the B Tech, as we are using the knowledge from the B Tech but are not compensated. Therefore, the Department needs to review the salary scales because they are very low.

In support of the above respondent, **Respondent 14** said:

The candidates made a comparison with the municipalities because they recognise the qualification in term of salaries. Hence I am saying that it does not make sense for the Department to invest so much in the candidates, and then just let them leave.

Respondent 9 echoed the same sentiment about salaries:

There are other various posts that need to be filled but have not been filled because one perception is when you work for the Department, the salaries are very low for technical people.

Similarly **Respondent 5** stated:

> *… Particularly the engineers' salaries compared to the private sector are very low.*

Objectives One and Two

- To establish the contributing factors that hindered the recruitment and retention of engineers within the KZN DoT;
- To determine the significance of the recruitment and retention of engineers for infrastructure development for the KZN DoT;

Theme Two: Role of engineers and the impact of vacant posts on engineers

Question three was posed to determine how the shortage of engineers affected service delivery and the achievement of the Department's strategic goals. When posing the general question regarding the core function of the KZN DoT, respondents indicated it was road infrastructure that was crucial for the mobility of communities and goods for economic growth and general welfare. The respondents further indicated that engineers played a critical role in ensuring that a well-balanced road network was attained and maintained, as they possessed different engineering skills that could only be provided by professional, registered, experienced and competent engineers. During the responses to question three the following sub-themes emerged: infrastructure backlog and deterioration, under expenditure, and reliance on consultants, which compromised the road standards.

Sub-theme 2.1: Infrastructure backlog

The respondents reported that the shortage of civil engineers had led to an infrastructure backlog as the delivery of road infrastructure projects started with civil engineers who possessed the engineering skills required to ensure a safe, feasible and economical road network.

> *It has affected the Department immensely. The biggest aspect of infrastructure delivery starts with designs that are safe and feasible and economical, and if you don't have an engineer it will affect service delivery. Unfortunately, it has to start with competent*

engineers within the Department, as it has different aspects for the functional road network. With the designs of the roads you need to have different engineers, who specialise in different aspects of the road, work collectively to produce the final product. Any shortage of one of these engineers in the collective affects the service delivery. Unfortunately, the Department has a shortage of these people and there is a backlog because of the lack of ability to deliver infrastructure to the public. This also affects the achievement of a strategic goal, which is providing a safe road network (**Respondent 8).**

Respondent 13 concurs with this**:**

Yes, it has affected service delivery. The Department has a shortage of professional registered engineers; the few registered cannot cope with the volume and service delivery is affected. Even the internal technicians are overloaded with projects and come the end of the financial year there are so many projects that are still outstanding as they are not completed in the specified time.

Respondent 10 added to this by stating:

With regards to the least amount of engineers that we are having at the moment, the timeframe with regards to the implementation of projects that are getting out to construction is now increased, and the shortage of engineers impacts on the delivery timeframe. The current engineers are overworked and can't deliver to the national standard. The Department is currently struggling to recruit the required engineers; it is affecting service delivery and the achievement of strategic goals.

However, in highlighting the backlog **Respondent 9** said:

In a big way…. Where I work currently, there should theoretically be more engineers, not only at geometric design. There should be full structural and pavement design engineers. These posts have been advertised and could not be filled. There are various engineering aspects that need to be considered when building roads, to ensure that our roads are safe. All these activities can only be done by professional engineers as they design, construct and maintain the roads, and any decision must be taken by the engineers.

Respondent 6 supported **Respondent 9** by stating:

> *We are unable to deliver services as expected for the community because we lack resources. We are running short in the field, as such, and as much as we depend on the young engineers that are still under development, remember those still need to be guided as well. You cannot just leave them alone out there with the public. We need very mature and experienced engineers so in that way the service delivery is impacted. And also there has been much reports where we found out there is an issue of safety… where you see bridges collapsed in this province. As such, it is beginning to affect us.*

Sub-theme 2.2: Reliance on consultants

Respondents were very concerned that the bulk of the work was outsourced to consultants, which compromised the Department's standards. Also, it reduced the scope of exposure for the candidate engineers as they needed to acquire specific competencies in order to be professionally registered with ECSA. Furthermore, the respondents indicated that the use of consultants had financial implications for the Department as these consultants claimed high rates and their appointment had to follow a long Supply Chain Management process which also delayed the implementation of projects. The respondents reflected these concerns in the following responses:

Respondent 3 highlighted:

> *OK, in my opinion there is not really enough being done by the Department, because what is currently happening within the Department is we are outsourcing every project within the Department. So they prefer using external bodies to run the projects… use the consultants…. We don't uplift the personnel we have within the Department as external consultants are used.*

Respondent 14 added:

> *It has affected service delivery excessively because the Department, in terms of financial spending, cannot implement projects on time and tends to rely on consultants, which compromises the standard of the roads. The Department has a standard document, even if the work can be given to consultants, but the departmental official is needed to conduct the assessment, and also the consultants claim high rates.*

Likewise, **Respondent 7** raised this concern:

> *I would say it is affecting the Department badly, especially on the money that ends up spent on projects. The Department outsources all those engineering services to consultants, and the Department ends up paying more than it would have been paying if we had internal people to do the job. Also, with the shortage of engineers we are not able to ensure compliance with regards to the Departmental standards, even on those jobs that are outsourced, so somehow it comprises the safety to the public and is also a waste of money.*

Responded 15 added:

> *I think when it comes to service delivery I don't have much information as I came from Human Resources, however, we have to constantly advertise posts of engineering as the Department has been struggling for years to fill the engineering posts. In a way it has a direct impact on a department which has to constantly use consultants, which is not what the government of the day wants us to do. However, because of the shortage of engineers the department has to rely on consultants.*

Respondent 13 also said:

> *There are a lot of road designs that need to be approved and signed out by a professionally registered engineer. Therefore, in order to get the design signed the department has to follow a long process to get external assistance from consultants.*

However, **Respondent 3** stated:

> *OK, in my opinion there is not really enough being done by the Department because what is currently happening within the Department, we are outsourcing every project within the Department. So they prefer using external bodies to run the projects… use the consultants. We don't uplift the personnel we have within the Department, so external consultants are used.*

Concurring with **Respondent 3, Respondent 4** also said:

> *No, I know of maybe the main reason being they (Department) are depending on consultants. They are not putting their interest into their internal staff because they*

know that they have someone who can provide similar services, even if Mr so and so can leave.

Respondent 5 supporting the above respondents said:

… Secondly, technicians are not exposed to practical work as the Department is using service providers and consultants.

Sub-theme 2.3: Budget under spending

The observation by the researcher based on the respondents' responses was that the Department had operational plans that reflected the projects that had to be implemented in each financial year and a budget was allocated for those projects. The respondents highlighted that there were delays in the implantation of the planned projects, which resulted in under expenditure, which in turn resulted in a negative finding when the Department was audited by the Auditor General. The respondents mentioned the following:

Respondent 6:

One: Right now we are sitting in this current financial year and it might have been a historical issue as well, we are going to underspend, and we lack resources basically on implementation and running the projects as such. The issue is that we can't spend our budget. We can't do some designs because we lack skills. That's basically what we have experienced so far.

The sentiment was echoed by **Respondent 14:**

Once you plan to start the project and the designs are not done on time, there is an overlap and the funds are underutilised. We get audited by internal auditors and the Auditor General because at the end of the day, it is public funds.

Engineers play a critical role within civil engineering and there is a different aspect that should be looked at, the building of roads, and this involves public funds. Therefore, we are required to build roads within other various laws. Material must be sourced from the right source and be tested by a geotechnical engineer who is professionally registered (**Respondent 9)**.

Object Three: To explore the effectiveness of the current intervention and measures that are in place to address the shortage of engineers.

Theme Three: Current intervention and measures

With questions two, four and seven the researcher was trying to establish how the vacant posts requiring scarce skills were identified, whether or not the KZN DoT had a strategy for attracting and retaining scarce skills, and if there was a plan to address the shortage of engineers. Question seven sought to determine if there was a tool to determine the reason for the staff migration. The sub-themes that emerged were bursaries, inadequate structure, a workplace skills plan and exit interviews

Sub-theme 3.1: Bursaries

Bursaries were mentioned by the respondents as one of the current interventions and a strategy for attracting and retaining engineers, but the problem was that when they were qualified, they left the Department for better opportunities. Also, one respondent mentioned that the conditions for enrolment in university as an engineer required maths and science, and most learners did not do pure maths at school. The respondents had the following to say:

Respondent 5:

> *I think the Department has a strategy in the form of bursaries because we recruit students, particularly those interested in engineering. However, the problem is not with the Department to be able to attract. I think the conditions of becoming an engineer require maths and science at a level, which is very difficult for learners to achieve as the learners don't do pure maths. Lastly, offer bursaries and they sign the obligation to serve, but they don't get exposure and their morale becomes very low, so they are so eager to leave the Department for better recognition.*

Similarly, **Respondent 14** said:

> *The Department did have an initial strategy in the form of a bursary to study engineering as it was identified as a scarce skill within the country. Studies have also shown that some of the engineers, once they get their qualification they leave the*

country for better opportunities. While one feels the technical personnel need to be retained within the country to uplift the upcoming engineers and technicians.

In support of the above responses, Respondent **8** also mentioned:

In terms of attracting the engineers, it starts a grass roots level where the Department offers bursaries to students and engineers who are still at varsity. Those students/ candidates have to serve an obligation.

Respondent 4 stated:

The only thing that I know as I have six years within the Department; each and every year they offer bursaries to high school graduates after completion of a diploma or degree and they offer you in-service training.

Not that I am aware of, but the Department does offer the bursaries for students who want to be within the Department, so that is the only way I am aware of (**Respondent 3**).

Respondent 11 highlighted:

Qualification and for example you want a female engineer. They are very scarce as women don't want to study towards an engineering qualification. Strategy: the Department offers bursaries to have a pool of engineers.

Sub-theme 3.2: Workplace Skills Plan (WSP)

According to the respondents who indicated that there was a WSP; they raised the challenge of funding and the shortage of skills development facilitators for the implementation of the WSP. The respondents mentioned the following:

Respondent 5 said**:**

Yes, the Department does have a WSP and it does reflect the need for engineers, but sometimes the challenge is funding to implement the WSP. The Department usually communicates with the relevant SETA to source funds in order to assist in implementing

the WSP, even though the money is not always enough. Also, the lack of human capacity in terms of a skills co-ordinator is a challenge.

Respondent 11 mentioned that:

There is a WSP which was developed and implemented by the Skills Development Section within the WSP – there is a section/portion that talks about scarce skills and the shortage of engineers always comes on top of the list as scarce.

The Department does have a WSP but it falls under the Skills Development Directorate. I'm really not sure how they really cover the shortage part in terms of the WSP **(Respondent 15)**.

Sub-theme 3.2: Exit interviews

Respondents expressed that it was not compulsory for exiting employees to participate in exit interviews; instead participation was on a voluntary basis. This tool had to be developed specifically for engineers and it could be in the form of a survey. The researcher established that the respondents did not clarify what was done with the information from the exit interviews that were done.

Respondent 15 mentioned:

There is a generic tool the department uses, an exit questionnaire. However, I feel that there must be a specific tool that will mainly focus on engineers, instead of using the current generic tool that is used in the public service, so that the Department is able to zoom in on the engineering field as well. Also, the Department should conduct surveys instead of using the generic tools to address the situation that we are faced with.

Respondent 6 also said:

Except for exit interviews that are conducted by HR there is no formal exit tool, particularly within the built environment (i.e. technicians, engineers, etc.). Maybe interviews from the HR side could help, or maybe one should develop such within the TIRS branch.

Respondent 5 highlighted**:**

> *We have an exit questionnaire, however it is not compulsory for them to do it, hence one will not know the reason for them leaving the Department.*

Sub-theme 3.3: Inadequate structure

When the researcher posed the question of how vacant posts were identified, the respondents mentioned that there was a Departmental structure and that the Department appointed candidate engineers as additional to the establishment to ensure that there was a technical pool. However, the structure that was referred to by the respondents was a proposed structure which had not yet been finalised, that would enable the Department to make appointments on a permanent basis. Some of the respondents revealed the following:

Respondent 9 stated:

> *At this point in time the Department is in the process of finalising the structure and it provides the employment of various people within the Departmental. So to my knowledge, the Department needs the structure to be approved in order for the Department to go full-scale filling the various engineer posts. Currently the Department has only three permanent engineers, but two are about to retire, and one is myself. I am not aware of any other strategy, but I am aware that the Department employs candidate engineers as additional to the establishment. Such initiative is to ensure the technical pool is expanded by providing them with experience and technical skills that are necessary for them to obtain their professional registration. Therefore, the Department hopes to have a big enough pool to select from when the time comes for the filling of posts.*

Respondent 7 mentioned:

> *I guess I have seen the structure, so from the structure you can identify how many vacant posts need to be advertised. I haven't heard of such a plan. I know that the Department is trying to fill the shortages by advertising posts and head hunting people.*

In support, **Respondent 8** said:

The vacant posts might be identified through the structure. In passing, I think there is a recruitment plan, but I don't know if it is effective.

However, **Respondent 15** stated:

Solely the responsibility of the manager who identifies the critical post for advertisement, and HRM only receives the request for the advertisement. Other than the OSD Policy, there are certain rules that apply during the recruitment process, like the OSD. The public service's regulations need to be taken into consideration.

Objective Five: To determine if there is any turnaround or exit strategy that the Department is intending to implement to address the shortage of engineers.

Theme 4: Turnaround strategy

Question six enquired if there was a mentorship programme, and if yes, how effective it was. Sub-themes that emerged were a mentorship programme and a lack of mentors

Sub-theme 4.1: Mentorship programme

The respondents expressed dissatisfaction about the mentorship programme, revealing that it was not effective. They indicated that it was not well structured for candidates to get the exposure that they needed, as the candidate engineers were seconded to the consultants. The respondents stated the following:

Respondent 1 mentioned**:**

Yes, there is a programme. It is initiated wrongly and not effective, given the rate of registration, of how many people get registered in a year (i.e. how many registered versus not registered). At the moment the Department does not talk about registering technologists or engineers, but entry level… But I wouldn't be sure about the engineers; they only focusing on the engineering technician level, not technologists and that's a problem in terms of development. If it is the strategy to get professional technicians and technologists then it shows that the Department at the moment won't grow.

Respondent 3 highlighted:

There is currently a programme, but it is not as effective as it is supposed to be because we do have candidates going out to consultants for assistance with ECSA registration, but whenever we speak to any of them they always have only one complaint; that when they get there they just sit there. It is like they are on holiday. They don't get enough assistance, attention basically. It's the same thing as with the Department, so I don't think enough is being done really.

Adding to what **Respondent 3** stated above, **Respondent 13** stated:

Yes there is a programme that assists the unregistered engineers and technicians to obtain their professional registration. But the programme is not effective since the candidates do not get exposure or the experience and competence required for registration. What is good on the programme is that you get seconded to consultants. Also technicians are Project Managers, which is different from the technical aspect and what you have studied from tertiary, and you get diverted from what is your core function.

In support **Respondent 2** said:

I don't have an idea, but last time I checked they said the T² give them the training for them to register. For civil engineers the mentorship programme is not effective, but for us it is effective. Also, I think it is up to the individual to wish himself/herself not to depend on the department.

Respondent 10 mentioned:

Yes, but the mentorship programme is not effective as it is not addressing directly the shortfalls of candidate engineers. The programme needs to be structured according to the personal exposure required by candidates and the progress needed to be closely monitored. Therefore the current programme must be improved.

In support of **Respondent 10**, **Respondent 14** added:

Yes, there is a mentorship programme to assist the candidates to obtain their professional registration. I wouldn't say it is effective, but looking at the number of candidates that have registered since the programme started…. But the problem is the candidates are under pressure and sceptical to get their contract not renewed. It is a

good initiative from the Department but it needs to be more comprehensive and get input from the candidates on how it can be improved, since they are already on the programme.

However **Respondent 15** said that programme was partly effective as there were some engineers who had registered through the programme. The respondent stated:

Yes there is under the Technology Transfer Centre, and it is a four to six year programme to help to bridge the gap of non-registered engineers so that the Department has enough pool of engineers in order to fill those posts. However, the challenge is that once the candidates are registered it is easy for the private sector to poach them because we've got certain limitations within the department. I would say partly yes, because the Department has been able to generate engineers to get registered, however, the only problem we have is exposure. We don't have job functions that they need to be exposed to, to such an extent that the Department has to have a Memorandum of Understanding with outside companies.

Sub-theme 4.2: Lack of mentors

The respondents who had enrolled on the mentorship programme mentioned that there were no mentors who would or could give guidance and assist them as candidate engineers to acquire the relevant exposure and experience that would enable them to become professionally registered engineers with ECSA. There was also a lack of monitoring of their progress in terms of them meeting the requirements set out by the Registration Council (ECSA), which resulted in low registration rates and states of readiness. Mentioning the lack of mentors, respondents had the following to say:

Respondent 4 reported:

Some of the people say poor mentorship. There is no one who is there to assist them to go through the ECSA application. If you can look at the question alone, if you answer them using your general understanding, at times when you find someone who is registered and then he is sitting down with you, you will find out this question is not as easy as it looks. Because the questions for engineers and technicians are the same but if you don't have someone who has gone through the process and also who is assisting

you in filling the forms. If we can have more mentors who will assist engineers or technicians during the process of registration.

In support of **Respondent 4**, **Responded 9** added:

Yes, there is a mentorship programme that the Department is using to guide the unregistered candidates towards professional registration. However, the programme lacks in one area and I want to call it supervision, because the mentor can have a meeting with various people to allocate activities but if there are no engineers employed within the Department who are able to provide mentorship and guidance, then such technicians and engineers end up getting seconded to the consultants who do not have skills to mentor. Therefore, the Department must train and expose the young engineers in-house, rather than seconding them to consultants.

Respondent 11 had a different view of the problem:

There is a mentorship programme in place and from my view, it is effective. It requires a dedicated person because you have to be able to give candidate engineers activities and projects, and monitor their progress. The candidates are not keen to register professionally, so they need to be closely monitored until they get their registration.

Respondents 4, 9 and 11 all agree that there is a mentorship programme in place, but they have vastly opposing viewpoints. Respondents 4 and 9 state that the failure of the mentorship programme is a Department problem: The programme doesn't really work because there are no or not enough mentors. Respondent 11 has a different viewpoint that the programme does work, but the candidate engineers and technicians don't want to do everything required to register.

Respondent 5 added:

Firstly, there are no mentors for engineers, but HR does try to use those few and they can't stretch enough to assist all the candidates. Another thing the retired engineers are not recruited to assist in mentoring, but the Department relies solely on service providers.

In support **Respondent 6** concurred:

The mentorship programme started in 2014 and there have been challenges with the participation of both mentors and mentees, and also the shortage of mentors.

Despite the opposing viewpoints on where the responsibility for the apparent failure of the programme lies, the common thread is the lack of sufficient numbers of mentors in the Department to mentor the civil engineering technicians and civil engineers properly.

Theme 5: Role of the Engineering Council of South Africa (ECSA)

Questions 9, 10, 11 and 12 were designed to establish if there were any programmes that ECSA offered to assist unregistered candidate engineers seeking employment, and if there was any assistance that ECSA provided to institutions during recruitment processes, in terms of identify potential employees. They were also designed to ascertain if there was a database that could be accessed by institutions for recruitment purposes, and why the registration rate for professional civil engineers and civil engineering technicians was so low.

ECSA is the professional registration body for engineers in South Africa, and all engineers and engineering technicians and technologists have to register with this body in order to work in the field and have their qualifications recognised. The researcher sought to establish from the respondents what role ECSA played in assisting the candidate engineers and engineering technicians who were working towards registration as professionals. The researcher also sought to establish the role that ECSA played in assisting the KZN DoT with attracting and retaining engineers. The respondents reported that ECSA did not play any role in either regard. It was merely the official registration body for the profession and provided workshops for candidate engineers who were working towards professional registration. The respondents also mentioned that ECSA had a website where all the different categories of engineering were listed, and where the different engineers, and engineering technicians and technologists' status of registration was displayed.

One of the respondents felt that ECSA should be regulating the salaries of engineers, like in other professions where the salary rates of practitioners in the various disciplines were regulated by their registration councils. Another great concern raised was the stringent registration requirements set by ECSA, and the very expensive annual registration fees. It was

felt that the Department should assist, as this had led to slow professional registration by candidates working for the Department. Respondents shared the following views:

Respondent 3:

ECSA does play its role to provide workshops which assist greatly towards one's registration. We do have senior people like the guy at T². He is here basically to assist us but again, it's just I don't think there is enough emphasis put in place to assist us with our registration. According to my knowledge, no, they don't assist the institutions. For starters, ECSA, the salaries for technicians are not standardised. Any consultants or employers will be paying qualified technicians any amount they see fit, so in that regard ECSA is not playing its part. I do have friends who tell me that a qualified technician is earning R10 000.00 per month. There should be a standard basic salary that is put in place so that people are not exploited.

Yes, they do have a database. You just log on to the ECSA website and just punch in your registration number. I am currently on their database as a candidate engineering technician, so as long you pay you annual registration fees you will be on their records. Yes, they do have a database for professional and candidate technicians. Well in order for the institution, I think they will have to contact ECSA directly.

Stringent requirements which are required by ECSA for registration…. I think we shouldn't just only shift the blame to ECSA. Yes, ECSA I feel they are not doing enough, but also my Department is not doing enough towards our registration. But it is also the part of the candidate; one needs to be focused and determined enough to get their registration so well, it depends on one's willingness to get registered. Even though it is not a walk in the park, one also needs to do better.

Respondent 12:

The *Department has a Memorandum of Understanding with ECSA. ECSA provides the road to registration for candidates and graduates to unpack the requirements for professional registration. It should not be the responsibility of ECSA to assist the institution in the recruitment of scarce skills because ECSA is just a council that ensures that in SA we have and recruit professional registered engineers. The responsibility*

still lies with the institution to attract those people who have scarce skills. They do have the database, but then the candidates have to register in different categories. The database can be accessed through the ECSA website. I think its negligence of candidates as they have the perception that professional registration was meant for a particular racial group and the conditions are very stringent, but now there is a transformation with regards to the assessors used by ECSA.

Respondent 4:

ECSA does not have a programme. It is up to that particular Department's mandate to have an MOU where they provide particular recognised numbers, like T². They do have that registration number, like where they must adhere to ECSA's conditions and ensure that every year they report to ECSA regarding the programme, that they still adhering to conditions applicable to that programme they presented that they will roll out with regards to training their candidates.

According to ECSA, the way I understand it, it is up to the candidates to be involved in their professional registration. ECSA only provides guidelines in order to receive professional registration. These are the criteria that need to be fulfilled, 1 – 11, where it needs the candidate technicians to produce a report that is broadly defined. Unlike for the engineers, that is problem-based and you need to solve a real life situation and its complex. ECSA only provides an application form which in your working experience you need to adhere to. Well, I think the way I understand it, ECSA plays a very important role in any government institution because they ensure that the standard of something is upheld because we as engineers / technicians; our role is to ensure that whatever we provide in our communities has the public's interest [in mind], meaning when the public is using a road, bridge or a building we catered for all registrations applicable to that particular service.

Yes, there is database you can Google. It will tell you whether that person is active or not active and their category of registration; that is a candidate or professional registered technologist or an engineer. As an organisation, maybe you can directly ask for the list from ECSA because it has personal information. Maybe you may be required to sign a consent form that you are not going to use that information to do unethical

work, because as we are registered we must ensure that we do not involve ourselves in unethical behaviour. They can't hide that list because ECSA also wants the country to develop and its professionally registered people to participate in the build-up of the economy of South Africa.

Some of the people say poor mentorship; there is no one who is there to assist them to go through the ECSA application because if you can look at the question alone, if you answer them using your general understanding, at times when you find someone who is registered and then he is sitting down with you, you will find out this question is not as easy as it looks because the questions for engineers and technicians are the same. But if you don't have someone who has gone through the process and also who is assisting you in filling the forms.... I think you can see the increase in registrations for engineers, technicians and technologists. If we can have more mentors who will assist engineers or technicians during the process of registration… If ECSA can have some sort of direction, that once you registered you need to help someone to register, and offer some sort of incentive or rewards, such as CPD points, but according to ECSA you need to register and then you need to go to those workshops up until you get that recognition and most people, once they get their registration, they are not willing to attend such workshops to receive that particular training.

Respondent 13:

No, there are no programmes because the Engineering Council of South Africa (ECSA) is a professional body and it is the responsibility of the employer to provide relevant exposure to candidates. Registration fees with ECSA: the Department has to look at the policy as currently the technician engineers are paying from their own pockets, hence the department is benefitting. Other organisations are paying for their professional personnel.

No, there is no database for the institution to access but only for registered candidates to check their registration status. According to ECSA, they have a lack of assessors therefore they have to use private individual to fast track the assessment of reports and sometimes they are not available. For example, my registration process took me for the whole year as I had submitted in January 2018 and only obtained my professional

registration in January 2019. Also, ECSA must ensure that the assessors must be those from the relevant field of engineering.

Respondent 5:

Yes, ECSA does have seminars but the Department does not have funds sometimes for the technicians to access these seminars. The Department must have Skills Development Facilitators employed solely to be responsible for liaising with ECSA in providing the assistance. Yes, there is a database, a website that is accessible. Recruitment lies with Human Practices and the perception is that it requires a certain skill. Not sure if Human Resources is aware of such a website. I think the professional registration for our candidates is expensive because for a technician there is a number of compulsory seminars that they need to attend, but the Department does not have funds. Secondly, technicians must be exposed to certain percentages of work / experience for their professional registration, therefore the Departmental candidates are not exposed to any practical work because the Department is using a lot of service providers and consultants to do the work.

Respondent 6:

Nothing that ECSA does as a Council, only the facilitation of registration. There is an MOU between the Department and ECSA to closely monitor the progress, by opening to the nearest satellite office to track the progress. No assistance provided to the institution for recruitment but can access the information of registered engineers through their website.

Yes, there is database. A request can be done through email to the registration manager. The access is limited because of personal information.

One of the challenges, historically, is what we had when we had not enough from basic education in terms of STEM (science, technology engineering and maths) and career pathing so there have been a limited number of people who are registering with universities and institutions of higher learning because of the myth around mathematics that is there. Obviously, engineering is linked with mathematics and people find it difficult to achieve. Also, with the educational system in South Africa we got a lot of

people who are unable to be admitted to study engineering, so from there, there is a bottom you need to start from… the education challenge that you go through to be engineers. I think we need to correct it from the side of mathematics, but I think the trend has changed a little bit with the new allowance, where we see the previously disadvantaged people are encouraged to do engineering. Also, we must remember in the apartheid regime that other careers were not supposed to be taken by other racial groups and the new regime is not that very old we are not going to see any change soon but it is just a historical trend and the issue of lack of mathematics in our education system. We found that people are forced to register in university; they don't even achieve their degrees and end up leaving the course. We have witnessed people who have been awarded bursaries drop out because they can't achieve their qualification, hence the number of people registering with ECSA will be limited because of their background. Another issue has been awareness and the importance of registration, and it has not been adopted as a compulsory policy within the country.

Respondent 9:

ECSA only provides guidelines for various registration categories within the built environment. I personally used those guidelines. ECSA does not have personnel who directly assist the candidates / graduate engineers on a daily basis, but ECSA has got a number of signatories who provide a certain level of training.

I do not have an answer to the question, I don't think ECSA provides such assistance but only know that there is a platform on the internet where the Department can check the registration status of candidate employees. Yes, ECSA does have a database but I do not know whether ECSA can divulge such information, but only know that you can log onto ECSA's website where the candidate applies for a job to check the registration statuses.

Engineering as a whole is competing with other professional fields in terms of attracting good calibre students from high school level. Children at high school level, they look at various things whether to pursue engineering or not if there are the students. I have a neighbour at home who is an engineering graduate and does have a job but they cannot pursue engineering as a career choice. Also, the law and medical professions have regulated their industries. In terms of charges with engineers, ECSA

has a gazetted fee rate but clients want the lowest bidder. This negatively impacts on the amount the engineers can do business. SA in general is competing with other countries for engineers. I know personally several professionally registered engineers who have decided to leave SA and pursue work opportunities in other countries. Engineering as a whole is in competition with a number of other professions.

Respondent 10:

There is no programme, but they provide the requirement that is required for the candidates to be professionally registered and how the engineers must meet the outcomes required. Not too sure about assistance to institutions for the recruitment. Yes, there is a database. They have the list of all single professionals that are registered as candidates or professionals. The list can be accessed via their website. The general knowledge is that professional persons are people like doctors, lawyers and people in marketing, so from the young age the person knows who they want to be, but things have evolved as they get exposed to a lot of things. There are colleagues who have a BSc in Engineering but choose to move to other fields like the banking sector and accounting because there is no passion, and this decreases the number of engineers. Engineering needs to be revolutionised by keeping up with the latest technology, as it is competing with other sectors. Also, there is a lack of mentors to transfer skills, therefore the younger engineers feel lost and there is no relevant training.

4.3 CONCLUSION

The data presentation and analysis has reflected the critical areas which were highlighted by the respondents during the interviews, which the KZN DoT needs to re-evaluate with the aim of addressing the challenges of recruitment and retention of engineers. This is critical for ensuring that the KZN DoT is able to deliver services according to its mandates and strategic objectives.

CHAPTER FIVE

STUDY FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The previous chapter presented the data collected from the respondents in the one-on-one interviews, and the analysis thereof. This chapter puts these findings together with the data gathered from the literature review and draws conclusions, with the view to addressing the research objectives. Recommendations are then made for the civil engineering profession and for possible future research.

5.2 RESEARCH OBJECTIVES

The main aim of the study was to investigate factors that posed a challenge in attracting and retaining a qualified, competent, skilled and experienced technical team in the KwaZulu-Natal Department of Transport.

The objectives of the study were:

- To establish the contributing factors that hindered the recruitment and retention of civil engineers within the KwaZulu-Natal Department of Transport;
- To determine the significance of the recruitment and retention of engineers for infrastructure development for the KwaZulu-Natal Department of Transport;
- To assess the impact of vacant posts for civil engineers on achieving the objectives of the KwaZulu-Natal Department of Transport;
- To explore the effectiveness of the current interventions and measures in place to address the shortage of civil engineers within the KwaZulu-Natal Department of Transport; and
- To evaluate the turnaround or exit strategy intended to address the shortage of civil engineers in the KwaZulu-Natal Department of Transport.

5.3 RESEARCH QUESTIONS

The study attempted to answer the following key research questions:

- What factors hindered the recruitment and retention of civil engineers within the KwaZulu-Natal Department of Transport?

- To what extent was recruitment and retention of civil engineers necessary for infrastructure development in the KwaZulu-Natal Department of Transport?
- To what extent had the vacant posts for civil engineers affected the achievement of objectives in the KwaZulu-Natal Department of Transport?
- What current interventions and measures were in place to address the shortage of civil engineers in the KwaZulu-Natal Department of Transport?
- What turnaround strategy was undertaken to address the shortage of civil engineers within the KwaZulu-Natal Department of Transport?

5.4 DISCUSSION OF THE STUDY FINDINGS WITH REFERENCE TO THE LITERATURE

The purpose of this research was to explore the challenges faced by the KwaZulu-Natal Department of Transport in the recruitment and retention of civil engineers. It was therefore logical to interview the relevant personnel within KwaZulu-Natal Department of Transport to determine the challenges that made this vital task so difficult. The theory and literature review were discussed in Chapter Two and a brief overview was provided and related data obtained from the respondents.

A number of factors surfaced during the study that contributed to the Department not being able to attract and retain the critical civil engineering skills that play such a crucial role in achieving the core mandate of the Department. The recurring themes that emerged conclusively pointed out that there were underlying factors that posed a challenge for the Department and hampered its ability to recruit and retain engineers. These themes allowed the researcher to draw some conclusions and identify some gaps in the policies, systems and procedures that were used for the recruitment and retention of civil engineers.

5.4.1 Recruitment and Retention Policies

The process of attracting a pool of proficient candidates to an organisation for employment is called recruitment (Louw, 2013:2), whereas retention, according to Azeez (2017:2), is a series of hierarchical preparations and practices used by an institution to retain key employees and discourage them from exiting the organisation. Azeez (2017) asserts that it is an effort by the company to retain scarce skills, with the specific end goal of meeting the company's targets. The participants in this study acknowledged that there were policies for recruitment and

retention that had been implemented by the Department, even though the majority of the participants erroneously referred to the Occupational Specific Dispensation (OSD) policy framework as the recruitment and retention policy utilised by the Department.

The participants however claimed that the policies were ineffective in addressing the current challenges faced by the KZN DoT as it was not able to recruit and retain sufficient numbers of people with the requisite critical skills. Furthermore, the participants mentioned that the OSD policy had stringent conditions that the candidate engineers had to meet in order to be permanently appointed and be placed on better salary scales. When the human resource participants were interviewed, they acknowledged that the OSD policy had special conditions which applied to the recruitment and retention of engineers and all other personnel in the sphere of the built environment.

5.4.2 Occupational Specific Dispensation

The Department of Public Services and Administration (2007:2) implemented the Occupational Specific Dispensation in 2009 in order to improve the government's ability to attract and retain skilled personnel through better remuneration. Levin (2013:3) asserts that the "general objective of the implementation of the OSD in the Public Sector was to introduce revised salary structures per identified occupation that catered for career pathing, pay progression, seniority, increased competencies and performance with the view to attract and retain professionals and other specialists". Furthermore, Levin (2013) claims that the OSD was intended to develop the Public Service's capability to attract and retain skilled people.

Even though human resources participants mentioned that the OSD was a strategy that was introduced by the Department of Public Service and Administration for the attraction and retention of scarce skills, they concurred with other respondents that the conditions were relatively stringent and customised, and it could not be reviewed by the Department as it was a national policy. Samwel (2018:37) concurs with the human resource particpants' views that an institution's incapability to formulate and implement effective strategies for attracting capable employees and retaining them to achieve organisational strategic goals was one of the major challenges facing institutions' performance. Taking into consideration the findings of the study and the intention of the implemention of the OSD, it was clear that there were limitations associated with this policy, which were referred to by the participants as stringent conditions. This simply meant that even if a potential engineer had the necessary qualifications,

the KZN DoT could not appoint them on a permanent basis, only on contract as a candidate engineer if they were not yet registered with the proffesional registration council (ECSA) as a proffesional engineer.

The participants who were appointed on contract as candidate engineers felt that there was no job security and even if they could obtain their proffesional registration, their post qualification experience was not recognised when they were appointed on a perment basis, as only post proffesional registration experience was recognised when determining their salary scales. Also, the study indicated that there were inconsistences in the application and implementation of the OSD in the different spheres of government, particularly where some municipalities did not consider the OSD requirements as compulsory during their selection and recruitment processes. As a result the KZN DoT was losing its candidate engineers and engineering technichians to these municipalities.

5.4.3 Policy Review

The concept of 'policy' is not really precise, according to Juma and Onkware (2015:833), as it means, among other elements, the direction for action. The authors define it as "general directives on the main lines of action to be followed". According to Ramesh, Howlett and Fritzen (2018:23), policy review is a critical final policy activity as it comprises the assessment of the degree to which a public policy is accomplishing its stated objectives or not, and establishes what can be done to improve the policy. The study showed that the current policies used by the KZN DoT with regard to the recruitment and retention of engineers were very old and no longer addressed the current situation, hence they needed to be reviewed.

In 2012 the KZN DoT implemented its retention policy and the purpose of this policy was "to provide a framework of principles, methods, factors and conditions for the retention and attraction of employees, particulary those who possess the skills necessary to realise and meet the startegic objectives and service delivery needs of the Department" (KwaZulu-Natal Department of Transport, 2012:3). This policy was overshadowed by the inception of the OSD which had simillar intentions as the Departmental retention policy, however, the requirements in the OSD were benchmarked and since it was a national policy it could not be bypassed and had to be implemented as is. In support of the implementation of government policies, Cochran

and Malone (2014:4) assert that government institutions are critical in enforcing the policies once they are officially adopted and the government provides legitimacy to these policies.

The findings highlighed that these policies needed to be reviewed and monitored to determine why the engineers and engineering technicians were leaving the Department. There had to be proper consultation with different stakeholders, particulary the Transport Infrastructure and Regional Offices Branch, to obtain relevent information before the implementation of such policies as this branch was the branch most affected by the exodus following the stipulations in the OSD policy. The study also showed that even though the Department had also implemented its Retention policy in 2012 with aim of retaining scarce and critical skills, the policy was not working as the OSD conditions had to be considered when recruiting and retaining the engineers. These policies needed to be reviewed at least every five years, or sooner, when the conditions that led to the establishment of the original policies had changed.

5.4.4 Remuneration and Qualification Recognition

The cash payment that is provided by the employer to the workers in exchange for their services rendered is known as remuneration (Schlecher, Hung and Bussin, 2014:3). Schlecher *et al.* (2014) highlighted that a salary is the most common form of remuneration and it is normally determined by the institution's compensation structure. Though the government has tried to attract and retain scarce skills through the implementation of the OSD, the findings of this study found that the technical employees were aggrieved with their remuneration and felt that their qualifications were not being recognised, whereas the municipalities and the private sector did recognised their qualifications and remunerated their staff with the same qualifications accordingly. It was for this reason that the Department's employees migrated to these sectors. In this study most of the technical participants wanted to leave the KZN DoT because of their current salary packages as other institutions were offering better packages.

This finding supported by the view of Sattigeri (2016:79), who claimed that salary was an important element that effected an individual's decision to stay or leave a company. Sattigeri (2016) further alluded that the valued employee should be afforded a salary package equivalent to or more than the current industry average in order to convince that employee to stay within the institution. Sule, Amuni, Obasani and Banjo (2015:13) attest that salaries and wages to be paid by insitutions must be able to interest talented human resources, form part of the

institution's legal requirements, assist with retaining talented human resources, and lastly motivates these talented human resources to do their work, which increases individual output and invariably enhances the institutional perfomance. The Public Service Coordinating Bargaining Council (PSCBC) signed a collective agreement in July 2012 to improve the salaries and other conditions of service for all government employees (PSCBC, 2012:3), and was to be implemented by all government departments.

The resolution included the following: "The employer will recognise the attainment of an improved qualification which is related to the employees' scope of work and which enhances the employee's perfomance and service delivery by the employee. Upon the attainment of an improved qualification, which relates to the employee's scope of work, the employee will receive a once off cash bonus (OOCB) of ten percent (10%) of her/his annual salary notch; provided this does not excced the minimum notch of salary level 8, which is payable with effect on 01 January 2013". Furthermore, "the cash bonus is limited to attainment of one additional qualification" (PSCBC, 2012:3). The findings of this study indicated that most of the participants expected to be recognised after the attainment of their qualification, and expected this recognition to take the form of a salary increase. This was because that they felt that the knowledge, they had acquired by obtaining that qualification was being used for the benefit of the Department, as they applied that knowledge in their day-to-day activities.

These findings were in line with those of Schlecher *et al*. (2014:4), who suggested that personal achievement and recognition were crucial motivators at work, adding that knowledgable employees valued independence and individualism. Adding to this Kwenin, Muathe and Nzulwa (2013:14) asserted that recognition and reward were part of a more comprehensive effort to keep employees and adopt good workplace practices, since recognition and reward were known to increase staff retention. Recognition and reward should therefore, form part of the KZN DoT's retention plan.

5.4.5 Role of Engineers and the Impact of Vacant Posts on Engineers

The KZN DoT was established with the aim to: "provide access and mobility within KwaZulu-Natal through the planning and provision of access roads and bridges (including pedestrian bridges) to communities, particularly the previously marginalized rural areas with the aim of improving the quality of the lives of our people. In so doing we strive to achieve an equitable,

balanced road network: effective management of the road infrastructure network through the planning construction, repair and maintenance of a balanced road network that supports the Provincial Growth and Development Strategy and the Provincial Spatial Economic Development Strategy in order to promote the economic and social development of KwaZulu-Natal" (KZN Department of Transport Strategic Plan 2017/2018). At the time of this study the KZN DoT only had three permanently employed, professionally registered civil engineers within the whole province.

This study therefore established that there was a high vacancy rate for technical employees (civil engineers and civil engineering technicians) who were critical for road infrastructure delivery by the Department. This was due to the Department's failure to attract and retain personnel with the necessary technical skills. This high vacancy rate resulted in the delayed implementation of capital projects, poor performance on target output and under expenditure. This was because these civil engineers were responsible for designs and providing technical advice on different aspects of engineering before and during the implementation of projects. Ekwoaba *et al.* (2015:23) caution against the negative effects of high staff turnover and failure to fill vacant posts, because human capital significantly contribute to an organisation's success and also constitute a significant source of competitive advantage because of their collective skills, abilities and experience, coupled with the ability to deploy these in the interests of the organisation.

Human Capital Theory claims that when an employee leaves the organisation, it indicates the exiting of specific valuable expertise, experience, skills and interactions (Owence, Pinagase and Mercy, 2014:72). This action produces two direct effects, namely: a decline in organisational output and decreased organisational service delivery. Draai and Oshonoyi (2013:869) concur that the South African government is stricken by the shortage of scarce skills, and this shortage is prevalent in all spheres of government. Positions remain vacant for lengthy periods, mainly because there is a shortage of suitable individuals. This shortage is either because such persons are unavailable or because those that do apply do not meet the job specific criteria. Failure to fill these posts with skilled and experienced personnel has led to several service delivery protests and a massive infrastructure backlog. At the time of this study the Department was found to be dependent on candidate engineers and engineering technicians

who had limited expertise and minimal decision-making powers, and as a result, the Department relied heavily on private service providers (contractors and consultants).

5.4.5.1 Infrastructure backlog

According to Khumalo, Choga and Munapo (2017:38), infrastructure is a set of facilities and systems that are essential for the public at large to function. In order for African states to realise the Sustainable Development Goals (SDGs) set by the United nations (UN), Agenda 2063 of the African Union (AU) and the High Five Goals of the African Development Bank (AFDB) depend on high-quality infrastructure (African Development Bank, 2018:65). The African Development Bank's (2018) report states that infrastructure is required for the upliftment of economic productivity and sustained economic growth. The South African Insitution of Civil Engineering (2017:12) asserts that infrastructure stimulates social mobility and access to economic prospects through access to good basic schooling, health facilities, electricity and transport. The literature supports the findings from the study that the core function of the KZN DoT was to construct and maintain a well-balanced road network infrastructure for the citizens of the province, so that they can access essential services. This infrastructure promotes economic growth within the province.

Literature reveals that the Economic Development Theory was developed in response to problems with economic development, which are complex and multidimensional. The goal of this theory was to create economic growth in its simplest form, for a country to improve the quality of life for its citizens, achieve sustainable development and realise the millennium developmental goals (Dang and Pheng, 2015:11-14). Literature also revealed that South Africa's apartheid history resulted in economic and social infrastructure that remained terribly imbalanced to this day. Even though South Africa achieved democracy in 1994, the new government inherited the infrastructure backlogs of the apartheid legacy and had not managed to reduce these backlogs significantly in the 26 years of post-democracy. The KZN DoT was established to deliver the road infrastructure mandate, but besides the negative impact of the apartheid legacy, the backlog was also exacerbated by a combination of the demands of the existing, new road infrastructure and a shortage of civil engineers.

The findings of this study confirmed that there was still a backlog of road infrastructure service delivery to the citizens of KwaZulu-Natal, due to the shortage of key human capacity, so the

strategic objective of the KZN DoT was not being realised. Modimowabarwa (2014:96) also found that the different spheres of government were repeatedly faced with accumulative and competitive demands for more services and a shortage of adequate resources to meet these demands. Modimowabarwa (2014) stated that the failure to deliver basic services resulted not only in large scale destitution for the counrty's citizens but also had a detrimental impact on social and economic advancement. This was evident in KwaZulu-Natal where road infrastructure service delivery protests by the communities in various parts of the province displayed the public's dissatisfaction with the Department's failure to meet the commitment made to construct and maintain the road infrastructure.

5.4.5.2 Reliance on consultants

Gunter, Hall and Mills (2015:519) portray consultants as "external knowledge, expertise and experience, and through consultancy as a relational transfer process they impact on structures, sytstems and organisational goals". The findings of this study showed that the KZN DoT relied heavly on consultants for the planning, designing, and implementation of road infrastructure projects, due to a shortage of in-house professionally registered civil engineers. Public administrators had idenified the gap between the internally available knowledge and the actual knowledge required, and had sought to address this by seeking the needed knowledge from outside sources (Steiner and Reichmuth, 2015:6). However, a great concern raised by the study's respondents from the Transport Infrastructure and Regional Services branch was that the bulk of the projects were given to consultants, which left them with little exposure to tasks so that they could acquire the necessary experience and expertise required by ECSA for their proffesional registration.

Steiner and Reichmuth (2015:6) claimed that in certain instances government was not keen to utilise the existing internal knowledge and instead favoured external experts. However, the increase in the number of additional projects often exceeded the government department employees' capacity, therefore these public organistaions had no option but to seek the help of external service providers (Steiner and Reichmuth, 2015). Beveridge (2012:8) concurred with Steiner and Reichmuth (2015) when he also noted that the public sector increasingly appointed consultants to perfom a huge variety of tasks. This study's participants reported that the consultants charged the department very high fees for their proffesional services; essentially for doing work that should have been done internally. The participants in this study further

reported that this reliance on consultants to deliver the road infrastructure projects compromised the Department's roads standards and the achievement of its annual targets. This was because the consultants allocated the tasks to unqualified and as yet not professionally registered technical personnel, enabling these engineers working under mentors the opportunity to gain the experience necessary for their professional registration with ECSA. Those skills gained were not being transferred to the Department's technical employees who desperately needed them, and they then continued to struggle to get the necessary skill and experiece required so that they could also register with ECSA.

Murwira (2017:131) asserted that globally construction projects more often than not suffered from poor perfomance with regards to time delays, cost overruns and quality defects. This study highlighted that the procurment of consultants' services involved a lengthly mandatory procurement proccess, which led to delays in the implementation of projects. Deferrals in procurement were always exacerbated by long bid evaluation processes, operational interruptions by implementing organisations, and the inexperience of local consultants supervising the projects (Emuze and Smallwood, 2013:21).

5.4.5.3 Budget under spending

According to Monsod (2016:1), budget under spending is an operational weakness within executing agencies, which arises as a result of bottlenecks in programme/project implementation, a project's design and in the procurement of raw materials, etc., among other things. Some critics even state that, "it is a sin not to spend the budget for essential public infrastructure" (Monsod, 2016). The findings of this study showed that budget under spending was a historical issue going back several years, due to the lack of key human resources responsible for the implementation and running of capital projects. Legoabe and Worku (2017:154-155) reported that municipalities consistently failed to spend their budgets for infrastructure maintenance because of their lack of human technical capacity and readiness to adequately maintain both new and current infrastructure.

Wall and Rust (2017:6) assert that the shortage of a skills base in the public sector responsible for infrastructure manifests in various ways, not just in the operation and maitenance of infrastructure. One of the major manifistations is the frequent under spending of the capital infrastructure budgets by most public sector institutions. Vandudzai and Lumengo (2019:5)

support this by stating that the National Treasury has struggled for several years with the challenges in the inability of a number of local government departments to spend their allocated budgets. These authors also claim that according to the National Treasury's report for the 2012/2013 financial year, the under spent budgets were adjusted by 0.6% and 1.9% respectively by the national and provincial governments.

Furthermore, this study's participants indicated that different engineering aspects had to be considered during the planning, designing and implementation phases of projects, and these services had to be provided by a professional engineer to ensure that road standards were adhered to and to ensure value for money. Due to the lack of internal skilled technical capacity, these services were sourced from external sources and had to follow a lengthy Supply Chain Management process, which also had to comply with any new policy reforms. According to Ambe (2016:278), the lack of operational guidance for practitioners responsible for the implementation of procurement policies was a hindrance, as personnel did not know how to implement consistent procurement practices, thus appropriate departmental policies were required. These procurement challenges were contributing factors to the budget under spending. The study revealed that since the budget allocated for the infrastructure projects was from public funds, the KZN DoT was subjected to auditing by internal auditors and the Auditor-General to enforce compliance and accountability.

Budget under spending in turn affected the allocation of the annual budget for the upcoming financial years, as the budget was reduced by the Treasury following under spending. In addition, under expenditure was regarded as financial misconduct, as planned projects were not delivered for citizens. Vandudzai and Lumengo (2019:5) point out that the ability to carry out programmes and deliver services was affected by capital budget under spending. Treasury has put measures in place to curb this trend of under spending, such as reducing, witholding or even transferring grants to other projects and entities, but the government departments continue to under spend. To illustrate this point, the KZN DoT has received a qualified audit for the past four years for poor performance output on the delivery of infrastructure projects due to under expenditure.

5.4.6 Current Intervention and Measures

5.4.6.1 Bursaries

The findings of this study showed that the KZN DoT offered bursaries to students who wanted to pursue the field of civil engineering, as a strategy to address the shortage of civil engineers within the department. These bursary students, upon the completion of their degrees, had a contractual obligation to serve the Department according to the period stipulated by their bursaries contract. However, the study showed that the inherent requirements to study engineering were maths and physical science, and there were not that many students who studied pure maths at school, as most students did maths literacy, which was a significantly easier subject. It was also revealed that the Department was struggling to attract women students to study engineering through their bursary programme, as women were more interested in other fields of study. For students to get accepted to university in order to pursue engineering, they required a high percentage pass at matric level for pure maths and physical science, and not enough students were able to achieve this requirement. Added to that, the engineering course itself was very difficult, and this translated into fewer engineering students graduating from university for employment.

Various literature used echoed the findings of the study like that of Lourens (2015:38), who stated that the briefing document from ECSA also acknowledged the influence of schooling on the number of students in engineering in the following statement: “South Africa faces a shortage of high-level engineering skills and there is an ongoing need to transform the profession to ensure greater representativity. Currently the pipeline of qualified candidates from the school system into science, engineering and technology (SET) fields in higher education is constrained by the poor quality of schooling, and many entering students, although in the top decile of their cohort, are academically under-prepared and financially disadvantaged. Currently less than a third of all engineering students in bachelor’s programmes graduate within the regulated time and under two thirds graduate within six years. As for African students and for a range of reasons, throughput and graduation rates are even less satisfactory. Just under a third of African students graduate in five years, as opposed to 64% of white students”.

According to this study's participants, as soon as candidates fulfilled their contractual obligation, they left the Department for better job opportunities and job security, because professional registration was an inherent requirement for permanent employment by the Department. Owing to the lack of work exposure and mentoring within the Department itself, because the bulk of the infrastructure projects were managed by consultants and the Department lacked mentors, the candidates left to work in the private sector where they could gain the experience required for professional registration.

5.4.6.2 Workplace Skills Plan (WSP)

For South Africa to be able compete in the global markets it has to address several challenges that arose because of the country's history before democracy, and these challenges included skills shortages. It was for this reason that the Skills Development Act No. 97 of 1998 was enacted, which requires each sector to compile a Sector Skills Plan (SSP) that is informed by the Workplace Skills Plan (WSP), to build the skills of the South African Workforce (Ngcobo and Govender, 2015:270). Institutions had to develop an annual Workplace Skills Plan which provides a planned and structured approach to the type and amount of training for the year ahead, based on the skills needed for their organisations, and as legally obliged by the Skills Development Act of 2003 and the applicable Amendments of 2008 (Enterprises at the University of Pretoria, 2019:1).

During the one-on-one interviews the reseacher asked the participants of the study if the KZN DoT had a Work Skills Plan in place, in the quest to establish how the Department was adressing the shortage of engineers. The findings of the study indicated that the KZN DoT did compile a Workplace Skills Plan annually, based on the Personal Development Plans that were submitted by employees on an annual basis. The literature also indicated that engineering was always on top of the list of scarce skills required. However, this study showed that even though the KZN DoT had a WSP in place, there was still a shortage of Skills Development Facilitators and funding to implement the plan.

5.4.6.3 Exit interviews

Typically, an exit interview is a private and open communication between the employer's representative and the exiting employee, to ascertain the reasons for the employee's imminent exit (Varshney, 2018:15). The findings of this study pointed out that exit interviews were

conducted by the Human Resource's Exit section within the KZN DoT before employees exited the Department. However, the study indicated that it was not compulsory for the exiting employee to do this exit interview. It was instead a voluntary decision to participate by the exiting employee, so it was difficult for the Department to establish the reasons for the departure of all of the employees. In support of these findings, John (2016:1) suggests that hypothetically exit interviews serve numerous functions such as recognising the push and pull reasons for voluntary terminations, finding information to detect areas for improvement, and sustaining an employee's benevolence once he/she becomes an ex-employee.

Participants in this study suggested the use of a generic tool to be utilised to conduct such surveys, specifically for employees of the Transport Infrastructure and Regional Services branch, as this was the most affected branch responsible for road infrastructure delivery and needed to be fully capacitated with engineering technician and engineers to establish as to what are the reason for leaving the department. However, it was not clear from the findings of the study exactly what the Human Resource division did with the information gathered from the exit interviews conducted. Also, how the information was collated, anaylsed and communicated with management for further action was also unclear. According to Hossain, Himi and Ameen (2017:2), an exit interview is supposed to be a Human Resource Management tool that can be strategically utilised to source critical information regarding the institution, to review and formulate policies, and ultimately to retain skilled employees for the future.

5.4.6.4 Inadequate structure

According to Al-Qatawneh (2014:30), organisational structure is "the formal authority relationships and tasks that control and coordinate employee actions and behaviour to achieve goals in an organisation". Similary Elsaid, Okasha and Abdelghaly (2013) posit that organisational structure "is the way that an organization arranges people and jobs so that its work can be perfomed and its goals can be met". This study found that vacant posts were identified throughout the organisation's structure, and while there was a newly proposed structure to address this, but it had not been approved yet.

Since the newly proposed structure was not approved yet, it was difficult for the KZN DoT to fill all the vacant posts due to policy reforms like the Occupational Specific Dispensation which contained job titles that had never been created in the current approved Departmenal structure,

and these posts were critical for the achievement of the KZN DoT's strategic goals of maintaing and improving the road infrastructure. The study found that there were technicians who held Bachelor of Technology degrees and were registered as Engineering Technologists, but posts for such candidates with their qualifications could not be advertised until the newly proposed structure was approved. An appropriate structure stimulates growth in an organisation, as it assists in boosting its capacity in dealing with an increased volume of activities (Ajagbe, Bih, Olujobi and Udo, 2016:58).

5.4.7 Turnaround Strategy

5.4.7.1 Mentorship programme

Vivian, Kiprono and Doreen (2016:152) postulate that in the traditional sense, "mentorship involves a process that brings together the inexperienced and the experienced professional in an attempt where the former will gain knowledge, self-confidence, skills and competencies from the latter as they transit through the process". According to this study's findings, the KZN DoT did have a mentorship programme which was established in 2014 in order to assist the candidate engineering technicians and candidate engineers to get the relevant exposure in terms of work experience, competencies, knowledge and skills that is required, with the aim to prepare the candidates for profesional registration with the relevant registration council. The study also indicated that this mentorship programme was crucial since the implementation of the OSD policy in 2012 by the Department of Public Service, following the failure to attract and retain technical human resources in the public sector.

This OSD policy outlines the inherent requirements for the appointment of all employees that fall within the sphere of the Built Environment, and one of those requirements is to be professionally registered with the relevant registration council. However the study showed that the current mentorship programme was not well structured, hence it was not effective at the KZN DoT in terms of work exposure. This was because the bulk of the projects were being managed by external consultants, and in addition to this there was a lack of internal mentors. Vivian *et al.* (2016:152) point out that for a mentorship programme to thrive: management's support must be secured; it must be a well planned programme; there must be good communication between all employees involved in the mentorship programme; the mentors

and mentees must be provided with training on how to proceed upfront; and the programme must be designed in a way that employees will easily be encouraged to participate.

The participants revealed that even though some candidates were seconded to consultant companies, these companies had to have a contractual obligation to the Department to transfer skills, guide these candidate technicians and engineers and ensure that they got the exposure that was required. The candidates seconded to the consultants unfortunately did not receive the relevant exposure and mentoring. Lastly the participants revealed that the consultants had to mentor them propely in preparation for their professional registration. Jones (2017:3) was in support of proper mentorship, but claimed that mentorship programmes were always "thrown together by overworked, overwhelmed people who've never built mentoring programs and many people in these roles have often never been mentored themselves".

The literature supported these claims by the participants by revealing that such interventions were in place in some organisations, but they required some expansion. There is a thus a need for formal internship programmes for qualified engineers, technologists and technicians, particularly as funds can be accessed from the relevant SETA for this training. Formal in-service training is needed for student engineering technicians, and trainee engineers have to be seconded to consultants on projects as part of a contractual agreement with the institutions so that these trainees can acquire the required design and project supervision skills for professional registration. External mentors have to be employed to oversee the training needs and the advancement of trainees and there has to be formalisation of their practical training. Trainees also have to rotate from one project to another so that a variety of experience is obtained (Daries, 2015:5).

5.4.7.1.1 Lack of mentors

According to Vivian *et al*. (2016:151), a mentor refers "to someone who takes a special interest in a person, and in teaching that person skills and attidutes to help that person succeed". Therefore mentoring, according to Ilieva-Koleva (2015:448), "is a developmental process in which a more experienced person shares their knowledge with a less experienced person in a specific context through a series of conversations. Occasionally mentoring can also be a learning partnership between peers". Participants in this study revealed that there were only three permanent Proffesional Chief Engineers within the KZN DoT, two of which were on the

verge of retirement. They were all overworked since the Department was strungling to attract and retain engineers. It was clear from the study's findings that there was no succesion plan in place to ensure that there was always a pool of engineers that the Department could use to fill posts as they were vacated.

There were no mentors who were dedicated to providing guidance and supervision to the young candidate engineers and technicians, and instead they had to teach each other as they acquired new knowledge. Ilieva-Koleva (2015:453) described corporate mentors as those individuals who leveraged their knowledge and skills by giving advice and conselling, networked with contacts, had political and cultural *savoir-faire,* and provided continuing personal support and encourangement. Gunter *et al*. (2015:519) concurred with the participants of this study that consultants were "external knowledge actors who trade knowledge, expertise and experience". Even though the study indicated that the KZN-DoT seconded the candidate engineers and technicians to consultants, who were contractually obliged to transfer their knowledge and skills, they did not get the exposure required and mentorship by dedicated individuals to prepare them for profesional registration.

5.4.8 Role of the Engineering Council of South Africa (ECSA)

The Engineering Council of South Africa (ECSA) is a well-known engineering regulatory body in Africa, and the core function of this body is the accreditation of engineering programmes, registration of professionals in specified engineering categories, and regulation of the practice of registered persons or firms (Mohamedbhai, 2015:18-19). This study established that the implementation of the OSD by the KZN-DoT required that all engineering personnel who worked within the Built Environment had to be proffesionally registered with a recognised registration council or body in order to be appointed to permanent positions within the public service. Initially the aim of introducing the OSD by the Department of Public Administration was to attract and retain scarce skills using structured remuneration packages for specific skills sets. However the findings of this study showed that in order for the candidate engineers and technicians to be appointed to permanent positions within the KZN DoT, they first had to be proffesionally registered with ECSA. The problem, as explained, was that once employed on contract, they struggled to get the necessary experience and reach the required milestones to register with ECSA. They were thus essentially caught in a 'catch 22' position, because as long as they were employed by the Department they would struggle to get registered, and lack of

registration prevented them from earning higher salaries and becoming employed on a permanent basis.

Chikarara (2016:13) also asserts that professional registration of engineers with ECSA is crucial in order for them to perform specific engineering tasks and get better paid jobs, even though registration with ECSA remains voluntary according to ECSA. This study's findings highlighted that in order for candidate engineers and technicians to be profesionally registered with ECSA, they had to meet specific engineering outcomes, and the candidate engineers and technicians felt that there were too many requirements, which were too hard to meet. Furthermore, the findings showed that ECSA did not provide any training and mentoring for candidate engineers and technichians. They only offered workshops to assist these candidates with the paperwork required for registration (essentially just how to write up the reports required) and informed them of the processes that had to be followed in order to become registered as a profesional engineer/technician/technologist..

A concern was raised by this study's participants that the assessment of reports by ECSA was a very lengthly process. The issue of assessors being from different fields of engineering was also a concern, as participants felt that these assessors' engineering expertise was not necessarily the appropriate expertise for assessing their civil engineering reports. They preferred that their reports were checked by civil engineers. The annual registration fee was highlighed in the findings by the respondents as a matter of concern because the KZN DoT did not pay for candidates' registrations. The candidates felt that they were supposed to get assistance from the Department as it benefitted from having profesionally registered engineers and technicians in its employ.

5.5 CONCLUSION

Several conclusions have been drawn from the study's findings, based on pre-determined and emerging themes regarding why the Department of Transport in KwaZulu-Natal was having so many difficulties recruiting and retaining engineers.

Even though the KZN DoT had good intentions by implementing the Recruitment and Retention and Occupational Specific Dispensation policies with the aim of attracting and retaining employees with scarce skills, it was clear from the findings of this study that the

policies were not effective, since there were still many vacant technical posts. The KZN DoT used a structured remuneration package, as per the OSD policy document, for the attraction and retention of engineers. However, the practice was conditional and static with regards to the posts' requirements as it was bound by a resolution that was agreed to by the Department of Public Service Administration and organised labour at a bargaining council. This led to the migration of technical staff to the private sector and municipalities as the KZN DoT could not compete with these institutions as they attracted recruits by recognising their experience and qualifications and remunerated them accordingly.

Although the Human Resources section of the Department conducted exit interviews with exiting personnel, participants revealed that these interviews were not compulsory, and there was no evidence of a forum that analysed the questionnaires completed by the exiting employees. Were these interviews analysed, the Department could ascertain why it was losing skilled personnel. The failure to analyse and address their reasons for leaving added to the Department's high vacancy rate for engineers, yet engineers were critical personnel and key role players in the delivery of infrastructure projects and the achievement of the Departmental mandate. The high number of vacancies added to the infrastructure backlog, under expenditure, poor performance in terms of outputs, and negative audit findings as engineers were vital for addressing these problems. The organisational structure was last updated in 2008 and was no longer functional as it was approved before the inception of the OSD and needed to be aligned with the latest Infrastructure Policy Reforms. The new structure was suggested in 2012 but had not yet been finalised, so posts remained vacant.

This compelled the Department to outsource most of the infrastructure activities at a higher cost, compromised the Departmental road standards and increased the number of project failures and terminations due to the shortage of engineers who were supposed to be responsible for site supervision and compliance with Departmental standards. The implementation of the mentorship programme by the Transport Infrastructure and Regional Services branch was commendable as one of the turnaround strategies to assist the candidate engineers and engineering technicians to acquire their professional registration. It was aimed at creating a pool of engineers to address the skills shortage within the Department. Although the Department compiled a Workplace Skills Plan annually with the aim of augmenting the skilled

workforce, the plan was faced with challenges, like the lack of facilitators and budget constraints due to cost cutting measures.

Bursaries were also awarded as one of the strategies to address the shortage of engineers. The bursaries were offered to learners who wanted to pursue careers in engineering, but this was a long-term process as it took a few years for these students to graduate and start working for the Department. Bursary recipients were only contractually bound to work for the Department for a relatively short period, and once these recipients had fulfilled their obligations they were no longer bound to remaining with the Department.

The mentorship programme that was implemented in 2014 was another initiative introduced to alleviate the skills deficit, but according to the findings of this study it was not well structured and there was a lack of mentors, As a result the candidate technicians and engineers were seconded to consultants, but unfortunately these consultants did not ensure that they received the work exposure and experience required for professional registration. The respondents also made it very clear that the Department should have been responsible for the payment of their registration costs and annual ECSA fees, as the Department benefited from their registration as professional engineers.

5.6 RECOMMENDATIONS TO THE KWAZULU-NATAL DEPARTMENT OF TRANSPORT

Consideration of the findings on the study's objective, which was to explore the challenges faced by the KZN-DoT in recruiting and retaining civil engineers, has resulted in the formulation of the following recommendations for consideration by the Department:

- The Department should consider reviewing its retention policy and have special conditions that will specifically be applied for the retention of civil engineers, and for developing a scarce skills policy for the recruitment and retention of said engineers.
- Even though the OSD policy has a structured remuneration package for technical engineers, with aim of attracting and retaining these engineers, the Department must consider approaching the DPSA through the Office of the Premier, to consider a holistic, standardised and balanced remuneration model that allows the Department to be on par with municipalities and the private sector in terms of remuneration,

with the aim of eliminating competition and employee migration to these other sectors.

- Fast track the finalisation of the Department's structure, with the creation of more engineering posts to allow the TIRS branch to have a pool of engineers. This pool may then be utilised for succession planning, in order to reduce the number of vacant posts for engineers, so that all projects may be managed and supervised by the Department's own internal engineers.
- The existing strategy of attracting and retaining engineers by offering student engineers bursaries should be improved upon. Skills development should focus on awarding more bursaries to students who want to become engineers, by creating more engineering exhibitions in schools.
- A retention committee should be established to evaluate the exit questionnaire and monitor the implementation of the retention strategy for engineers.
- The mentorship programme should be enhanced. A strategy to achieve this may be the re-allocation of a certain percentage of the capital projects that are currently being allocated to consultants. The re-allocation of these capital projects to internal candidate engineers will assist in providing the work experience and exposure for their professional registration. This will in return ensure that road standards are re-enforced and reduce the reliance on consultants.
- Selection and recruitment policies should be flexible to allow the selection panel members the opportunity to allow the interviewees during their interviews to indicate their three most preferable work centres that they would like to be posted to if they are shortlisted for more than one post during their interviews.
- The Department's EXCO should consider recalling or reemploying retired, experienced engineers to play a mentorship role to candidate engineering technicians and engineers, rather than relying on consultants for this purpose. It was identified in this study that these external consultants did not fulfil their obligation of transferring skills.
- Human Resources management should periodically conduct surveys or evaluations with the Transport Infrastructure and Regional Services employees to consider new strategies to be incorporated during the retention and remuneration policy process and implementation.

5.7 RECOMMENDATIONS FOR FURTHER STUDY

It is suggested that further research be conducted on the Department of Public Service and Administration's failure to standardise its remuneration packages for technical employees across all sectors. The importance of consultation with the relevant stakeholders that fall under the sphere of the built environment during policy making processes cannot be overemphasised. It would be both interesting and beneficial if research could be conducted on the importance of support for these technical employees by their supporting directorate in the Department's operational branches.

REFERENCES

Boon, C., Eckarat, R., Lepak, D. P. & Boselie, P., 2018. Intergrating Strategic Human Capital and Strategic Human Resource Management. *The International Journal of Human Resource management,* 29(1), pp. 34-67.

Adewale, O. O., Abolaji, A. J. & Kolande, O. J., 2011. Succession Planning and Organizational Survival:Empirical Study on Nigerian Private Tertiary Institution. *Serbian journal of Management,* September, 6(2), pp. 231-246.

African Development Bank, 2018. *https://www.tralac.org/news/article/12592-african-development-bank-launches-the-2018-edition-of-the-african-economic-outlook.html.* [Online] Available at:

https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/African_Economic_Outlook_2018_-_EN.pdf
[Accessed 01 December 2019].

Ajagbe, M. A., Bih, J., Olujobi, J. O. & Udo Udo, E. E., 2016. Which Precedes the other? Organisational Strategy or Organizational Structure. *HARD International Journal of Economics and Business Management,* 2(6), pp. 50-66.

Almalki, S., 2016. Intergrating Quantitativ and Qualitative Data in Mixed methods Research - Challenges and Benefits. *Journal of Education and Learning,* 5(3), pp. 288-296.

Almendarez, L., 2011.

http://www.open.uwi.edu/sites/default/files/bnccde/belize/conference/papers2010/almendarez.html.

[Online] [Accessed 28 May 2018].

Al-Qatawneh, M. I., 2014. The impact of Organizational Structure on Organizational Commitment: A comparison between Public and Private Sector Firms in Jordan. *European Journal of Business and Management,* 6(12), pp. 30-37.

Ambe, I. M., 2016. Public Procurement Trends and Developments in South Africa. *Reserch Journal of Business and Management.* 3(4), pp. 277-290.

Anney, V. N., 2014. Ensuring the Quality of the Findings of Qualitative Research: Looking at Trustworthness Criteria. *Journal of Emerging Trends in Educational Research and Policy Studies.* 5(2), pp. 272-281.

Anon., 2014. *www.mype.co.za.* [Online].

APEC Human Resources Development Working Group, 2014. *Evidence of Skills Shortages and General Trends in Employment and the Value of better Labour Market Information Systems,* Australia: Asia-Pacific Economic Cooperation.

Auditor-General South Africa, 2017. *Final Management Report.* Pietermaritzburg: Auditor-General South Africa.

Azeez, S.A., 2017. Human Resource Management Practices and Employee Retention: A review of Literature. *Journal of Economics, Management and Trade,* 18(2), pp. 1-10.

Babbie, E., Hailey, F. S., Wagner, W. E. & Zaino, J., 2011. *Adventures in Social Research : Data Analysis Using IBM SPSS Statistics.* 7th ed. London: SAGE Publications.

Babbie, E. M., 2011. *The practice of Social research.* Cape Town: Oxford University Press Southern Africa (PTY) LTD.

Barnard, P., 2013. Closing the Skills Gabs- the Three Golden Rules of Talent Management. *Civi Engineering= Sivele Ingenievrswese,* 21(10), pp. 67-69.

Berg, B. L. & Howard, L., 2012. *Qualitative Research Methods for the Social Sciences.* 8th ed. USA: Pearson Education Inc.

Beveridge, R., 2012. Consultants,New Forms of Governance and the Policy Process: Privatizing Water in Berlin. *Policy Sciences,* 45(1), pp. 1-34.

Bryman, A., 2012. *Social Research Methods.* Fourth ed. Oxford: Oxford University Press.

Castleberry, A. & Nolen, A., 2018. Thematic Anaylsis of Qualitative Research data:Is it as easy as it sounds?. *Currents in Pharmacy Teaching and Learning,* 10, pp. 807-815.

Cherika, R. & Prezzama, J., 2015. Innovative approaches to Building Comprehensive Talent Pipeline:Helping to Grow a Strong and Diverse Professional Workforce. *Systemetics,Cybernetics and Informatics,* 13(6), pp. 82-86.

Chetty, M., Bird, A. & Lawless, A., 2016. *ir.dut.ac.za.*

[Online] [Accessed 12 May 2018].

Chikarara, S., 2016. Barriers to Professional Recognition:Experiences of Zimbabwean Engineers in South Africa. *Journals.hioa.no,* 6(3), pp. 1-34.

Chitsaz-Isfahani, A. & Boustani, H., 2014. Effects of Talent Management on Employees Retention:The Mediate Effect of Organistional Trust.. *International journal of Academic Research in Economic and Management Sciences,* 3(5), pp. 114-128.

Clearly, B., 2017. *https://www.hwa.ie/career-advice-and-news/top-engineering-recruitment-challenges-and-how-to-overcome-them/.*

[Online] [Accessed 19 May 2018].

Cochran, C. L. & Malone, E. F., 2014. *Public Policy: Perspectives and Choices.* USA: Lynne Rienner.

Cohen, L., Manion, L. & Morrison, K., 2011. *Research Methods in Education.* 7th ed. London: Routledge.

Cresswell, J. W., 2014. *Research Design.* Fourth Edition. London: Sage Publications India Pvt.Ltd.

Cronje, J. B., 2014. *https://www.tralac.org/discussions/article/5924-south-africa-s-new-immigration-policies-attracting-skills-and-investors-and-securing-visas.html.*

[Online] [Accessed 02 June 2018].

Dang, G. & Pheng, L. S., 2015. Infrastructure Investments in Developing Economies. *DOI,* 10.1007/978-981-287-248-7(2), pp. 11-25.

Daniel, E., 2016. The Usefulness of Quantitative and Qualitative Approaches and Methods in Researching Problem-Solving Ability in Science Education Curriculum. *Journal of Education and Practice,* 7(15), pp. 91-100.

Daries, D., 2015. Training our Future Engineers. *IMIESA,* 40(2), p. 5.

Darshani, R. K., 2017. A Study of Applicability of Succession Planning As a Retention Tool in Middle Level Management. *International Journal of Research in Management,* 5(7), pp. 77-86.

Das, D. L. & Baruah, M., 2013. Employee Retention: A Review of Literature.. *IOSR Journal of Business and Management (IOSR-JBM),* 14(2), pp. 08-16.

De Vaus, D., 2014. *Surveys in Social Research.* 6th ed. Australia, Sydney: UCL Press.

De Vos, A. S., Strydom, H., Fouche, C. B. & Delport, C. S., 2012. *Research at Grass Roots.* Pretoria: Van Schaik.

Department of Higher Education. 2011. *National Skills Development Strategy.* Pretoria: Government Printers.

Department of Home Affairs, 2016. *http://www.dha.gov.za/index.php/immigration-services/scarce-skills-work-permits.*

[Online] [Accessed 02 June 2018].

Department of Transport. 1994. *http://home.kzntransport.gov.za/.*

[Online] [Accessed 13 May 2018].

Department of Public Service. 2011. *Occupational Specific Deospensation (OSD) - Engineers and Related Professionals.* Pretoria: Government Printer.

Deshwal, P., 2015. Succession Planning: The Right people,for the Right Job, at the Right Time. *International Journal of Advanced Research in Management and Social Sciences,* 4(11), pp. 57-67.

Devadas, U. M., 2015. Comprehensive Literature Review on Human Capital Investments Theory:What's in it. *Kelaniya Journal of Human Resource Management,* 10(Number 01 January 2015 & Number02 July 2015), pp. 20-44.

Dlamini, W. & Mulaudzi, M., 2016. Unravelling Procurement Skills and Capacity Constraints in an Open Distance learning (ODL) Environment. *Research journal of Business and Management,* 3(2), pp. 120-128.

Draai, E. & Oshonoyi, O., 2013. Scarce and Critical Skills for Local government: Assessing the Nelson Mandela Bay Metropolitan Municipality. *Journal of Public Administration,* December, 48(4.1), pp. 867-882.

Du Plooy-Cilliers, F., Davis, C. & Bezuidenhout, R., 2014. *Research Matters.* Cape Town: Juta & Company LTD.

Du Plooy-Cilliers, F., Davis, C. & Bezuidenhout, R.M., 2014. *Research Matters.* Cape Town: Juta & Company LTD.

Durst, S. & Welhelm, S., 2012. Knowledge Management and Succession Planning in SMEs. *Journal of Knowledge Management,* 16(4), pp. 637-649.

ECSA, 2010.

https://www.ecsa.co.za/news/Bulletins/241110_Engineering_Skills_Pipeline.pdf. [Online] [Accessed 08 May 2018].

Ekolu, S. O., 2016. *On Capacity and Quality Issues in Engineering Studies across Sub-Saharan Africa :a Review.* Johannesburg: University of Johannesburg.

Ekwoaba, J. O., Ikeije, U. U. & Ufona, N., 2015. The Impact of recruitment and Selection Criteria on Organization Perfomance. *Global Journal of Human Resource Management,* March, 3(2), pp. 23-33.

Ellis, T. J. & Levy, Y., 2012. *Data sources for Scholarly research: Towards a Guide for Novice Researchers.* Fort Lauderdale,FL,USA, Information Science.org, pp. 405-415.

Elmasri, R. & Navathe, S., 2011. *Fundamentals of Database Systems.* 6th ed. USA: Pearson Education Inc.

Elsaid, N. M., Okasha, A. E. & Abdelghaly, A. A., 2013. Defining and Solving the Organizational Structure Promblembs to Improve the Perfomance of Ministry of State for Environmental Affairs-Egypt. *International Journal of Scientific and Research Publications,* October, 3(10), pp. 1-10.

Emalahleni Municipality, 2016.

http://www.emalahlenilm.gov.za/wp-content/uploads/2016/04/ELM-RETENTION-SCARCE-SKILLS-POLICY-MAY-2010.pdf.

[Online] [Accessed 03 July 2018].

Emuze, F. & Smallwood, J. 2013. Management Concepts and Projects Perfomance : Perceptions from the South African Public Sector Environment. *Journal of the South African Institution of Civil Engineering,* August, 55(2), pp. 21-28.

Engineering Council, o. S. A., 2013. *National Engineering Skills Survey,* Johannesburg: Media Positioning Solutions (Pty) Ltd.

Enterprises University of Pretoria, 2019. *http://www.ce.up.ac.za/Workplace-skills-planning-and-the-importance-of-training.*

[Online] [Accessed 05 January 2020].

Eshiteti, N. E. 2013. Effects of Succession Planning Programs on Staff Retention.. *Mediterranean Journal of Social Science,* July, 4(6), pp. 157-162.

Estache, A. & Garsous, G., 2012. *The Impact of Infrastructure on Growth in Developing Countries,* s.l.: www.infrastructureafrica.org.

Garg, A. K. & Van Weele, E., 2012. Succession Planning and Its impact on the Perfomance of Small Micro Medium Enterprises within the Manufacturing Sector in Johannesburg. *International Journal of Business and Management,* May, 7(9), pp. 96-107.

Gentles, S. J., Charles, C., Ploeg, J. & Mckibbon, K. A., 2015. Sampling in Qualitative research: Insights from an Overview of the Methods Literature. *The Qualitative Report,* 20(11), pp. 1772-1789.

Gillies, D., 2014. Human Capital, Education and Sustainability. *Journal of Education,* 2(3), pp. 78-99.

Gordhan, P., 2017. *Budget Speech.* Pretoria: National Treasury.

Govaerts, N., Kyndt, E., Dochy, F. & Baert, H., 2011. Influence of Learnig and Working Climate on the Retention of Talented Employees. *Journal of Workplace Learning,* 23(1), pp. 35-55.

Gratton, C. & Jones, I., 2010. *Research Methods for Sports Studies.* 2nd ed. Abingdon: Roultedge.

Grayson, D., Collier-Reed, B., Pearce, H. & Shay , S., 2013. *A Curriculum Framework for Flexible Engineering Degrees in South Africa.* Glasgow,UK, s.n.

Gulzar, S. S. & Durrani, A. 2014. Impact of Succession Planning on Employee Engagement in Telecommunication Sector in Rawalpindi, Pakistan. *European journal of Business and Mangement,* 6(33), pp. 274-281.

Gunter, H. M., Hall, D. & Collin, M., 2015. Consultants,Consultancy,and Consultocracy in Education Policy making in England. *Journal of Education Policy,* 30(4), pp. 518-539.

Hall-Ellis, S. D., 2015. Succession Planning and Staff Development - a Winning Combination.. *The Bottom Line: Managing Library Finances,* 28(3), pp. 95-98.

Heyns, C. & Luke, R., 2012. Skills Requirements in the Supply Chain Industry in South Africa. *Journal of Transport and Supply Chain Management,* 6(1.34), pp. 107-125.

Hossain, M. S., Himi, S. T. & Al Ameen, J., 2017. Strategic Use of Exit Interviews: The Art of Retention. *Asian Journal of Economics,Business and Accounting,* 2(4), pp. 1-12.

Ilieva-Koleva, D., 2015. *Importance of Mentoring Programs in Business.* Rome: VUZF University.

Ivanova, E. & Masarova, J., 2013. Importance of Road Infrastructure in the Economic Development and Competitiveness. *Economics and Management,* 18(2), pp. 263-274.

John, R. E., 2016. Exploring the Behavioural Options of Exit and Voice in the Exit Interview Process. *International Journal of Employment Studies,* 01 February, 24(1), pp. 25-41.

Johnson, B. & Christensen, L., 2012. *Educational research,Qualitative, Quantitative and Mixed Approach.* 4th ed. Edinburg: Pearson Educational Inc.

Jones, M., 2017. *https://www.theatlantic.com/business/archive/2017/06/corporate-mentorship-programs/528927/.*

[Online] [Accessed 3 April 2020].

Juma, T. O. & Onkware, K., 2015. The Challenges og Public Policy Formulation and Evaluation Through the Questions "What, Who, How and When?. *International Journal of Economics, Commerce and Management,* November, III(11), pp. 830-841.

Kahn, T., 2017. *https://www.businesslive.co.za/fm/features/2017-07-13-how-a-lack-of-engineers-in-municipalities-is-putting-infrastructure-projects-at-risk-and-threatens-service-delivery/.*

[Online] [Accessed 14 May 2018].

Kaming, P. F. & Raharjo, F., 2014. Perceptions of Civil Engineers Regarding Adequacy of Infrastructure in the Yogyakarta Special Region. *Procedia Engineering,* 12(215), pp. 539-551.

Karakatshanis, C., 2012. *https://engineerscanada.ca/sites/default/files/news/pam_e_enging_pdf-eng.pdf.*

[Online] [Accessed 25 June 2018].

Karanga, J. G., Ndunga, R. M. & Mugambi, C. N., 2014. Factors Influencing Employee Selection In The public services in Kenya. *International Journal of Economics, Commerce and Management,* December, Vol II(12), pp. 1-15.

Kauzya, J., 2010. *Strategies for Attracting and Retaining the best Talent in the Public Service in Africa: Challenges and Strategies.* New York: UNPAN.

Kepha, O., Mukulu, E. & Waititu, G. A., 2014. The Influence of Recruitment and Selection on the Perfomance of Employees in Research Institutes in Kenya. *International Journal of Science and research (IJSR),* May, 3(5), pp. 132-138.

Khumalo, M. J., Choga, I. & Munapo, E., 2017. Challenges Associated with Infrastructure Delivery. *Public and Municipal Finance,* 6(2), pp. 35-45.

KwaZulu-Natal Department of Transport, 2012. *Retention Policy.* Pietermaritzburg: s.n.

Kwenin, D. O., Muathe, S. & Nzulwa, R., 2013. The Influence of Employee Rewards, Human Resource Polocies and Job Satisfaction on the Retention of Employees in Vodafone Ghana Limited. *European journal of Business and Management,* 5(12), pp. 13-20.

Lawless, A., 2017. *http://ally.co.za/wp/wp-content/uploads/2017/01/IMESA-Conference-2016-Numbers-and-Needs-in-Local-Government-Update-Allyson-Lawless-13-July-2016.pdf.* [Online] [Accessed 17 05 2018].

Leedy, P. D. & Ormrod, J. E., 2010. *Practical Research: Planning and Design.* 9th ed. Upper Saddle River,NJ: Prentice Hall.

Leedy, P. & Ormrod, J. E., 2014. *Practical Research Planning and Design.* 10th ed. Edinburgh: Pearson educational Inc..

Legoabe, R. S. & Worku, Z., 2017. A study of Barriers that Affect Civil Engineers in the South African Local Government Sector. *Journal of Management & Administration,* Issue 1, pp. 151-179.

Levin, R. M., 2013. *The Impact of the OSD Dissatifactions Raised by Aggrieved Public Servants Through Grievances.* s.l., Public Service Commission.

Lin, P. P., 2017. *How to Improve Engineering Recruitment and Retention.* Cleveland, American Society for Engineering Education.

Litchman, M., 2013. *Qualitative research in Education: A User's Guide.* 3rd ed. USA: SAGE Publication.

Lourens, A., 2014. The Development of Co-curricular interventions to sthrengthen female Engineering Students' sense of Sel-efficacy and Improve the Retention of Women in Traditionally Male-dominated Disciplines and careers. *South African Journal of Industrial Engineering,* Nov, 25(3), pp. 1-12.

Lourens, A., 2015. Exploring the self-efficacy of engineering students: Findings of a longitudinal study relating to student recruitment, development, retention and success. *Journal for New Generation Sciences,* 13(1), pp. 36-53.

Louw, G. J., 2013. Exploring recruitment and selection trends in the Eastern Cape. *SA Journal of Human Resource Management/SATydskrif vir Menslikehulpbronbestuur,* 11(1), pp. 1-10.

Mabusela, K. E., 2011. *Skills Shortage in Transportation Engineering- Education Perspective.* Pretoria, s.n.

Mack, L., 2010. The Philosophical Underpinnings of Educational Research. *Polyglossia,* October, 19, pp. 5-11.

Maelekanyo, C., Tshilongamelenzhe, Coetzee, M. & Masenge, A., 2013. Development of the Learning Programme Management and Evaluation scale for the South African Skills Development Context. *SA Journal of Industrial Psychology,* 39(1), pp. 1-17.

Mahamedbhai, G., 2015. Engineering Education in Sub-Saharan Africa :Quest for Quality. *International Journal of African Higher Education,* 2(1), pp. 1-24.

Mamabolo, M. A., 2016. Provision of Quality Roads Infrastructure in South Africa : Rural Villagers' Perceptions. Polokwane Municipality in Limpopo Province. *Journal of Public Administration and Development Alternatives,* December, 1(2), pp. 28-44.

Mamabolo, M. A., Kerrin, M. & Kele, T., 2017. Human Capital Investiments as Sourcec of Skills : An Analysis at Different Entrepreneurship Phases. *The Southern African Journal of Entrepreneurship and Small Business Management*, 9(114), pp. 1-12.

Marguire, M. & Delahunt, B., 2017. Doing a Thematic Analysis : A practical, Step-by-Step Guide for Learning and Teaching Scholars. *All Ireland Journal of Teaching and learning in Higher Education(AISHE-J)*, Autumn, Volume 3, pp. 3351-33514.

Mashamaite, K., 2014. Public Service Delivery Protests in a democratic South Africa: A Dilemma for Local Minuicipalities. *Mediterranean Journal of Social Sciences*, November, 5(25), pp. 231-237.

Mateus, A. D., Allen-lle, c. & Iwu, C. G., 2014. Skills Shortage in South Africa: Interrogating the Repertorie of Discussions. *Mediterranean Journal of Science*, 5(6), pp. 63-73.

Mateus, A.D., Iwu-lle, C.G. & Allen-lle, C., 2014. Skills Shortage in South Africa: Perspectives from High School Educators. *Anthropologist*, 18(2), pp. 491-504.

Mathur, A., 2011. Succession Planning: A Planning that Turns out to Legacy. *International Journal of Management and Technology*, July - December, 19(2), pp. 50-59.

Mavomaras, K., 2013. *Measuring Skill Imbalances in Times of Change:Recent Evidence from the Australian ICT Sector.* Australia: s.n.

Mbah, S.E. & Ikemefuna, C.O., 2012. Job Satisfaction and Employees' Turnover Intentions in Total Nigeria plc.in Lagos State. *International Journal of Humanities and Social Science*, July, 2(14), pp. 275-287.

Mbanjwa, M., 2013. *SAICE.org.* [Online].

McManus, P., Mulhall, S., Ragab, M. & Arisha, A., 2017. *An Investigation in the Methodological Approaches used in Doctoral Business Research in Ireland.* Dublin, Dublin Institute of Technology ARROW @ DIT, p. 10.

McCarthy, D., 2013. *https://www.ivyexec.com/executive-insights/2013/10-succession-planning-best-practices.*

[Online] [Accessed 16 July 2018].

Mehrabani, S. E. & Mohamend, N. A., 2011. Identifying the Importance Factors Influencing the Implementation of Succession Planning.. *International Conference on Information and Finance,* 21(0), pp. 37-41.

Mhlongo, S. B. & Harunavamwe, M., 2017. Exploring Management's Pecerpections of Succession Planning and its Impact on Staff Retention at an Agricultural Company. *International Journal of Research in Business Studies and Management,* 4(3), pp. 7-26.

Modimowabarwa, K., 2014. Exploring Challenges of Municipal Service Delivery in South Africa (1994 -2013). *Africa's Public Service Delivery and Perfomance Review,* 2(1), pp. 90-110.

Mohajan, H., 2017. *Two Criteria for Good Measurements in Research: Validity and Reliability.* UTC(Chittagong): Premier University.

Mohamedbhai, G., 2014. *Improving the Quality of Engineering Engineering Education in Sub-Saharan Africa*, s.l.: UNESCO.

Mohamedbhai, G., 2015. Engineering Education in Sub-Saharan Africa: Quest for Quality. *International Journal of African Higher Education,* 2(1), pp. 1-24.

Monsod, T. C., 2016. *Government "Underspending" in Perspective: Incompetence, Inertia,or Idigestion.* Philippines: ECONSTOR.

Mouton, J., 2013. *How to succeed intyour Master's & Doctoral Studies A south African Guide and Resource Book.* Pretoria: Van Schaik Publishers.

Murwira, D., 2017. Building an Ifrastructure Project Perfomance in the North-West Province Department of Public Works and Roads. *Acta Structilia,* 24(2), pp. 128-145.

Neo, R. A., Hollenbeck, J. R., Gerhart, B. & Wright, P. M., 2012. *Human Resource Management: Gaining a Competitive Advantage.* Eighth Edition. New York: Irwin McGraw-Hill.

Neuman, L. W., 2011. *Social Research Methods:Qualitative and Quantitative Approaches Students.* 7th ed. London: Pearson education.

Neuman, L. W., 2014. *Social Research Methods :Qualitative and Quantitative Aproaches Students.* 7th Edition ed. London: Pearson Education.

Ngcobo, P. & Govender, K., 2015. Addressing the Skills Shortage in South Africa: A Case Study of a Sector Education and Training Authority. *Internal Journal of Innovative Research and Creative Technology*, 1(3), pp. 270-275.

Ngcwangu, S. & Balwanz, D., 2014. The Language of 'Skills Shortage' and the Insufficiency of 'Skills shortage' language: DHET and Scarce Skills. *Post-School Education Review,* 1(2), pp. 15-17.

Nkiwane, V. S. & Barnes, N., 2017. An Ivestigation of Skills Programmes as Training Interventios: A Case Study of the Department of Higher Education and Training. *International Journal Social Science & Education,* 7(3), pp. 138-155.

Nowell, L. S., Norris, J. M., White, D. E. & Moules, N. J., 2017. Thematic Analysis:Striving to Meet the Trustworthiness Criteria. *Internal Journal of Qualitative Methods,* Volume 16, pp. 1-13.

Nxumalo, M. & Nordengen, P. A., 2010. *Improving Human Resource Capacity for Road Network Preservation.* Pretoria: CSIR Built Environment.

Nyatshumba, K., 2017. *South Africa's Escalating Engineering crisis.* s.l.:Business Report.

Oaya, Z. C., Ogbu, O. J. & Remilekun, O. G., 2017. Impact of Recruitment and Selection Strategy on Employee's Perfomance: A Study of Three Selected Manufacturing Companies in Nogeria. *International Journal of Innovation and Economic Development,* 3(3), pp. 32-42.

O'Gorman, K. & Maclntosh, R., 2014. *The Global Management Series:Research Methods for Business & Management.* Second Edition ed. Oxford: Goodfellow Publishers Limited.

Oke, A. E. & Aigbavboa, C., 2018. *Effect of Skills Shortage on Sustainable Construction.* Johannesburg, Springer International Publishing AG 2018.

Oosthuizen, P. & Nienaber, H., 2010. The Status of Talent Management in the South African Consulting Civil Engineering Industry in 2008: A Survey. *Journal of the South African Institution of Civil Engineering,* October, 52(2), pp. 41-47.

Orthman, A. A., 2013. Challenges of Mega Construction Projects in Developing Countries. *Organization,Technology and Management in Construction: An International Journal,* 5(1), pp. 730-746.

Oseghale, B. O., Abiola-Falemu, J. O. & Oseghale, G. E., 2015. An Evaluation of Skilled Labour Shortages in Selected Construction Firms in Edo State,Nigeria. *American Journal of Engineering Research (AJER),* 4(1), pp. 156-167.

Owence, C., Pinagase, T. G. & Mercy, M. M., 2014. Causes and Effcets of the Staff Turnover in the Acadenic Development Centre: A case of a Historically Black Universtity in South Africa. *Mediterranean Journal of Social Sciences,* June, 5(11), pp. 69-76.

Pacho, T. O., 2015. Exploration Participants' Experiences using case Study. *International Journal of Humanities and Social Science,* April, 5(4), pp. 44-53.

Patel, S., 2017. *https://mg.co.za/article/2017-03-17-00-south-africa-urgently-requires-engineers-for-development.*

[Online] [Accessed 19 May 2018].

Paton, M. Q., 2015. *Qualitative Research & Evaluation Methods: Integrating Theory and Practice.* 4th ed. Thousand Oaks:CA: SAGE.

Pearson, M. L., Albon, S. P. & Hubball, H., 2015. Case Study Methodology:Flexibility,Rigour,and Ethical Considerations for the Scholarship of Teaching and Learning. *The Canadian Journal for the Scholarship of Teaching and Learning,* 12 November.pp. 1-7.

Peterson, D., 2016. *www. Infrastructurene.ws.* [Online].

Prinsloo, R., 2015. Group Intervention with institutionalised older Persons. *HTS Teologiese Studies/Theological Studies,* 71(3), pp. 1-7.

KZN Provincial Treasury. 2014.

https://www.google.co.za/search?safe=active&rlz=1C1GGRV_enZA764ZA764&q=functions+of+provincial+government&sa=X&ved=0ahUKEwjYroq5kuzbAhXFJ8AKHUCxAbwQ1QIIhAEoAw&biw=1024&bih=658.

[Online] [Accessed 24 June 2018].

PSCBC, 2012. *Resolution 1 of 2012 - Agreement on Salary Adjusment and Improvements on Conditions of Service in the Public Service for the period 2012/2013-2014/2015.* Pretoria: Public Service Coordinating Bargaining Council.

Public Service and Administration, 2007. *https://www.gov.za/public-service-and-administartion-occupation-specific-dispensation.*

[Online] [Accessed 06 October 2019].

Rajasekar, S., Philominaathan, P. & Chinnathambi, V., 2013.

https://ia800400.us.archive.org/12/items/arxiv-physics0601009/physics0601009.pdf.
[Online]
[Accessed 28 October 2018].

Ramana, K. R. & Nallathiga, R., 2013. *Skill Development in Construction Sector (with Specific Reference to Urban Poor).* Hyderabad, National Academy of Construction.

Ramesh, X. W. M., Howlett, M. & Fritzen, S. A., 2018. *The Public Policy Primer : Managing The policy Process.* Second Edition ed. New York: Routledge.

Rasool, F. & Botha, C. J., 2011. The nature ,extent and effect of skills shortages on skills migration in South Africa. *SA Journal of Human Resource Management,* January, 9(1), pp. 1-2.

Rasool, F., Botha, C. J. & Bisschoff, C. A., 2012. Push and Pull Factors in Relation to Skills Shortages in South Africa. *J Soc Sci*, 30(1), pp. 11-20.

Rasool, F., Botha, C. J. & Bisschoff, C. A., 2013. The effectiveness of South Africa's Immigration Policy for Addressing Skills Shortages. *Managing Global Transitions,* Winter, 10(4), pp. 399-418.

Ritchie, J., Lewis, J., Nicholls, C. M. & Ormston, R., 2014. *Qualitative research Practice :A guide for Social Science Students and Researchers.* 2nd ed. London: Sage Publication.

Rosenthal, M. 2016. Qualitative Research methods: Why,when and how to conduct interviews and focus groups in pharmacy research. *Currens in Pharmacy Teaching and Learning,* pp. 509-516.

RSA. 1996. *The Constitution of the Republic of South Africa of 1996.* Pretoria: Government Printer.

Samuel, M., 2012. Employment Equity Consideration and Continued Skills Shortages in South Africa:Parallel Evidence from Literature and Empirical Investigation. *Journal Social Science,* 32(2), pp. 173-181.

Samwel, J. O., 2018. An Assessment of the Challenges facing Recruitment, Selection and Retention Process in Small Industries in Mwanza Region. *International Journal of Business and Management Invention (IJBMI),* March, 7(3), pp. 35-41.

Sattigeri, R. C., 2016. Employee Retention and Commitment. *International Journal of Engineering Technology,Management and Applied Sciences,* April, 4(4), pp. 77-88.

Saunders, M., Lewis, P. & Thornhill, A., 2012. *Research Methods for Business Students.* Seventh ed. England: Pitman Publishing.

Schlecher, A., Hung, A. & Bussin, M., 2014. Understanding talent attraction: The influence of financial rewards elements on perceived job attractiveness. *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur,* 12(1), pp. 1-13.

Schroeder, R. G., Goldstein, S. M. & Rungtusanatham, M. J., 2013. *Operations Management in the Supply Chain : Decision and Cases.* New York: McGraw-Hill.

Sebola, M. P., 2015. Scarce skills expatriates in South Africa Universities: Rhetoric and realities of the "Messianic" academics. *Journal for Transdisciplinary Research in Southern Africa,* December, 11(4), pp. 180-192.

Sibiya, M., Aighavboa, C. & Thwalo, W., 2015. *ujcontent.uj.ac.za.* [Online] [Accessed 08 April 2018].

Singh, S., 2014. An analysis of what makes a non profit organisation sustainable: specific reference to revenue diversification. *Interdisciplinary Journal of Contemporary Research in Business,* June, 6(2), pp. 293-424.

Sinha, V. & Thaly, P., 2013. A Review on Changing Trend of Recruitment Paractice to Enhance The Quality of Hiring in Global Organization. *Management,* 18(2), pp. 141-156.

South African Insitution of Civil Engineering, 2017. *SAICE 2017. Infrastructure Report Card for South Africa,* Midrand: SAICE.

Steiner, R. & Reichmuth, L., 2015. *Saints or Seducers? The Role of Management Consultants in the Public Sector Organizations.* Rio de Janeiro,Brazil: Kompetenzentrum for Public Management der Universitat Ber.

Steyn, L., 2015. *https://mg.co.za/article/2015-05-18-sas-skills-deficit-has-a-negative-effect-on-employment.*

[Online] [Accessed 17 May 2018].

Strydom, H., 2013. An Evaluation of the Purposes of Research in Social Work. *Social Work/Maatskaplike Werk,* 49(2), pp. 149-164.

Strydom, N., Schultz, C. & Bezuidenhout, A., 2014. Staff Perception on Talent Management and Retention : A Case of a Labour Organisation in Gauteng. *South African Journal of Labour Relations,* 38(2).

Sule, O. E., Amuni, S. I., Obasan, K. A. & Banjo, H. A., 2015. Wages and salaries as a motivational tool for enhacing organizational performance: A survey of selected Nigeria workplace. *EuroEconomica,* 34(1), pp. 7-26.

Taherdoost, H., 2016. Sampling Methods in Research Methodology; How to choose a Sampling Technique for Research. *International journal of Academic Research in Management (IJARM),* 5(2), pp. 18-27.

Taryn Florence, T. M. & Braam Rust, A. A., 2012. Multi-skilling at aTraining Institute (WesternCape Provioncial Training Insitute) of the Provincial Government of Western Cape, South Africa : Post Training Evaluation. *African Journal of Business Management,* 16 May, 6(19), pp. 6028-6038.

Terera, S. R. & Ngirande, H., 2014. The Impact of Training on Employee Job Satisfaction and Retention among Administrative Staff Members: A case of a Selected Tertiary Insitution. *J Soc Sci,* 39(1), pp. 43-50.

The Mercury, 2017. *Zuma covers all Bases, from Business to Health.* s.l.:The Mercury.

The PEW, Charitable Trust, 2014. *http://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2014/09/recruiting-and-retaining-public-sector-workers.*

[Online] [Accessed 20 May 2018].

Thomas, J. R., Nelson, J. K. & Sliverman, S. j., 2011. *Research Methods in Physical Activity.* 6th ed. Champaign,IL: Human Kinetics.

Todd, B. A., 2013. *A Global Talent Shortage: Myth or Reality?.* s.l.:University of Tennessee Honors Thesis Projects.

Torrington, D., Hall, L., Taylors, S. & Atkinson, C., 2014. *Human Resource Management.* fourth ed. United Kingdom: Pearson Education Limited.

TRS, Staffing Solution;, 2017. *https://www.trsstaffing.com/news/top-5-engineering-recruitment-challenges-and-how-address-them.*

[Online] [Accessed 19 May 2018].

Tunje, G. S., 2014. *Relationship Between Succession Planning Practices and Employee Retention in Large Media Houses in Kenya*. Unpublished MBA Dissertation. Kenya:University of Nairobi.

Twalo, T., 2010. Education for self reliance - South Africa's alternative for addressing skills shortage and job creation: A literature review. *SAJHE,* 24(5), pp. 832-846.

Vaismoradi, M., Turunen, H. & Bondas, T., 2013. Content and Thematic Analysis ; Implications for Conducting a Qualitative Descriptive Study. *Nursing and Health Sciences,* Volume 15, pp. 398-405.

Van de Walt, F., Thasi, M. E., Jonck, P. & Chipunza, C., 2016. Skills shortages and Job Satisfaction- Insights from the Gold- Mining Sector of South Africa. *African Journal of Business and Economic Research (AJBER),* 11(1), pp. 143-183.

Van Dyk, J., Coetzee, M. & Tebele, C., 2013. Organisational Commitment and Job Embeddedness of Service Staff with Critical and Scarce Skills. *South African Journal of Labour Relations,* 37(1), pp. 61-78.

Van Manen, M., 2014. *Phenomenology of Practice:Meaning-giving Methods in phenomelogical Research and Writing.* Walnut Creek,CA: Left Coast.

Vandudzai, M. & Lumengo, B.-B., 2019. *Municipal Infrastructure Spending Capacity in South Africa : A Panel Smooth Transition regression.* Johannesburg: MPRA.

Varshney, D., 2018. *Goodbye Time for Employees: Exit Interviews or Routine Interviews.* Dubai, King Abdulaziz University.

Vaseghi, M. & Moayedi, Z., 2016. Approach of Talent Management on Personnel Selection. *International Journal of Humanities and Cultural Studies,* May, Issue 2016, pp. 940-946.

Vivian, C., Kiprono, T. D. & Doreen, N., 2016. Infuence of Mentorship Practices on Employee Perfomance in Small Manufacturing Firms in Garissa County, Kenya. *European Journal of Business and Management,* 8(8), pp. 151-160.

Wagner, C., Kawulich, B. & Garner, M., 2012. *Doing Social Research: A Global Context.* New York: Mcgraw-Hill Higher Education.

Wall, K. & Rust, C., 2017. *A Rating Tool to Assess the Condition of South African Infrastructure.* Pretoria: Department of Construction Economics, University of Pretoria.

Wall, K. & Rust, C., 2017. *An Assessment of the Condition of South Africa's Transport Fixed Infrastructure.* Pretoria: CSIR.

Waruiru, W. E. & Kagiri, A. W., 2015. Effects of Succession Planning Strategy on the Perfomance of International Non-Governmental Organization in Kenya.. *International Journal of Science and Research,* May, 14(5), pp. 3147-3155.

Watermeyer, R. & Pillay, M., 2012. Strategies to Address the Skills Shortage in the Delivery and Maintenance of Infrastructure in South Africa:a civil engineering perspective. *Civil Engineering=Sivele Ingenievrswese,* June, 21(10), pp. 46-56.

Wiid, J. &. D., 2013. *Marketing research.* 2nd ed. Cape Town: Juta & Co.

Windapo, A. O. & Cattell, K., 2013. The South African Construction Industry: Perceptions of Key Challenges Facing Its Perfomance, Development and Growth. *Journal of Construction in Developing Copuntries,* 18(2), pp. 65-79.

Wirba, A. V., 2017. The recuitment,Selection and Retention Practices by Familiy Owned Small and Medium Size Enterprises (FOSMEs) in Cameroon. *American Journal of Business, Economics and Management,* 5(1), pp. 1-12.

Wotela, K., 2017. Towards and Outcomes-Based Approach to a 'Research Strategy,Design, Procedure and method' Chapter for Business and Public Administration Research. *Journal of Public Administration,* March, 52(1.1), pp. 223-246.

Yin, R., 2014. *Case Study Research Design and Methods.* 5th ed. London: Sage Publications.

Yin, R. K., 2011. *Qualitative Research from Start to Finish.* New York: Guilford Press.

Zikmund, W. G., Babin, B. J., Carr, J. C. & Griffin, M., 2010. *Business Research Methods.* 8th ed. Mason,HO: Cengage Learning.

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SCHOOL OF MANAGEMENT, INFORMATION TECHNOLOGY AND GOVERNANCE

REQUEST TO PARTICIPATE IN THE STUDY

Dear Sir/Madam

I, Sibonisiwe Maggie Ngcobo a Masters student in Public Administration (MPA) at the University of KwaZulu-Natal. I am conducting a research project entitled: "Exploring Challenges in Recruiting and Retaining Civil Engineers within KwaZulu-Natal Department of Transport". The study is purely conducted to ascertain the challenges that might be the cause for Department of Transport not be able to attract and retain civil engineers. An approval to conduct the study was sought and granted by the Head of Department of Transport.

You were selected purposively to participate in this research project. Through your participation I anticipate to gain more insight of what might be the challenges of not be able to attract and retain the civil engineers by the department and also contribute in achieving the objectives of the study. A consent form will be signed before the interviews is conducted. You may refuse to participate or withdraw any time from the study as there are no binding obligations. There is no monetary gain from participating in this study. Confidentiality and anonymity of any records identifying you as a participant will be maintained and be kept in a lockable place within the facilities of the university.

Should you have any questions or concerns about participating in this research project, you may contact me. The interview might take about 30 minutes to complete and it will be schedule according to the time and venue that is convenient to you. I hope you will take the time to participate in this research project.

Yours sincerely

[redacted]

Miss Sibonisiwe Maggie Ngcobo

ANNEXURE A

INTERVIEW GUIDE

WELCOMING REMARKS (RESEARCHER)

I will first greet the participant, introduce myself and then invite the participant to do the same.

PURPOSE OF THE INTERVIEW

I will inform to the responded that all issues to be discussed are of great importance for exploring the challenges faced by the department for recruitment and retaining of scarce skills

I will encourage respondents to feel free to express their views. I will remind them that there are no right or wrong answers hence their views are very important. I will make it clear that this research is mainly aimed at eliciting information that would contribute towards exploring the challenges faced by the department for recruitment and retaining of scarce skills. I will advise respondents of entitlement to their own opinions. All respondents will be informed as to the duration of the interview and a request will be extended to record the whole interview session.

INTERVIEW

I will start of the interview by posing a general question of what the core function of the department of Transport then I will ask the specific questions as stipulated below:

1. Does the Department of Transport have recruitment and retention policy? If yes, does the policies has special conditions that applies for the recruitment and retention of engineers?
2. How does the vacant post of scarce skills are identified within the department .does the department have another strategy of attracting and retaining the scarce skills?
3. How the shortage of engineers has affected the service delivery and the achievement of department's strategic objective.

4. Does the department has Workplace Skills Plan? If no, what is the plan that is in place to address the shortages of engineers identified?
5. What is you perception regarding the policies used by the department for the recruitment and retention of scarce skills?
6. Is there any mentorship program that assist the unregistered candidate to obtain professional registration/ if yes, is it effective?
7. Is there a tool that the department is using to determine the reason for staff migration?
8. What strategy do you think the department should put in place in order to attract and retain the engineers?
9. What programs does ECSA has in place that assists the graduate and candidates engineers in obtaining professional registration
10. How does ECSA assists the institutions in the recruitment of scarce skills?
11. Does ECSA has the data base of all professional registered engineers? If yes, how the list can be accessed by the institutions for recruitment purposes?
12. According to ECSA in terms of numbers what is the reason of low registration?

CLOSING REMARKS

I will offer an opportunity for any short final comments that the participants may wish to make.

Thank you very much for your invaluable input to the research project, would you like to make any last comments? The information you provided will be vital in my research dissertation and it will contribute in determining the challenges faced by the department in recruiting and retaining the scarce skills; civil engineers

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INYUVESI YAKWAZULU-NATALI

Appendix 1: Gate keepers' letter

Flat 304 Thanet House
164 Langalibalele Street
Pietermaritzburg
3200

Head of Department
KwaZulu-Natal Department of Transport
Inkosi Mhlabunzima Maphumulo House
172 Burger Street
Pietermaritzburg
3201

Dear Mr. Gumbi

This letter serves to request permission from the Head of Department for the KwaZulu-Natal (KZN) Department of Transport (DOT) to conduct a research study in the organizations; specifically, with the employees / units relevant to the research study (Transport Infrastructure & Regional Services technical employees, Human Resource, Practioners, Skills Development Officers & Senior Management).

My name is Sibonisiwe Maggie Ngcobo, I am currently employed by the KZN DOT whiles also pursuing Masters of Arts in Public Administration. My research topic is "exploring challenges in recruiting and retaining civil engineers within KwaZulu-Natal Department of Transport". This study seeks to investigate why KwaZulu-Natal Department of Transport had a challenge in recruiting and retaining the civil engineers. I kindly request that I am granted permission to be able to engage with the relevant units / employees in your organisation. Please note that the data collection process would not interfere with the KZN DOT business processes, appointments will be made with the relevant people at their convenience. The study and the purpose of the study will be explained to the relevant people and would be informed that participation is voluntary and that they can withdraw participation at any time.

Kindly consider my request. If there any questions or additional information required which could help facilitate my request I can be contacted on 0829072197 or alternatively my supervisor Prof Thokozani Nzimakwe can be also contacted on nzimakwe@ukzn.ac.za or 0829592635.

Sincerely,

Sibonisiwe Maggie Ngcobo (Ms)
UKZN MA: Public Administration
Student number: 217071341

transport
Department:
Transport
Province of KwaZulu-Natal

Street Address: 172 Burger Street
Pietermaritzburg, 3200
Postal Address: Private Bag X9043
Pietermaritzburg, 3200
Tel: (27)(33) 355 8808
Fax: (27)(33) 355 8021
E-mail: Sbusiso.Gumbi@kzntransport.gov.za

OFFICE OF THE HEAD: TRANSPORT

Ms Sibonisiwe Maggie Ngcobo
164 Langalibalele Street
Pietermaritzburg
3200

Dear Ms SM Ngcobo

RE: LETTER GRANTING PERMISSION TO CONDUCT RESEARCH

The KwaZulu-Natal Department of Transport received your request seeking permission or access to conduct research in pursuit of your Master of Public Administration degree. This letter serves to formally inform you that permission to conduct research at the KwaZulu-Natal Department of Transport is hereby granted.

Regards,

[redacted]

27/08/2018

Mr. BS Gumbi
Head of Department
KwaZulu-Natal Department of Transport

Date:

"Prosperity through mobility"

Pauline Fogg
54 Grundel Road
Carrington Heights
Durban
4001
074 782 5234

27 November 2020

Letter of Editing

This report serves to state that the dissertation submitted by Sibonisiwe Ngcobo has been edited.

The dissertation was edited for errors in syntax, grammar, punctuation and the in-text referencing system used.

The edit will be regarded as complete once the necessary changes have been effected and all of the comments addressed.

Thank-you for your business.

[redacted]

Pauline Fogg
Emerald Editing Services

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INYUVESI YAKWAZULU-NATALI

13 April 2021

Ms Sibonisiwe Maggie Ngcobo (217071341)
School of Management, IT & Governance
Westville Campus

Dear Ms Ngcobo,

Protocol reference number: HSS/1635/018M
Project title: Exploring challenges in recruiting and retaining Civil Engineers within KwaZulu-Natal Department of Transport
Amended title: Exploring challenges in recruiting and retaining civil engineers within the KwaZulu-Natal Department of Transport

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 24 March 2021 has now been approved as follows:

- Change in title

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

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

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]

.....
Professor Dipane Hlalele (Chair)

/ms