



Career Cognitions of Black Engineers in South Africa

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Black engineers are a scarce and critical resource in South African industries. The objective of this research was to explore the career cognitions of black engineering in South Africa with a view to understand their decision making patterns in terms of their careers. Understanding these patterns could enhance the success of organizations in recruiting, training and retaining these engineers. Six propositions were developed.

Thirty five black engineers were interviewed either face-to-face at various places such as restaurants, their offices, homes, etc or due to distance constraints some were done by telephone. A semi-structured interview guideline was used. Each engineer provided data on all the questions. The data was then mapped to specific propositions. Various descriptive statistical techniques were used to collate and analyze the data.

A model, based on the findings, was designed for the purpose of summarizing the findings. The model (Figure 4) illustrates the key findings relating to what factors the organizations should concentrate on when formulating their recruitment and retention strategies. These are factors relating to the questions used to address the 6 propositions. Although the model only highlights the key findings, this research identified additional findings that have improved the understanding of the career cognitions of black engineers in SA. The details are discussed in the research report.



DECLARATION

I, Jabulani J. Sithole declare that this research report is my own, unaided work. It is submitted in partial fulfilment for the degree of Masters of Business Administration in the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in this or any other university.

Jabulani J Sithole

November 2006



DEDICATION

In loving memory of my sister, Mrs Busisiwe M. Kubeka whose love and belief in me always pushed me to be the best I could be. You were the best and I miss you.

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CHAPTER 1

1 INTRODUCTION

1.1 BACKGROUND

Nations' searches for competitive advantage in the global knowledge economy has led public policy-makers to focus on education as a key factor in strengthening competitiveness, employment and social cohesion (Dempsey, 2004). The South African (SA) profiles of the main economic sectors have followed the same trend by shifting towards the use of skilled labour with the resultant reduction in formal employment of semi-skilled and low skilled workforce by 19% between 1990 and 1998 (Department of Labour (DOL), 2006). However, Barker (1999) argues that there is a shortage of skilled labour force in South Africa and this is a key factor that inhibits the country's economic growth.

As the government gears itself up for its Accelerated Shared Growth Initiative of South Africa (ASGISA program) in order to stimulate higher economic growth (Mlambo-Ngcuka, 2006), the shortage of suitably skilled labour remains a major concern. The country is also quickly transforming towards a knowledge based economy with the majority of previously disadvantaged people lacking the necessary technical skills required to support the economic growth (DOL, 2006). This has resulted in hugely distorted income disparities between blacks (previously disadvantaged) and whites in the country (Department of Trade and Industry (DTI), 2006).

Concerns have also been expressed about the limited number of black technical workers especially in senior positions in South African organizations (Lawless, 2005).

The state of skills report by DOL (2006) shows an unexpected apparent decline in the number of professionals employed between 1997 and 2001. This evidence of shortages of many categories of professionals in the labour market, the DOL (2006) suggests, may be affected by the number of people emigrating and retiring or may be due to survey or statistical changes or errors. The evidence of shortage (for whatever the reason) is suggestive of either the lack of supply of the skills to replace these lost resources or career movement of people away from their profession in search of better opportunities in other industries.

An initiative by African National Congress Youth League (ANCYL) and Engineering Council of South Africa (ECSA), dubbed “Engenius” has recently been launched with the aim of helping address the acute shortage of engineering skills in the country (Hill, 2006). ECSA’s strategic implementation and quality director, Liesel Kirsten said, at the launch, that the campaign is aimed at promoting the engineering sector from grassroots level (high schools). It is also to encourage existing engineers to remain in the profession (Hill, 2006). This further indicates that there is wide recognition in the country of skills shortage of this type of knowledge workers as well as turnover of engineers from the engineering profession in favour of other sectors of the economy.

In an attempt to redress this apparent skills shortage as well as the inequalities of the past, the government has passed a series of legislations such as the Employment Equity Act 55 of 1998 and Broad Based Black Economic Empowerment (BBBEE) Act 53 of 2003 (DOL, 2006) and Black Economic Empowerment (BEE) Strategy Document (DTI, 2003). These regulations are meant to make the South African organizations demographically representative of the society. The government compels the organizations to comply with the acts by giving incentives to those companies doing business with the government that comply and penalising those who do not comply.

In a bid to comply with these regulations, organizations started competing for the available but limited resources. The result of these actions is the very high demand for the black engineers. The low supply due to the above reasons has only just fuelled this demand even more. The effects of this demand has manifested in high turn-over of these engineers to other companies and even to other industries

By understanding the career cognitions of black engineers, i.e. how they view their careers, management of South African engineering organizations will be able to formulate and implement recruiting and retention strategies for attracting and retaining these engineers. Measures can also be put in place by both the government and private sector to increase the supply side of these knowledge workers in the short, medium and long term.

1.2 MOTIVATION

The previous section suggested that due to the lack of the supply for the black engineers in South Africa, their demand is very high. It is becoming increasingly critical for South African public and private sectors to understand the reasons behind the lack of supply as well as deficiencies for skilled black engineers. These organizations are discovering that not only is it becoming increasingly difficult to attract these workers, it is also becoming costly as well as their turnover has also markedly increased due to the limited pool from which to recruit. Since competitors are constantly looking for the same kind of resources and in the absence of increasing and consistent supply, the war of talent is ever increasing. The literature on retention strategies often emphasizes the need for organizations to concentrate on winning with people value propositions (Chambers, Foulon, Handfield-Jones, Hankin & Michaels, 1998). However, empirical research on what the key components of such value propositions is insufficient.

Academics and organizations that wish to address the issues of lack of supply of black engineers as well as the retention thereof, need empirical evidence of the career cognitions of these knowledge workers. This will enable them to suggest ways of addressing this problem for the betterment of the organizations and ultimately the South African economy.



1.3 THE AIMS OF

There are many issues that can be investigated regarding the shortage of black engineers in SA. The aim of this research was to explore and understand insights on the following issues;

- What the causes for the lack of supply of black engineers are,
- What key factors forces black engineers to leave their jobs?
- What keys factors encourage black engineers to leave their jobs?
- How these engineers see their careers changing with time (5-10 years),
- What advantages and disadvantages results from the high demand of the black engineers in SA.

1.4 KEY DEFINITIONS

Black: The official definition of “Black” in South Africa includes the Africans, Coloureds and Indians. The “Black” definition in the context of this research refers only to Africans section of the definition.

Technical: A technical worker/ graduate in this context refer to engineers of all disciplines.

Graduate: For the purpose of this research, graduate refers to the university qualified engineer.

1.5 RESEARCH L

The sampling methodology fell under the non-probability methods (snowballing method) and thus the extent to which the sample represented the population cannot be claimed with confidence. This approach was chosen to facilitate access as well as convenience since the time in which to do the research was limited.

Although the intention of research was to investigate all the engineering disciplines, the representivity of the disciplines was dictated by availability of the members from a particular discipline.

Costs and time constraints were the limiting and the determinant factor on the access to the sample.

Due to time constraints, it was not possible to achieve the quota in terms of a balanced demographic representation with regards to age, gender and experience.

The researcher was not formally trained for conducting the face-to-face interviews as Welman & Kruger (2001) recommends.

The environment (location, time of the day, etc) under which the interviews were conducted varied from work, restaurants, coffee shops to telephonically conducted ones which may have affected the concentration of the engineers.

CHAPTER 2

2 THEORY AND LITERATURE REVIEW

2.1 INTRODUCTION

The literature review and the supporting theory will identify the major themes which are important in the understanding of the mobility of the black engineers in South Africa.

There is extensive research currently going on in the country regarding the shortage of skills for South Africa's economic growth. The research has, however, either concentrated on the knowledge workers in general context (Sutherland, 2004) or specific to certain sector of the population (Reddy, 2004). This research will concentrate on a specific group of knowledge workers, the black engineers. These knowledge workers form part of the critical skills required for South Africa's economic growth, however, they are also in critical short supply (Naidoo, 2006). The literature review will concentrate on the following key topics;

- The knowledge era
- Technical skills demand due to transformation of SA
 - Political transformation
 - Role of government legislation (BEE, BBBEE, EE, etc)
- Technical skills supply in SA
- Career management
- Retention strategies

2.2 THE KNOWLEDGE

2.2.1 KNOWLEDGE BASED ECONOMY

The variety of economic, psychological and other phenomena have changed the context of the workplace in recent times. Jones (2004) argues that collective agreements are quickly being replaced by individual agreements with rewards and remuneration that recognizes individual contribution. She also says that the emphasis is on the need to recognise the interdependence between the different forms of capital, which are human (labour, intelligence, etc), financial (cash, investments, monetary instruments, etc), manufactured (infrastructure, machines, tools, etc) and natural capital (resources, living systems, etc). The labour is becoming more expensive and technology is increasingly being used by organizations to improve their financial standing.

Globalization and technological development of the World Wide Web is increasingly leading to networks rather than separate business entities being regarded as the organizational design of the future. Employee skills are fast becoming an organization's most valuable asset (Matsumoto, Stapleton, Glass, Thorpe, 2005). They argue that fundamental to successfully completing complex tasks in areas such as construction projects, for instance, is in bringing together individuals with the correct balance of skills as no one individual has the complete set of skills to do everything themselves. This makes the team only as strong as its weakest link. This further solidifies the importance of nurturing and valuing the workforce and the individual skills in

an organization. The combined make the difference between a successful and unsuccessful organization.

The profile of the main economic sectors of South Africa has over the years shifted towards the use of skilled labour with a resultant reduction in the formal employment of semi-skilled & low skilled workers (DOL, 2006). The country has also had to compete with higher volumes of imports from low cost producing countries such as India and China while new opportunities are also becoming available for exports, besides commodities.

2.2.2 THE KNOWLEDGE WORKER

In all the sectors of the economy, technology is becoming more favourable at the expense of job losses for the low skilled employees. In order for South Africa to be globally and technologically competitive, positive steps must be taken to create a diverse, well-trained and multicultural workforce (Lawless, 2005).

Knowledge workers are key employees that identify more strongly with peers and networks than with the organization (Despres & Hiltrop, 1995). They manage their careers external to the organization through years of education and they are loyal to their own careers than the organization. They relate to intrinsic motivational satisfiers such as responsibility, scope to use and development skills and interesting and challenging work. Cappelli (2000) argues that traditional motivational factors such as compensation are not critical to these workers, instead carefully designed jobs that allow them to assess their own interests, values & skills are more motivational.



2.3 TECHNICAL SKILLS CHANGES IN SA


The changing SA working conditions favour the knowledge or skilled as opposed to the unskilled labour force. In order to be globally competitive, SA labour force has to improve its skills levels to enable sustainable and even an increase in the current economic growth.

2.3.1 POLITICAL TRANSFORMATION

Lee (2006) argues that many young democracies failed due to the pursuit of political transformation to the total disregard of the need for socio-economic transformation. South Africa is one of these young democracies that is quickly becoming a stable and viable politically, but is still battling with the socio-economic transformation. Lee (2006) explains that interventions which harness the collective human capital are an imperative to South Africa as they will help unlock the economic growth and ensure the achievement of global competitiveness. Such interventions can be implemented via government policies & regulations, engagements between public and private sector, labour organizations, general society involvement, etc to bring about structural reforms to redress the imbalances of the past. The interventions can be further encouraged by promoting equality, eliminating racial discrimination, creating job opportunities to alleviate poverty. Politically, in order for this young democracy to thrive, the country must transform to meet all its citizens needs.

2.3.2 SA'S REGULATORY IMPACT ON ECONOMY

Economic transformation in SA, it is suggested, has resulted in a higher mobility of the workforce. The challenge is analysing the reason behind this

mobility. It is not clear  seeking better career opportunities available elsewhere or they are transferred by their globalising or global organizations (an acceptable global phenomenon) or it is due to those people who feel the new labour practices such as Employment Equity (EE) and Black Economic Empowerment (BEE) are negatively impacting on them and their families (typically white citizens). It is suggested that these policies might be causing this mobility, which might be having a negative impact on the skills base of the country (see section 2.4.2. below for details); they are crucial economic transformation tools. They have been introduced to create a workforce that is diverse and representative of the country's demographics in the various economic sectors. Their main aim is that of redressing the imbalances of the past (DOL, 2006). This transformation step is critical to ensuring sustainable and stable democracy in South Africa (Lee, 2006).

Transformation is a global phenomenon, encompassing many spheres of life, whether in politics, education, social life, health care or business (Esterhuysen, 2003). It is one of the most frequently used concepts in post apartheid South Africa. It is a strategic response to a situation where things cease to function as before and the country or organization has to drastically review and change every key facet of its existence.

The BEE strategy document by the Department of Trade and Industry (DTI) (2006) explains that the defining feature of apartheid was the use of race to restrict and completely control the access to the economy by black majority of

the country. This struggle for people from economic power took place over a long period of time, dating from the late 1800's to the enactment of the apartheid laws after 1948. The apartheid policies such as job reservation were reinforced by the vastly inferior education system for black learners which had devastating effects on skills, particularly technical and science skills (DTI, 2006). The labour market was distorted with access to education, skills, managerial and professional work based on race and ethnicity (Thomas & Jain, 2004). The BEE and EE was enacted with the specific goal of redressing these inequalities.

The rationale for BEE and EE was to put in place policies to address prejudice by setting a national tone and parameters of acceptable behaviour. It was also to open rights and privileges to previously excluded groups while simultaneously increasing the opportunities and resources (Thomas *et al*, 2004). It is speculated that due to the amended EE and BEE acts, the demand for black engineers is higher than their white counterparts due to supply shortage of these individuals, especially at middle and senior positions in organizations. This is seen as the major cause of the high mobility in black engineers for greater opportunities (BEE or financial remuneration). In 1996, Thomas *et al* (2004) explains that only 6% of black people were represented in management positions in public sector and only 5% were female. In the private sector, out of 160 organizations reviewed, it was found that 80% of management levels were occupied by white males. Whites also enjoyed 104% wage premium over Africans and men earned 43% higher wages than similarly qualified women in similar industrial sector and occupation. It is

therefore in light of a [redacted] were enacted and it explains the movement of black engineers to re-establish the balance.

BEE and EE compliance are an imperative component of doing business in South Africa. This means that for an organization to succeed in South Africa, especially in business dealings with the government, they need to comply with these imperative. Although this does not guarantee success, it is a minimum requirement without which chances for success are slim, to put it mildly. In this context, organizations that succeed are those that have embraced diversity by not only complying with the EE legislation, but also by ensuring that the people capable of delivery on their new posts are appointed.

2.3.3 ECONOMIC GROWTH IMPACT

The current commodities boom as well as the globalization of South African companies such as Sasol, SAB, Anglo American, etc are believed to be fuelling the demand for skills in mining, construction and engineering sectors (Naidoo, 2006). Naidoo (2006) further argues that other factors spurring the job growth in South Africa is the gold price which recently reached 26-year high around \$730/oz, a relatively stable rand and increased activity by South African players who are developing more facilities and winning contracts in the global arena. Naidoo (2006) explains that these are the findings of a survey (the DMA index) commissioned by Business Times that measure and reports on private and public sector trends in recruitment advertising, appearing in this publication – by function, sector and location.

The survey reflects the mining, construction, and engineering sectors which are trying to build capacity as they gear to benefit from the government's R400-billion infrastructure development schedule, i.e. the ASGISA program. Further work is required in preparation for the 2010 world cup finals to be held in South Africa. According to Naidoo (2006) government remains the biggest recruiter of skilled employee, for instance, about 56% of the positions advertised in this publication in April 2006. This was to help the government deal with the issue of service delivery at provincial as well as local government levels and utility challenges at Eskom, Telkom, etc.

2.4 TECHNICAL SKILLS SUPPLY IN SA

2.4.1 EDUCATION SYSTEM

The supply side of the engineering profession is dependent on the number of students coming through education system with the type of quality education that will enable them to make it through the tertiary institutions (Lawless, 2005). However, the number of students with the necessary education is still very low (DOL, 2006). The state of skills report of 2003 by the DOL (2006) emphasizes that there are no quick fix solutions to the education problem. The education reforms cannot bear fruit within a short space of time. The report indicates that there are still huge challenges in the education system such as poor teaching, lack of resources, etc at high school level. Less than 25% of African learners who passed matriculation in 2002 were going into science and technology related fields (DOL, 2006). The education system has

to be improved such and science proficient students comes out of high schools into universities.

The initiative by ANCYL and ECSA to encourage the youth to take up mathematics and science at high school level as well as encourage those in the engineering profession not to leave (Hill, 2006), suggests that there is growing interest by different organization to help change the status quo. This is, however, still not enough. Further understanding of the reasons for engineers to leave their profession has to be understood as well and measures put in place to reduce this phenomenon so that the engineers coming out of university will remain in engineering sector and those already in the profession will not leave. The government cannot drive this change alone, the private sector and the community at large also has to get involved for there to be a lasting solution.

2.4.2 LABOUR MARKETS

Reddy (2004) defines a labour market as an imaginary marketplace where labour is bought and sold. It is defined by the same principles as those governing supply and demand for goods although they are different (Barker, 1999). The employer purchases the services of the employees and they do not buy the employee as it happens with the goods. However, the employee and his/ her services cannot be separated. This therefore emphasizes the importance of ensuring a good relationship between the employer (labour purchaser) and the employee (labour seller).

As the knowledge base price of labour. The intellectual property of the organization is increasingly residing with a few knowledgeable individuals as opposed to the organization having the ownership of the knowledge. Barker (1999) argues that the shortage of skilled labour is a major inhibitor to SA's long term economic growth. He notes that education and training, the upward mobility of workers and over-reliance on white males in skilled occupation are controversial issues in SA. Thomas *et al* (2004) suggests that the issues of globalization and competition have increased the migration of skilled and professional workers from less developed to industrialized countries such as those in continental Europe, Britain and United States of America. They report that the International Monetary Fund (IMF) found that the biggest migratory flows from Africa to United States was from Egypt, Ghana and South Africa and that more than 60% of these people are college and university graduates. They elaborate that by 2000 there was 33% increase in people who emigrated from South Africa from 1998 figures, which represented 25% of the total number of people who emigrated. Such movements, it is suggested, clearly put a strain on a strategic management of human resources in a diverse and global context as well as on the full utilization of increasingly scarce human resources in the South African context (Thomas *et al*, 2004).

The Labour Market Commission has indicated that a lack of management skills in leadership, mentoring, coaching, work re-organization and decision making abilities is a major inhibitor to productivity improvement. Barker (1999)

notes that it is general lack of management skills are critical contributors to poor productivity performance.

The SA labour market was made by interaction between political agendas and economic needs. Due to the legacy of the SA apartheid past, there needs to be redressing of the imbalances of the past through the implementation of labour market legislation such as the EE Act 55 of 1998 (DOL, 2006). These and many other acts may unfortunately be the reason for the brain drain.

2.5 CAREER MANAGEMENT

2.5.1 CAREER CAPITAL

Kanter (1993) notes that the locus of focus for career is increasingly becoming the person's own professional base and network of contacts and not the institution. Entrepreneurial careers, in which people count on their know-how and skills at making connections to provide security, even when they are employed by large organizations, are becoming more prominent than bureaucratic careers.

The knowledge workers manage their careers external to the organization through further education by acquiring more qualifications (Cappelli, 2000). They also lack loyalty to their profession or employers in favour of their own careers. Intrinsic motivational satisfiers such as responsibility, scope to use and development skills and interesting and challenging work is very important to them (Cappelli, 2000).

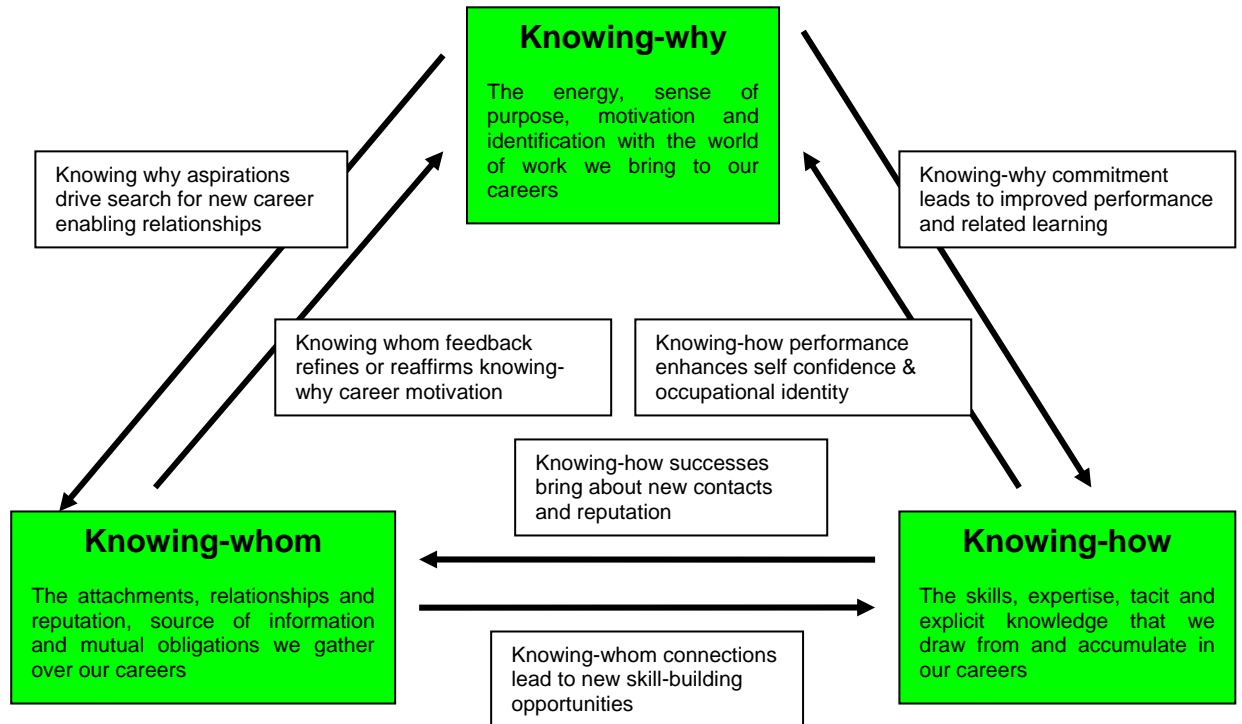
Career development | ue in many countries.

(Wessel, Christian and Hoff, 2003) argue that the career management plans may help students that are academically undecided to become more connected to their majors by focussing more on academic and career matters. This emphasizes the importance of career guidance at schools and universities in helping learners make informed decisions on the type of careers to pursue. Figure 1 below gives an illustration for career development framework as presented by Inkson & Arthur (2001). Inkson *et al* (2001) asset that there are three key assets that knowledge workers take with them as they move from one employer to the next. These assets are described as “knowing-why”, “knowing-whom” & “knowing-how”. The assets, however, function independently as each job involves engaging one asset with consequences for the other two assets.

When engaging with the working world for the first time, the principal asset to employ is “knowing-why”. This asset is the desire or motivation to be or sense of purpose. This is what drives the knowledge worker; it is what they can contribute to the world of work that will be fulfilling (Inkson *et al*, 2001). This asset changes continuously with changing circumstances.

The “knowing-how” is the skills and expertise that are accumulated by the knowledge workers as they develop from one job to the next (Inkson *et al*, 2001). This is a career long endeavour that each knowledge worker embarks upon and the skills accumulated may be technical or interpersonal and maybe

Figure 1: Three ways: **career capital**



Source: Inkson & Arthur (2001)

transferable. The asset of “knowing-whom” lies in the relationships that the knowledge workers gather through their careers. These relationships may include colleagues, subordinates, managers, etc that one meets in their careers. These may also involve non-working lives such friends, family, etc. These relationships and networks become important in the knowledge worker’s career and they are used as and when necessary. Contacts made in employment are often retained and in many instances the job transitions are facilitated by network connections that the knowledge workers accumulate over time in the career.

It is no longer organizations that manage their careers.

It is important for SA youth to understand these issues. However it is the duty of the organizations and government to provide the understanding to the youth early to ensure increased numbers of students in the engineering profession. The approach ANCYL and ECSA are taking to expose the engineering profession to the high schools (Hill, 2006) will help the learners to understand the admission requirements at the tertiary level in time for them to focus on improving their grades to meet these requirements. The lack of career guidance at school can lead to promising learners who could have succeeded in engineering studies being unable to get admission to universities for engineering degrees because they either chose the wrong subjects while doing the lower grades or the wrong subject standard required by the university, for instance, standard grade (SG) as opposed to higher grade (HG) required for university entrance.

2.5.2 CAREER COGNITIONS

The shift in the way the knowledge workers see their careers has resulted in increased mobility of these workers from one job to another, one country to another and even one industry to another. Sturges, Simpson and Altman (2003) explains that studying for a Masters in Business Administration (MBA) has over the past twenty years become popular means of development aimed at acquiring management skills and enhancing career opportunities. It is well documented how gaining the MBA qualification can contribute to increasing pay, status and promotion opportunities for graduates (Sturges *et al*, 2003). It is important for organizations to understand these issues; what is the cause of

this phenomenon? How do you see their careers and profession? Understanding these will trigger the innovation to come up with ways that accommodates these workers needs leads to improved attraction and retention strategies.

Kanter (1993) notes six important shifts of emphasis that affect the corporate jobs and careers. These are;

- **The new organizational staffing principle:** employment assumptions have shifted from “big is better” to “smaller is beautiful”, this favours flexibility and efficiency at the expense of job security,
- **The new organization:** the hierarchical emphasis on organizational designs is declining and is being replaced by the matrix structures where work is done across teams, functions and departments. The people are encouraged to look across the organizations instead of upward to their bosses
- **The new workforce:** occupational sex segregation is declining and is being replaced by more diverse workforce. This is due to the minorities (or previously disadvantaged in SA’s case) and women (white) increasingly being given opportunities that were previously not afforded to them,
- **The new power source:** The power in the job shifting from being hierarchical to being based on formal expertise in the job that one performs. The balance between job-related power and network-derived power is shifting towards the value that leaders bring to organizations from the external relationships they form.

- **The new loyal** characterised by the weaker attachments to the company and stronger attachments to one's own profession,
- **The new career asset:** today, people rely primarily on their human capital as opposed to institutionally derived careers, they need portable career assets – skills and reputation that can be applied anywhere.

These changes have increased the uncertainty of careers and widen the arena for power seeking. The increased movement of talent in the workforce, initiated by individuals and organizations, has presented people today with far more career decisions than those required ten to fifteen years ago (Broscio, 2003). Many employment experts predict that the average working person in the United States, for instance, will change jobs between five and ten times during their careers (Broscio, 2003).

South Africa is no exception to the global phenomenon. The black engineering graduates are some of the knowledge workers that enrol for extra qualifications such as the MBA in order build up their career capital. The improved career capital is used as a lever to move from technical work to engineering management jobs or even leave the engineering profession altogether. This phenomenon leads to the engineering sector losing out on the skills required in the economy. The literature suggests that identification of the trends and understanding them will help organizations come up with strategies to implement that will provide for the needs of these knowledge workers. They have to take the initiative in addressing the supply challenges

facing them in an increasingly competitive environment for survival and global competitiveness.

2.6 RECRUITMENT & RETENTION STRATEGIES

Hiring and retaining top talent is the driving concern of human capital management (HCM) professionals today (Aberdeen group & human capital institute, 2005). The institute further argues that the loss of top talent to a competitor, for instance, can lessen the organization's competitive advantage. Drucker (2002) says that developing talent is the business's most important task. This topic is therefore imperative to the organization's retention strategy. In the employment world, a buyer's market is very different from the seller's market (Herman, 2005). In the buyers market, the employers – the buyer - are in the driver's seat, and the employees are forced to take whatever jobs are available under whatever conditions the employers impose. In the sellers market on the other hand, with plenty of jobs available to workers, the employers must compete to attract and hold the talent they need to fulfil their mission – to serve customers.

Given SA's economic growth and legislation requirements, there are generally more jobs available requiring engineering skills than there are resources (engineers). This situation is definitive of a sellers market as the skilled workforce has become accustomed to moving freely from job to job. Given the government's legislation (BEE, EE, BBBEE), one would presume that it would be more so for black engineers than for white engineers (SA citizens).

The make-up of global workforce is changing as the global economy grows and more employment opportunities open up for skilled workforce (McDonald, 2006). The SA citizens have also explored employment opportunities beyond the boundaries of the country (by emigration and expatriate assignments as SA organizations embrace globalization by expanding outside SA).

McDonald (2006) argues that today's workforce is increasingly multigenerational, with age differences often spanning a 40 year period. The primary United States demographic groups are baby boomers, generation X (those born between 1965 & 1976) & Y (those born between 1977 and 2002). As the workplace becomes dominated by these demographic groups, organizations may need to expand their HR staff to address the generational differences to improve recruitment and retention.

SA organizations need to update their recruitment and retention strategies to fit the current situation in order to stay in business. Compliance with government legislation (Employment equity, black economic empowerment, etc in the case of SA) is an imperative for doing business in the country. Organizations therefore have to think long term and ensure that their strategies are adequate.

2.6.1 LABOUR TURNOVER

Most business leaders understand that having the right people in the right place at the right time to maximise business opportunities has become the

most important factor for organizational success (Ingham, 2006). Even though managing employees effectively is an important issue, it's the acquisition, allocation, development, retention and succession that are most important, adding value by recruiting the people that can best create competitive advantage for the organization. Effective management of organization's talent ranks amongst one of the business leaders' most critical challenges (Ingham, 2006).

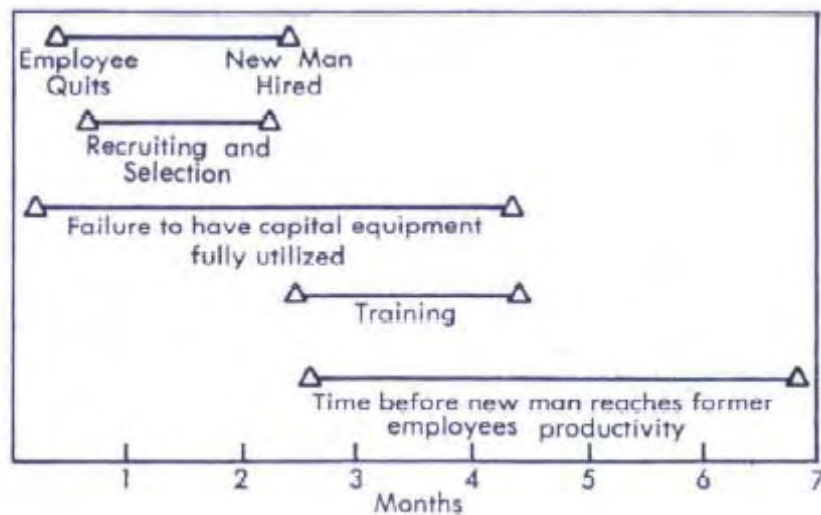
Labour turnover defines the actual movement of employees from the association with an organization in terms of working for remuneration (Reddy, 2004). It is important for the organizations to master the art of controlling their labour turnover as this can affect the organization's profitability & productivity (Aberdeen Group, 2005).

2.6.2 COST OF LABOUR TURNOVER

Zimmerman (1971) defines labour turnover as the total number of separations which occur during a specific period. Many of the separations are beyond the control of management, for instance, death of an employee while others can be planned for in advance, for instance, retirements or economic slowdown (retrenchments). The largest producer of separations, Zimmerman (1971) argument comes from employees who quit. The employees leave without warning and set in motion a chain of events which costs the industry a great deal of money each year.

The analysis of the cc edule shown in figure 2 below. The schedule illustrates the typical amount of time that can elapse from the time an employee quits to the time a new employee is at the same productive levels of the old employee. The schedule also indicates the cost of recruitment, training and productivity losses. This is a costly exercise and can be presented in a number of ways (Howard, 2002), for instance; personnel time (interviews, checking references, choosing the person and hoping they do not quit in a week);

Figure 2: Typical replacement schedule for an employee who quit



Management of Personnel Quarterly, Summer, 1971


- cost of recruitment (advertising through recruitment agencies, cost dependent on the availability and market demand),
- Extra overtime (paying extra which may be more than the normal full time equivalent) for the existing personnel to close the gap of the missing employee

- Customer annoyance due to productivity drop of new employee (whilst on training). The targets may be missed to the annoyance of customers.
- Employee frustration as the person with whom they may have been working with for years has to now quit. They also may get tired of continuously training new employees who eventually leave and end up leaving themselves.

All these factors indicate that it is best for all if the retention strategies are such that labour turnover is kept to a minimum.

2.6.3 BECOMING THE EMPLOYER OF CHOICE

In a recent global survey, Accenture found that attracting and retaining talent is the 3rd biggest concern of senior business executives, after health of global economy and competition worries (Ingham, 2006). He says that although this information has been found, there is few business leaders currently heavily involved in leading and sponsoring talent management programs. This gap is due to the fact that most people identified as talent are treated in very much the same way as the rest of the people in the organization, a little more development, some coaching here and there, but the career dynamics remain the same. He argues that organization's relationship with its talented employees needs to be fundamentally different from that of other employees if the strategy and implementation gap is to be closed.

The opportunity is to |  | employer of choice. This means developing and promoting itself in such a way that those people considered to be the talent of the organization would never want to look elsewhere, except maybe to add variety to their careers. Ingham (2006) argues that his experience indicates that closing the gap of strategy and implementation requires a holistic approach in managing the following

- Talent strategy - clarify the requirements of the organization's talent management program including the criteria to be used to measure success;
- Talent definition – after creating talent strategy, clarify the focus, scope and boundaries of the approach to talent management, which is the “talent pool”. The appropriate definition will depend upon the business strategy, type of firm and competitive environment;
- Talent framework – this adds detail to talent definition by describing what the employer expects the talent pool to exhibit or deliver in terms of mix of competencies, knowledge, networks, relationships, mobility, values, motivation, potential, etc.
- Employee value proposition – this should articulate what's unique and compelling about an organization that would want people to join and stay. It articulates the psychological contract between the individual and the organization;
- Talent management capabilities – those key individuals identified as talent deserve and require more intensive support than other employees. This can be done through mentoring, executive shadowing, coaching to leverage exposure and learning within the organization.

This type of support in a consistent manner, can be of significant value to talent and business in general.

In South Africa EE is an imperative, especially when looking at organizations that depend on government for the success of their business. Implementing such as strategy and striving to successfully implement it can add serious value to the organization as the black engineers will also want to join the organization. This goes a long way in addressing the organizations supply side and it also ensures that those people that have been recruited stay as they want to be in this organization.

2.6.4 THE CHANGING PSYCHOLOGICAL CONTRACTS

Developing strong retention strategies and focussing on the alignment between psychological contracts (employer vs. employee) is becoming increasingly important in different organizations, as was discussed in the previous section. Lee (2000) argues that organizational changes have been forced upon employment relationships since the mid 1980's. The employee's job security is increasingly becoming uncertain. The traditional perception of what is owed between an employee and an organization are now subject to reappraisal and the employee loyalty in return for job security is becoming less pronounced (Lee, 2000).

Successful employers know the value of retaining good employees and fostering their development (Marks, 2001). They are increasingly investigating ways of keeping their most talented employees in order to maintain their competitive advantage. The open competition for other companies' people,

once a rarity in busi (Cappelli, 2000). The human resources management is no longer to minimize the overall turnover but it is to be influential on who leaves and when.

De Koning (2005) argues that selecting and developing future managers is a crucial task and a big concern for many organizations, particularly for leadership positions. Rousseau (2004) explains that employees must agree on a performance contract with employers. This will define the expectations of either party and eliminate uncertainties and misunderstandings. Organization who thrive are those who have mastered the understanding and effective management of these dynamic conditions.

2.7 CONCLUSION

This chapter has highlighted that today's economy is knowledge based. The knowledge workers are an imperative for this type of economy. These workers have the skills and expertise that are critical for any organization's global competitiveness. They therefore have to be well managed and provided with the necessary environment to unleash the skills and potential they have.

The literature review describes the knowledge workers, specifically the black engineers in SA. It alludes to the problems that have been introduced by the political changes in the country. It begins with the effect of the policies that have been enacted to deal with legacy of apartheid, followed by the demands and supply problems that the economic growth has posed in the country. It then goes into the knowledge workers themselves in understanding how their career cognitions affect the organizations they work for. It goes into the

retention strategies that are being implemented, trying to deal with the issues of labour turnover of these black engineers.

In an attempt to redress the imbalances of the past, the SA government enacted policies such as BBBEE, BEE and EE acts. These laws have created opportunities for the previously disadvantaged population of the country. However, they have also resulted in brain drain from the country of some skilled white workers who felt that they and their families were going to be negatively impacted by these laws. The result has been high demand for black engineers. As a result these workers are commanding premium in the market place. As the organizations scramble for the available limited pool, the turnover of these workers has increased.

The supply chain of these technical workers is however struggling to keep up with the demand due to the problems in the education system. Very few black students matriculating have necessary mathematics and science for university admission in the engineering disciplines. In light of the poor supply of black engineers, this further fuels the demand in the market place. This is further exacerbated by the fact that the engineers in the profession are living for better opportunities (BEE and EE appointments) that improve their financial position.

These workers are also increasingly focusing on their career capital. They are constantly improving their knowledge base by acquiring extra qualifications such as MBA. Organizations, faced with the problem of high labour turnover

and increasing costs (come at a premium), are resorting to innovation around retention strategies to try and recruit and retain the best workers in the market.

Understanding the career cognitions of these workers is becoming the critical issue for those who are looking to tackle this issue and succeed. Education and skills development is increasingly becoming the most important answer to job security for these workers. It is also becoming increasingly apparent that these retention strategies are not sustainable without the proper functioning supply chain. The government and the private sector have to cooperate in encouraging the students at high school to take mathematics and science. They also have to ensure that they commit resources in ensuring that these students are properly supported (learning equipment such as laboratories, etc). Further to this, organizations have to better understand the value proposition of these engineers and try to meet it or even exceed this for these engineers to stay in their profession.

The aim of this research is to fill in the gap that exists in the literature regarding the black engineers and the perceptions of the market place in SA.

CHAPTER 3

3 RESEARCH PROPOSITIONS

The key research propositions that have been identified from the literature review are the following

3.1 PROPOSITION 1

Factors that force the black engineers to leave their jobs (push factors) are;

- Lack of recognition and rewards
- Perceived lack of empowerment (accountability)
- Lack of responsibility (perpetual training)
- Perceived lack of management transformation
- Misaligned psychological contracts

3.2 PROPOSITION 2

The key factors that encourage black engineers to leave their jobs (pull factors)

- Increased responsibility (growth and development)
- Accelerated promotions brought about by EE targets requirements
- New business opportunities (BEE deals & entrepreneurship)
- Expertise that ensure they command a premium pay in the market
(MBA)

3.3 PROPOSITIO

Majority of black engineers see their lives drastically improved in 5 to 10 years time. They see themselves achieving their goals through;

- Changing their career into a different job
- Entrepreneurship (starting their own business)
- Promotion to senior management positions in their organizations

3.4 PROPOSITION 4

The high demand for black engineers has its advantages and disadvantages for these workers;

Advantages:

- Accelerated promotions through the ranks in the organization
- Exposes these workers to high development opportunities

Disadvantages:

- Inadequate development for management positions which could have negative impact on organization's performance in the long term,
- Job hopping which can lead to incompetence,
- High mobility of engineers away from their profession thereby negatively impacting on the engineering sector resources,

3.5 PROPOSITION 5

The key factors for the shortage of black engineers in organizations are due to:

- Poor education system

- Poor career guidance
- Lack of organizational/ government's planning
- Brain drain
- Engineers not practising their profession (leave for other industries)

3.6 PROPOSITION 6

The key factors for the shortage of skilled black engineers in organizations are due to:

- Lack of supervision & coaching
- Lack of mentorship
- Lack of exposure to challenges

CHAPTER 4

4 RESEARCH METHODOLOGY

4.1 INTRODUCTION

As discussed in chapter 2, very few research studies have been done to understand career cognitions of black engineers. This therefore justified the need for this study. The purpose of this chapter is to report on the method used to collect and analyse the data.

4.2 RESEARCH METHOD

Welman & Kruger (2001) argues that the quantitative approach strives to formulate laws that apply to populations (universally valid) and explains the causes of objectively observable and measurable behaviour while the qualitative approach allows the researcher to explore all kinds of unexplained as well as so-called previously explained but misunderstood phenomena. The research was qualitative and exploratory in nature.

Patton (2002) argues that qualitative findings grow out of three kinds of data collection; in-depth, open ended interviews; direct observation and written documents. The researcher conducted interviews using the in-depth, open ended questions. The data was therefore verbal and a qualitative approach was used (Leedy & Ormrod, 2001). The purpose of the research was to gain insights and understanding of the decision making behaviours of the chosen

group of knowledge ut their experiences, perceptions and attitudes towards their careers.

4.3 POPULATION OF RELEVANCE

The term black engineers as was used in this research is referring to all the university qualified, “African” engineers in the SA. It includes everyone fitting this description, both men and women, irrespective of whether or not they are still practicing engineering as a career or not, for instance, general managers, entrepreneurs, those working in other sector either than engineering, etc. In order to get a balanced view of the current situation, it was important to get diverse points of views in order to identify the important trends which could be further analyzed. Further limitations were identified as the research continued and these are discussed in the limitations sections.

4.4 SAMPLING METHOD

Welman *et al* (2001) identified two kinds of sampling methods, i.e. probability and non-probability sampling. This research was based on non-probability sampling method, whereby there is no way of forecasting or guaranteeing that the each element in the population will be represented in the sample (Welman *et al*, 2001). This method was chosen in order to meet the research constraints (schedule & budget); it had to be finished within specified time limits and budgetary constraints (Welman *et al*, 2001). The researcher used the snowballing sampling method as this was convenient enough to get the population meeting the sample of relevance. There was also a need for quota sampling in order to identify some trends in terms of mobility with regards to,

for instance, age, experience to time constraints, the balance was not achieved, although the researcher did attempt to achieve a diverse population sample. The sample size of 35 interviews was used.

4.5 INTERVIEW QUESTION GUIDELINE DESIGN

In using structured questionnaires Welman & Kruger (2001) mentions that the interviewer is limited to the questions and how they are asked as well as the order in which they appear on the schedule. The researcher followed a semi-structured approach, which provided flexibility in ensuring that when insightful comments were made through the interview, which were not replying to the question asked, they could be noted under general comments. Since the research was qualitative and exploratory in nature, open ended questions were asked by the researcher. The questions were pre-tested by interviewing a colleague at work who provided meaningful feedback which helped to improve the final version of the interview guideline.

The interview guideline was structured as follows;

- Introduction which gave the background of the study to the interviewee.
- Demographics of the technical workers as well as their qualifications and years of experience.
- Different questions relating to each of the research propositions as described in chapter 3.
- Recommendations from the interviewee's perspective
- General comments section

The face-to-face interviews which included coffee shops, restaurants, and place of work as well as the interviewee's homes. Due to time constraints other interviews were done telephonically.

4.6 DATA COLLECTION

The research was carried out through in-depth, semi-structured interviews with open ended questions. Since snowballing sampling approach was adopted, the people that were approached were those available within the given time and cost constraints. The interview schedule was set up in agreement with the people to be interviewed some time in advance. The interview guideline questions was then e-mailed or faxed to the people concerned to give them enough time to prepare. The interview was conducted in one of two ways; in person and by telephone (using the e-mail to forward information to the engineer) before the discussion.

The make up of the sample was two thirds from one employer and one third from diverse group of companies. The reason for this approach again was purely for convenience. The data was a collection of attitudes, perception and opinions of the identified sample of the described population (see interview guideline document for details on APPENDIX 1 below).

The duration of each interview was an hour on average, however, the ones where people replied electronically (before the interview) moved quickly as the researcher only concentrated on clarifications rather than re-questioning.

The data from the interview was recorded by the researcher during the interview for later analysis. The researcher's interpretation of the answer was recorded and confirmed by reading it back to the interviewee to ensure that it was correctly noted. Each question was designed with a specific proposition in mind to ensure easier mapping during the analysis phase.

4.7 DATA ANALYSIS

Eisenhardt (1989) explains that data analysis and interpretation forms a critical part of the research process. Since this was qualitative research the data collection was through open-ended, exploratory interviews. The use of inductive reasoning was required during the analysis and interpretation.

Content analysis method as described by Welman *et al* (2001) was used to analyse all collected data. Welman *et al* (2001) explain that this involves the content of these sources being examined systematically to record the frequency of themes and of the ways in which these themes are portrayed. The six research propositions formed the framework for data analysis. The analysis probed the in-depth responses about the sample's opinions, perceptions, feelings, knowledge, experiences, etc.

The following approach was adopted by the researcher in analysing the data;

- Organisation of the responses in a logical manner according to the proposition they corresponded to,
- The responses were also classified into clustered themes such as push/ pull factors, etc.



- Patterns of . emerged from the classification.
- All the results analysed were combined into a model (using the findings from the research).
- Recommendations were then made to policy makers, organizations and the black engineers based on the research findings.

4.8 RESEARCH LIMITATIONS

These were discussed in section 1.5 above

5 RESEARCH

5.1 INTRODUCTION

The research data for 35 black engineers was divided into 3 categories.

These were;

- Category 1 – Demographics of the black engineers
- Category 2 – Research propositions
- Category 3 – Additional findings

The next section will present these categories in more detail

5.2 EXPLANATION OF RESULTS

The analysis of the raw data obtained from the interviews was done to enable the presentation of the results in the tabular format used in this chapter. The content analysis was done to determine the frequencies of constructs emanating from the raw data. All the responses from the interviews were analysed to identify constructs for each question. The constructs with the same meaning were then grouped together and reported in a tabular format. The number of frequency that each construct was mentioned was then documented and counted. These frequencies were then used to calculate the percentages as seen in the tables presented from next section below. The tables presented for each category are ranked by one of the columns to make it easier to understand.



5.3 CATEGORY

ACK ENGINEERS

The research data was obtained using the sample of black (African) engineers only. The average age of the engineers in the sample was 31 – 35 years. The age group intervals that were considered are presented on Table 1 below. 45% of the engineers fell into the age group of 31 to 35 years.

Table 1: Age group of the black engineers

Age group interval	Frequency	Percentage
20 – 25	1	3
26 – 30	8	23
31 – 35	16	45
36 – 40	8	23
over 40	2	6

68% (45% + 23%) of the engineers were between the ages of 30 to 40 years of age and only 6% was over the age of 40 years. No engineer was over the age of 50 years and only 26% of the engineers were below the age of 30 years.

Table 2 illustrates the split in gender distribution in the sample. This shows that a significant number of the engineers were male.

Table 2: Gender distribution of the sample

Gender	Frequency	Percent
Male	29	83
Female	6	17

Table 3: Total working experience of the engineers

Working experience (in years)	Frequency	Percentage
<5	4	11
6 – 10	21	60
11 – 15	7	20
16-20	2	6
>20	1	3

Table 3 indicates the years of working experience distribution of the engineers. This time is from the time they started working. The minimum number of years that the least experienced engineer has is 2 years and maximum is 22 years. The average years of experience for the group are 9.1 years.

Table 4: Undergraduate engineering qualifications of the engineers

Discipline	Frequency	Percentage
Chemical	23	66
Mechanical	5	14
Electrical	4	11
Metallurgical	2	6
Mining	1	3
Total	35	100

Table 4 indicates all the Bachelor of Science (Bsc.) in Engineering (Eng.) disciplines represented in the raw data from the interviews. The chemical engineering discipline is the most represented with 66% followed by mechanical and electrical engineering with 14%, and 11% respectively. Both Mining and Metallurgical engineering are the least represented with <10%

representation each. does not have any representation.

Table 5: Other qualifications that these engineers have completed; are pursuing or will be pursuing in 2007

Degree	Frequency	Percentage
None	8	23
Msc (Eng)	7	20
MBA/MBL (complete)	7	20
MBA/MBL (ongoing)	6	17
Other undergraduate	5	14
MEM (Complete)	2	6
MPM	2	6
MBA (to start in 2007)	1	3
MEM (ongoing)	1	3
MOT (ongoing)	1	3

Table 5 shows the post graduate qualifications that this group of engineers is embarking upon or has completed. The highest number of engineers are either going to start (3%), currently studying (17%) or have already completed (20%) a Master of Business Administration (MBA) or Leadership (MBL) degree (which were treated as the same for the purposes of this research) giving a total of 40% of the group. 20% of the engineers have studied a technically specialized postgraduate degree which is a Master of Science (Msc) in Engineering (Eng) degree. Most of the other indicated post graduate degrees are engineering related, however in management; Master of Project Management (MPM), Master of Engineering Management (MEM), Management of Technology Management (MOT) and all of them combined account for 18% of the post graduate qualifications of the group. Some of the engineers have more than one post graduate degree, for instance, an Msc

and an MBA. 23% of any further; they only have Bsc. Eng. Degree while 14% of the engineers have chosen to do another undergraduate non-engineering related degree, for instance, the Bachelor of Commerce (Bcom).

Table 6 below indicates the types of work that this group of engineers is currently doing for a living. The majority of the jobs are in engineering related fields (97%), however, 63% of these jobs are in engineering management and only 34% is in technical jobs. Only 3% in this group of engineers was in a non-engineering related job (in financial sector).

Table 6: Types of jobs that the engineers are doing

Types of jobs	Frequency	Percentage
Management (Engineering)	22	63
Business	8	
Technical	6	
Operations	5	
Projects	3	
Technical	12	34
Senior Eng	10	
Petroleum Eng	2	
Non-engineering related	1	3
Finance	1	
Total	35	100

Table 7: No of employers the engineer's career

No of employers	Frequency	Percentage
One	14	40
Three	10	29
Two	9	26
Four	1	3
Five	1	3
More than Five	0	0
Total	35	100

Table 7 indicates the number of organizations that engineers have worked for in their careers. It was noted that that on average the engineers who had worked only for one organization their whole career had the opportunity to move within their organization at least once.

5.4 QUESTIONS FOR RESEARCH PROPOSITIONS

The questions that were used for research propositions are answered through the data presented in this section.

Proposition 1: Question 1 has been used to evaluate this proposition.

Question 1: What would force you to leave your current job? Give 5 reasons.

This question was asked in order to understand the negative factors, called push factors that would lead to a resignation. Table 8 below shows these factors in ranking order from the most frequently mentioned (77% - unaccommodating culture/ values system/ emotionally unpleasant working environment) to the least mentioned factor (3% stating awkward working times).



Table 8: Factors that push engineers to resign from their job

Push Factors	Frequency	Percentage
Unaccommodating culture/ value system/ principles/ unpleasant working environment (emotional)	27	77
Lack of career prospects/ development	24	69
Lack of challenge/ monotonous/ responsibility	20	57
Lack of recognition	17	49
Lack of management support/ fall out	11	31
Lack of strong leadership/ bureaucracy/ trust	10	29
Inconsistency in development opportunities	9	26
Lack of transformation	9	26
Unpleasant working environment (physical such as location)	7	20
Uncompetitive remuneration package	6	17
Company bankrupt/ going down/ struggling financially	3	9
Lack of shareholder backing	1	3
Awkward working times	1	3

The 1st three highest ranking factors were mentioned by over 50% of the interviewed engineers. The second factor that was mentioned by 60% of engineers was an unaccommodating culture/ value system and 57% saying they don't want a monotonous or routine job.

Proposition 2: Question 2 has been used to assess this proposition

Question 2: What would attract you to leave your current job? Give 5 reasons. This question refers to the pull factors that would lead to the black engineers wanting to leave their current position. Table 9 below shows two pull factors that were identified by over 70% of the engineers. These were; "best career prospects/ development" that was identified by 74% and "better package" by 71% of the interviewed engineers. 43% of the engineers felt culture was an important lever as well to their decision making.



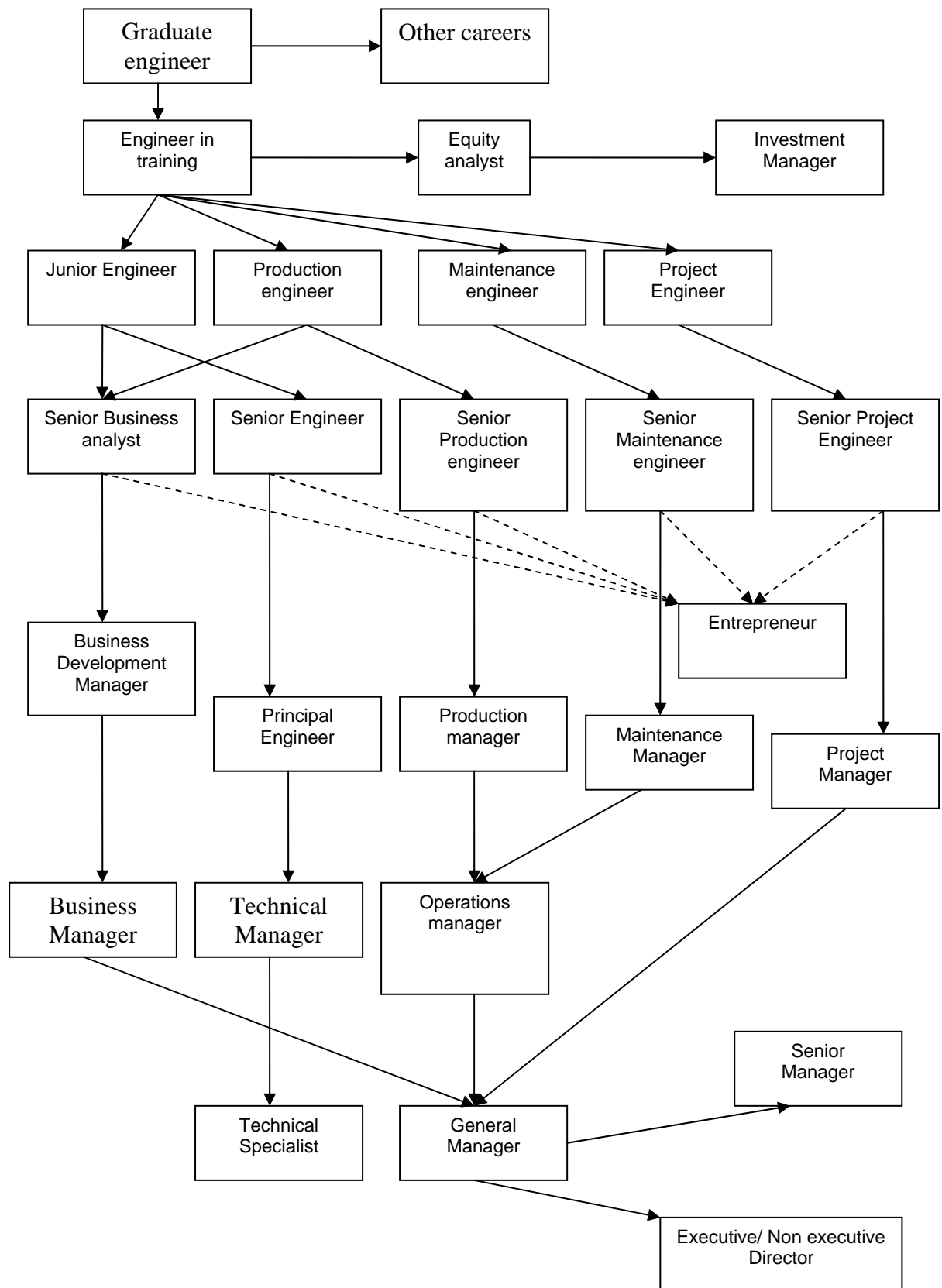
Table 9: Factors that pull engineers away from their current job

Pull Factors	Frequency	Percentage
Better career prospects/ development	26	74
Better package	25	71
Better working environment (accommodating culture/ value system/ principles)	15	43
Family (work, life balance)/ convenience/ location	13	37
Exposure (accelerated/ wider / business)	10	29
Ownership opportunities (BEE, shares, entrepreneurship)	10	29
Better challenge/ responsibility	9	26
Leadership role (senior/ executive)	7	20
Recognition & rewards (performance based)	5	14
New career/ self actualization / calling	3	9
Involvement in core business/ strategy	3	9
Company reputation / performance	3	9
Commitment to transformation	3	9
management's leadership style/ mentorship	2	6
International exposure	1	3

Proposition 3: Question 3 addresses the issues raised in this proposition that the engineers have big ambitions for their lives going forward.

Question 3a: Tell me about your career up to now? This question refers to the engineer's career progression to date. Figure 3 indicates these milestones by a flowchart showing the general career progression that most of the engineers have taken from when they graduated. It was noted that most engineers aspiring to become entrepreneurs were still at relatively lower levels (senior 3 engineer equivalent). Those in senior positions were focussing on becoming senior managers or even executives in their organization.

Figure 3: General career path for interviewed black engineers



Question 3b: Where 5/10 years (Position)

AND **Question 3c:** How are you going to achieve this goal? (Possible requirements to achieve these goals)

These questions were designed to understand the ambitions of the black engineers. Question 3 b refers to the position that the engineer envisaged over the next 5 to 10 years. Most of them had two options (1st and 2nd choice). Table 11 below indicates the 1st choice positions of the each engineer. The second part of table shows all the issues that were raised as important in enabling the engineer to reach whatever goal they set for themselves. Senior management position is ranked no 1 (31%) as it was the most frequently mentioned option, followed by entrepreneurship (with consultant as one of the options of entrepreneurship). Table 5 above indicates the types of post graduate qualifications that these engineers have either completed, currently studying or enrolling for next year (2007). The post graduate qualifications are mentioned as one of the levers that will be used to gain the necessary experience to reach the set targets. Most of the engineers made mention of MBA/ MBL or some management qualification as part of the qualification necessary to gain business experience. Another popular enabler mentioned was exposure (through experience in the current job or through making the necessary move to facilitate the gaining of the experience).



Question 3b - Position	Senior Management	Entrepreneurial Consultant	Technical Manager	Operations Manager	Investment Manager	Don't know
Ranking	1	2	3	4	4	5
Frequency	11	10	9	2	2	1
Percentage	31	29	26	6	6	3
<p>Question 3c:</p> <p>All the issues that were identified by the engineers as important in helping them acquire their goals as mentioned in question 3b.</p>	Doing a business degree (MBA/ MBL, etc) helps	Doing a business degree (MBA/ MBL, etc) helps	Technical Management degree helps (MPM, MBA, MEM, etc)	Doing a business degree (MBA/ MBL, etc) helps. Also a Bcom degree	Exposure to the current job	Don't plan that far ahead
	Business exposure at their current positions.	Exposure is everything	Technical specialization is critical	Mentorship is important	Growth in terms of growing portfolio to manage	Lack of mentorship
	Willing to move to different areas of the business to get the value chain experience (supply chain, marketing, etc)	Need for a secondary income to enable the start of a business is essential to its success.	Lots of experiential learning important in later years	Management support	Studying CFA can help in a lot of instances	Still trying to understand what their passion is
	Trust is critical	Normally start a business while working full time to enable the financing of the start-up.	Continuous improving your understanding is crucial to staying ahead of the technological advances	Improve the management skills	Natural progression	
	Exposure to strategic thinking in the organisation	Leverage on relationships through partnerships and Networks which are critical	Exposure to work that provide the necessary exposure and experience is crucial		No real promotion per se, the growth in responsibility is directly proportional to the portfolio that one has	
	Trust is critical	Trust is critical	Trust is critical	Trust is critical	Trust is critical	

Table 10: Black engineer's future ambition for the next 5 – 10 years



Proposition 4: Que of demand for black engineers, whether or not it is high and what impact that has for both the individual engineers and the organizations they work for.

Question 4a: Do you believe there is a high demand for black engineers in SA? Yes/ No. Why do you say so (reasons)? This question was designed to find out the opinions of the engineers themselves about the demand for black engineers in South Africa.

Table 11: Is there a high demand for black engineers in SA?

Answer	Frequency	Percentage
Yes	30	86
No	3	9
Don't know/ not sure	2	6
Answer: Yes: Reasons	Frequency	Percentage
Legislation driven (demographic representation, fulfil senior management requirement)	27	77
Requirement for SA's economic growth (Infrastructure, 2010, etc)	22	63
Engineers leaving engineering for other sectors or Management	6	17
High mobility implying high demand (ease of movement)	4	11
White engineers emigrating leaving gaps	2	6
Strategic imperative (black people more likely to stay in SA)	1	3
Answer: NO: Reasons	Frequency	Percentage
General demand for engineering resources (not race specific)	2	6
Global economic requirements are such that engineering resources are in demand globally (engineers are mobile)	1	3

Table 11 shows the results of the views expressed by the engineers. The majority of the black engineers expressed the view that there is a high demand for the black engineers in the country (86% agreed vs. 9% who

disagreed). The table shown as the cause for high demand, for those who said there is a high demand as well as reasons for those who disagreed. There is a unanimous view that the high demand is legislation driven (77% of the engineers). There was also a unanimous view that the demand is also influenced by the good economic growth that has been experienced by South Africa in the recent years. Another opinion that was raised by about 17% of the engineers was the fact that engineers are leaving the profession for other non-engineering careers or management positions.

Question 4b: What are the advantages (give 3) for this demand to the individual engineer?

Table 12: Advantages for the high demand for an individual engineer

Advantages for the engineer	Frequency	Percentage
Ease of movement by engineers (easier to acquire knowledge useful to the engineer)	26	74
Competitive pay for the engineers	20	57
Wide choices to choose from in terms of jobs & scope	20	57
Exposure to high responsibility job "earlier" in their careers	6	17
Rewards and recognition more visible (retention tool)	5	14
Engineer is more marketable because of this demand	5	14

Table 12 is above shows the advantages that the high demand for black engineers has on the individual engineer. Three advantages have been identified by the majority of the engineers. These are; this creates ease of movement for engineers (74%), remuneration is competitive for the engineers

(57%) and there is a from which to choose (57%).

Question 4c: What are the disadvantages (give 3) for this demand to the individual engineer?

Table 13: Disadvantages for high demand on the individual engineer

Disadvantages for the engineer	Frequency	Percentage
Technically shallow engineers due to job hopping	27	77
EE candidates can be used for window dressing/ fronting (leading to their lack of technical growth or development)	11	31
Resentment from the white colleagues (trust problems)	9	26
Lack of sound judgement in future due to lack of technical grounding in earlier years	8	23
Complacency & possibly big egos with arrogance	7	20
Lack of confidence to make the technical decisions	5	14
Lack of specialist knowledge	5	14
Easier to make wrong choices (financial vs. growth driven)	3	9
Under pressure to perform because more work available than the resources to perform the tasks	2	6

Table 13 indicates all the issues that were raised as disadvantages to the individual engineer caused by the high demand of these engineers. The only issue where there was unanimous agreement (77% of the engineers) that this is a disadvantage was the fact that job hopping creates technically shallow engineers because they move too soon without any time for growth.

Question 4d: What are the advantages (give 3) for this demand to the organization? This question seemed to be very difficult to answer as no one

was able to identify a **high demand for black engineers** due to the demand for black engineers.

Question 4e: What are the disadvantages (give 3) for this demand to the organization? This question was posed to the engineers about disadvantages that organizations might have because of the demand for black engineers (whether it is high or low). The most common frequencies were issues related to the recruiting costs (adverts, training new employee and pay structure) while the risk was high that they would most probably leave again (71%), The next related issue was that of high labour turnover (57%) given the high mobility of the group since it was advantageous for them. The lack of continuity was also becoming an issue because the black engineers opted to move quicker from their positions, i.e. before they had gained competencies in their position (49%).

Table 15: Disadvantages for high demand for organization

Disadvantages for the organization	Frequency	Percentage
Cost of recruiting increases (recruiting, training, poaching, etc)	25	71
High labour turnover	20	57
Lack of continuity	17	49
Loss of competitive advantage due to loss of talent	10	29
Inability to meet the EE targets leading to penalties	8	23
Lack of experienced technical personnel	6	17
Lower morale for stuff remaining	3	9
Insufficient experience for senior management	3	9
High management effort	1	3

Proposition 5: This regarding the supply of black engineers in the country. Question 5 deals with these issues.

Question 5a: Do you believe there is a short supply of graduate black engineers in the country? Yes/No

This question was asked with specific reference to the education system (including high school, tertiary, etc). Table 17 below gives the reply to the question in terms of those who agree and those who disagree. 60% of the engineers agree that there is a short supply of engineers while 37% says that there is enough supply. Both arguments are supported by reasons behind the agreeing as well as the disagreeing statements.

There are different issues that were identified as the cause of short supply, mainly the lack of students available at high school level with the necessary maths and science knowledge that they would pass the tertiary education (63%). Other issues that were identified are the high failure rate at tertiary institutions (37%) and lack of career guidance at high school (31%).



Table 17: The supply

n SA

Answer	Frequency	Percentage
Yes	21	60
No	13	37
Don't know/ not sure	1	3
Answer: Yes – Reasons (Question 5b)	Frequency	Percentage
Lack of students with Maths & science (Quality)	22	63
High failure rate at tertiary institutions (lack of support)	13	37
Lack of career guidance	11	31
Lack of financial assistance for students	8	23
High employment rate of graduate engineers	6	17
Lack of Capacity (tertiary institutions & schools)	4	11
Poor marketing of the profession	3	9
Lack of black engineers as role models for black youth	2	6
Answer: No – Reasons (Question 5b)	Frequency	Percentage
Black graduate engineers change careers because of lack of support (training & development problems) by organizations. These engineers not used effectively in their organizations	11	31
Demographics of university nowadays is more black than white	6	17
Increased number of black engineering graduates at lower levels of employment in organizations	3	9
Higher bursaries are available for students	1	3
There is a general short supply (not race specific) - economic growth reasons (SA & Global)	1	3

Proposition 6: Question 6 below addresses the issues pertaining to skilled black engineers, whether or not these types of engineers are available in the country.

Question 6a: Do you believe there is a shortage of experienced/ skilled black engineers in SA organizations? Yes/ No.

Given the imbalances it is understood that it was difficult to have black engineers and scientists, as the government policies did not allow it. This question there was posed at trying to understand in the South African contest whether or not there were any experienced black engineers. It was understood that there would not be as many black engineers retiring as there would be entering the market. The experience was therefore referring to the recent times when the policies had changed to allow for the black people to pursue engineering studies with the necessary support from the government.

Most of the engineers (80%) say that there is a lack of skilled black engineers in the country (as it can be understood). However, the disagreement also extended to even the recent times with some of them saying that there is a lack of support in terms of training and development (51%) by organizations to ensure that these engineers gained the appropriate experience. These difficulties have lead to engineers eventually leaving the profession for other careers (51%).



Table 18: Availability **Engineers**

Answer	Frequency	Percentage
Yes	28	80
No	4	11
Don't know/ not sure	3	9
Answer: Yes – Reasons (Question 6b)	Frequency	Percentage
Lack of proper support, training & development for engineers to grow as quickly as their white counterparts. Unequal opportunities available to black vs. white engineers.	18	51
Black engineers leave their profession for other non-engineering careers	17	49
Lack of support/ exposure for black engineers to take up technical leadership position by organizations	13	37
Result of the education imbalance from the past (apartheid), only 14 years into Democracy and "quality education for all"	8	23
Job hopping - negative consequence of Legislation. The engineers might be moving too quickly (no soak time for gaining of technical experience)	8	23
Lack of interest for engineering specialization (poor pay)	7	20
Engineering pay not competitive as other careers (finance, etc) for the same experience.	6	17
Legislation to address the economic imbalances of the past leads to loss of technical expertise to BEE & senior positions	5	14
Very few black owned and run engineering firms in SA	4	11
Engineers imported from other countries to meet the Government programs (ASGISA), 2010 construction, etc.	2	6
Answer: No - Reasons (Question 6b)	Frequency	Percentage
Lack of exposure	2	6
Retention problems	1	3
Lack of progression	1	3
Lack or role models	1	3
Networks still limited for black engineers	1	3

5.5 OTHER RESI

This section deals with findings about what the black engineers see as important when dealing with their careers, especially what would encourage them to stay within the engineering field for longer than they have been.

Question 7a: What do you believe should be considered regarding the career movements of the black engineers?

Question 7b: Any other comments you would like to make?

Responses from both questions below were combined to come up with the constructs of Table 19 below. The major issues that most engineers mentioned were regarding training and development. 51% of the engineers felt that this is critical and should be closely aligned with an effective mentorship program. 46% warns against “perpetual training” syndrome saying that their qualifications do not seem to matter to their organizations and they are assumed “incompetent” until they prove themselves.

43% of the engineers feel that the opportunities are not equal for all. Specifically they feel that the EE legislation has had some negative results in terms of exposure, for instance, availing international (expatriate) opportunities to white employees in their organizations and excluding black engineers in order to fulfil their EE targets. 40% of the engineers felt that the lack of black role models in senior engineering organizations also contributes to the lack of interest by these engineers for staying within the engineering field. They feel that these organizations should transform this situation and this will help change the culture to be more accommodating to diversity of the country.



Table 19: Critical i **ulating recruiting &**
retention strategies of black engineers

Additional finding	Frequency	Percentage
Focussed development plan (such as in Chartered Accountants) with effective mentorship programs.	18	51
Perpetual training is a serious problem at this stage. The premise is black engineer is incompetent and must prove otherwise while for white engineer is competent unless proven otherwise. This results in too many programs for black engineers to get them to "an acceptable standard".	16	46
Provide equal opportunities for all in the organization with the appropriate recognition e.g. expatriates, international assignment alignment with the development plans (negative consequence of EE legislation).	15	43
Availability of black Role Models at senior management in organizations is critical - transform the organizations. Black engineers leave because they are not able to identify and feel their needs are secondary. Cultural bias towards white culture with no diversity.	14	40
Retention strategies - Recognition of value added (function of meaningful work), manage expectations through transparency on promotions and genuine helping engineers to meet targets (communicate development needs and help person gain the experience)	12	34
Review remuneration system in line with other non-engineering related careers that require engineering skills or background	12	34
Equitable remuneration (black & white) for the same experience and performance	12	34
Provide meaningful jobs and support (challenge & growth coupled with accountability)	11	31
The working conditions are not conducive for black engineers.	10	29
Provide support systems at university (even company universities) to ensure the increased pass rates at tertiary.	10	29
Encourage engineering based entrepreneurship (emphasis on R&D instead of manufacturing - create technology rather than source it from other countries)	9	26
Encourage passion through proper marketing of the profession to the youth. Medicine is well marketed, why not with engineering. This will create the supply side pull	5	14

6 INTERPRETATION OF RESEARCH RESULTS

6.1 INTRODUCTION:

35 black engineers were interviewed to understand their career cognitions. This section is pertaining to discussion of the research findings, with relevant references to the literature, where applicable for supporting evidence or contradiction. It is however important to note that the research data suggested the outcome of the proposition from the information provided by the respondents and not from the requirements as described in the literature. Comparing and contrasting the findings to the literature is an invaluable tool in determining new insights into academia.

The results were presented in tabular format by ranking order that made it easier to understand constructs as contributed by respondents. It is important to note though that the highest ranked construct does not necessarily mean that it is the only contributor to the research regarding the particular subject (proposition).

The results of the research discussed below are per research propositions as formulated in chapter 3.

6.2 RESEARCH I

6.2.1 PROPOSITION 1

It was proposed in chapter 3 that the factors that may force black engineers to leave their jobs (push factors) are as follows;

- **Lack of recognition and rewards,**
- **Perceived lack of empowerment (accountability),**
- **Lack of responsibility (perpetual training),**
- **Perceived lack of management transformation &**
- **Misaligned psychological contracts**

The results shown in table 8 above indicates the top 6 factors that may force black engineers to resign from their job as the following;

- Unaccommodating culture/ value system/ principles/ unpleasant working environment (emotional)
- Lack of career prospects/ development
- Lack of challenge/ monotonous jobs/ responsibility
- Lack of recognition
- Lack of management support/ fall out
- Inconsistency in development opportunities

All the factors mentioned above seem to be related to each other. The main factor that may force black engineers to resign from their jobs is an unaccommodating culture or value system that the engineer experiences in the organization. This is not part of the factors identified in the proposition and

is also not supported in chapter 3. However, this may be true in the South African context when considering that the apartheid government encouraged maintaining the differences in culture and value system between black and white culture in business and otherwise. The black people and their culture did not play any significant role, for instance, in business making decisions. The business culture was therefore more aligned with the white culture since management was dominated by white people (Thomas *et al*, 2004). Table 8 also indicates that lack of transformation is another push factor. In these engineering organizations, the management is still white dominated and thus the business culture is still largely unchanged and unwelcoming to black engineers. More importantly, the demographics in a lot of organizations are still skewed towards black majority in low levels and white majority in management positions. Black engineers are emotionally disconnected as in most cases they are in the minority in these organizations and so they feel left out even in social events as well on information shared as “useful” information still gets shared during informal meetings amongst people of common identity. Black engineers have to assimilate into the “new” culture otherwise they are not accepted and no effort is made to create a culture acceptable to all.

The research further indicates that 26% (Table 8) of black engineers see an inconsistency in development opportunities between the races (black and white engineers); they feel that, on average a white engineer moves up the ranks quicker due to better exposure & opportunities. They also feel that there is a lack of management support (31%) and as a result they do not see any

career prospects or d an environment and that is why they resign. These factors are not supported by any literature and the reason may be due to the specific nature of the research as opposed to the general nature of the literature (which refers to knowledge workers in general) and the extent to which the literature considers international issues with specific references to experiences from where the authors resides and work, such as Cappelli (2000) who may be drawing from his experiences in United States of America (USA).

The work that Cappelli (2000) has done, to indicate that the lack of interesting and challenging work, responsibility and developing of the skills is an intrinsic satisfier for the knowledge worker's (and black engineers are part of them), is well supported by one of the factors found during the research which is lack of challenge or doing monotonous job or lack of responsibility.

The research also indicates that the lack of recognition and an uncompetitive remuneration package are also factors that may lead to resignation. However, the work done by Cappelli (2000), which says that the knowledge workers are not motivated by compensation, contradicts this research finding. However, his work does support the research finding when he says that the knowledge workers are more motivated by the design of the work and the extent to which it includes the engineer's interests, values and skills and they are less likely to resign when this need is satisfied.

The research also indicates that strong leadership can also lead to resignation and this is related to the misalignment in psychological contract between an employer and employee. This is supported by the work done by Rousseau (2004) who explains that there has to be a performance agreement between employer and employee (engineer) to ensure management of expectations.

In conclusion, the research has added more insight into the push factor for the black engineers in SA. This includes issues such as the lack/ failure of organizations in addressing the cultural issues, to be more inclusive of black culture (diversity) and lack of definition on a more clear and transparent career development path or prospects for all the engineers.

6.2.2 PROPOSITION 2

It was also proposed in chapter 3 that the key factors that encourage black engineers to leave their jobs (pull factors) are;

- **Increased responsibility (in growth and development)**
- **Accelerated promotions brought about by EE targets requirements**
- **New business opportunities (BEE deals & entrepreneurship)**
- **Expertise that ensure they command a premium pay in the market (MBA)**

The results shown on table 9 above indicate that the only top 2 factors were identified by the majority of the engineers (above 50%). Most of the other factors were identified by between 20% and 45% of the engineers. These factors are;

- Better career prospects (71% respondents)
- Better package/ remuneration (71%)
- Better working environment (accommodating culture/ value system/ principles) (43%)
- Family (work, life balance)/ convenience/ location (37%)
- Exposure (accelerated/ wider / business) (29%)
- Ownership opportunities (BEE, shares, entrepreneurship) (29%)
- Better challenge/ responsibility (26%)
- Leadership role (senior/ executive) (20%)

The research shows that the majority of the engineers interviewed (over 70%) would resign from their jobs for better career prospects or development and for better remuneration. This research results agree with the proposition in terms of growth & development and more package (accelerated promotion brought about by the EE targets). The need for development and responsibility is supported by the work done by Cappelli (2000) as an incentive for moving.

Jones (2004) on the other hand refers to the knowledge worker's need for remuneration and reward that recognizes individual contribution. This is again another important similarity to research finding that is further supported by the push factors discussed in section 6.2.1 above. Black engineers want to grow and develop and be paid consistently for their effort. Since they feel that there is a lack of consistent pay, they feel they are lagging their white counterparts. An opportunity that can be offered to them to catch up will be welcome.

Another insight that is the fact that these engineers come from poor backgrounds and in most cases they are looking after their extended families (relatives). This obviously puts a strain on their financial resources and so if they can move for a better package, they will. The additional findings (table 18) also indicate that these engineers feel that they are forever being trained with no responsibility (perpetual training) so when the opportunity does arise where they can be able to use these skills, they take it, knowing that they will have responsibility, grow and develop at the same time.

Another factor that was mentioned in the proposition is the fact that these engineers strive to acquire more qualifications in order to be able to market themselves with their expertise, specifically referring to an MBA qualification. The literature, through the work done by Sturges, Simpson and Altman (2003), supports this view that gaining an MBA qualification can contribute to increasing pay, status and promotion opportunities for graduates. Taking the 35 engineering graduates that were interviewed, table 5 indicates that 40% of them are either studying for (17%), have completed one (20%) or will be starting their MBA studies in the following year (3%). Furthermore, those who had not studied to get an MBA qualification were studying or had completed some type of management qualification (MEM, MPM, MOT, etc) which was a further 15% of the engineers. This indicates that these engineers are actually managing and growing their career capital. This is mostly driven by the fact that they don't believe they have a future in their organizations (see section 6.2.1 above) and so they make sure that they secure their future employment.

The research indicates that the fewer than 50% of the engineers actually felt that a better culture would be a driver for them to leave their current employment (43%). 29% of the engineers would move for BEE reasons, for instance, which supports the proposition. This is a SA specific government intervention and there has been general public notion that this has been going to a selected few individual who have government links, which might explain the low percent. However, there is limited literature available on this subject.

In conclusion, the research has identified an insight into the drivers behind the engineers changing their jobs (extended family, need for better working environment (aligned culture/ value system). These engineers are also conscious of their careers and until they better understand where they fit in into their current organizations, they will continue making their own plans which might be different to the needs of the organization.

6.2.3 PROPOSITION 3

Chapter 3 also proposed that majority of black engineers see their lives drastically improved over the next 5 to 10 years time. They see themselves achieving their goals through;

- **Changing their career into a different job**
- **Entrepreneurship (starting their own business)**
- **Promotion to senior management positions in their organizations**

The demographic information on the engineers reveals that the average working experience of the interviewed group is 9.1 years with a minimum of

about 2 years and more than 10 years between the least and the most experienced engineer (table 3 above). 60% of the group have between 6 and 10 years of experience (table 3) and 45% of the age group fell into the 31 – 35 years (table 1), which is the biggest age group in the sample. Table 7 indicates that 40% of the group has worked for only 1, 26% for 2 and 29% for 3 employers. The average number of employers has been 2 per engineer. This indicated that on average the engineers have been changing jobs every 4.5 years. This is supported by the work done by Broscio (2003) that on average it is predicted that an average working person would change their jobs between 5 and 10 times, which is about once every 5 years over a 40 years career.

This research found that most of the engineers have been working in engineering related fields such as design, maintenance, production, projects, etc, see Figure 3 which shows the engineer's career progression to date. Table 10 indicates the engineers' future ambitions for the next 5 to 10 years. Most of the engineers want to be Senior Managers (31%), entrepreneurs (28.5%) or Technical/ Project Managers (25.5%). This supports the proposition made in chapter 3 in that most see themselves in another job (which may or may not be with the current employer) to gain experience, as entrepreneurs or having been promoted to senior management positions.

Most of the engineers when asked how they are going to achieve their goals explain that the experience they are gaining will be important to the future. Most of them also explain that they are also embarking or have already

completed some qual them understand the necessary business skills. Others also say that they will move from their job in order to gain the necessary experience to achieve their goals. This approach is supported by the work done by Inkson & Arthur (2001) on the framework of career development which involves 3 key assets, i.e. “knowing-whom” – the necessary networks that will help them in future, “knowing-why” – the understanding of their vision for the career and “knowing-how” – knowing what expertise and skills to provide the knowledge to help them get to their goals.

These engineers are looking towards the senior management positions, entrepreneurship and changing jobs because there is a drive from the government perspective (EE, BEE, etc) and these resources are scarce in the market. The literature, for instance, through the work done by Thomas *et al* (2004) explains that in 1996, out of 160 organizations reviewed 80% of management levels in SA were occupied by white males and in general whites also enjoyed 104% wage premium over Africans and men earned 43% higher wage than a similarly qualified women in similar sector or industry. This builds up to the reason behind black engineers wanting to control “their destiny” by managing their careers themselves. They are looking to provide the management experience that is required in senior management as the organization work towards “transformation“ of their organizations in line with the government EE targets. The research concern, however, is that the process is moving very slowly and there is lack of commitment from

management to ensure they are well equipped and grown in their current positions so they do not see they will not need for leaving.

In conclusion, this proposition is well supported by the research findings and literature reviewed. It has also been found that these engineers have taken their development as their own responsibility. Research also found that using experience and necessary exposure in line with one's development plan is critical to one's success. There is also a generic career progression flowchart for the engineers. It might help organizations to define the different career paths for the engineers as opposed to the engineers defining their own path that does not include engineering because they do not get support and equal treatment compared to their white counterparts and so they seek better employment which will fulfil these needs (which might not be in engineering).

6.3 PROPOSITION 4

Chapter 3's other proposition was that there is a high demand for black engineers and that this high demand has its advantages and disadvantages for the black engineers. These were identified as follows;

Advantages:

- **Accelerated promotions through the ranks in the organization**
- **Exposes these workers to high development opportunities**

Disadvantages:

- **Inadequate development for management positions which could have negative impact on organization's performance in the long term,**

- **Job hopping v**
- **High mobility of engineers away from their profession thereby negatively impacting on the engineering sector resources,**

86% of the engineers that were interviewed indicated that there is a high demand for black engineers (Table 11). They continued to mention the reasons for the high demand as legislation (77% of the sample) and economic growth driven (63%). The argument is that it has to be both these because even if the legislation was in place, there would not be any jobs available for EE candidates if the economy is not growing. Both the views are supported by literature review as the work done by Thomas *et al* (2004) suggests. Thomas *et al* (2004), also indicates that the impact of emigration of skilled workers such as engineers to developed countries and SA is one of the 3 African countries most affected, other being Ghana and Egypt. Thomas *et al* (2004) again says that by 2000 there had been an increase of 33% in emigration figures from those of 1998 in SA (60% of which was found to be graduates). This obviously takes away from a pool that is already limited and thus the demand of the remaining professionals increases. There are suggestions that the emigration of the people maybe due to globalisation of organizations (expatriates), readmission of SA into the global arena (globalization) or because of EE/ BEE legislation (white citizens feeling that they will be discriminated against and thus do not see a future for themselves in SA). It was also suggested that the demand is further increased by those engineers who leave the profession for other non-engineering related careers.

Table 12 indicates that interviewed think that the advantage of the high demand for them is that it becomes easier to move, thereby facilitating the acquiring of useful knowledge for their career growth. 57% felt that the advantages are that the pay becomes competitive and the choices become wider. There was also a mention of obtaining exposure to higher responsibility jobs sooner; however, only 17% of the sample felt this way. This does not agree with the proposition that these engineers are about accelerated promotion in their organizations. They rather opt for moving to in order to obtain what they perceive as necessary experience, probably driven by the lack of management support and the unaccommodating culture, which was mentioned in previous propositions.

Table 13 shows disadvantages identified for the individual is that the engineers may move too quickly (job hop) and therefore not gain the technical expertise they need to be in technical positions in future (77%). They also identified window dressing as another issue that may disadvantage for them (31%) as they may be put into positions where they will not grow, where they would not have meaningful responsibility but be paid high packages for doing “nothing”. The other disadvantage that was identified is that of resentment from their white colleagues because they feel they do not deserve to be where they are.

It seems these engineers are aware of these issues and hence their studying further to ensure their competence away from engineering (through MBA/ MBL discussed in proposition 2 above). The environment does not allow them

to prosper in the tec) succeed away from engineering. This notion disagrees with the proposition that they have inadequate management development because they make up for this by exposure, qualifications and moving away from engineering. In the number of engineers interviewed, only 2 (6%) of the sample had moved more than 3 times as shown in table 7. 66% are in the category of one or two employers as supported by Broscio (2003) and 40% has only been with just one employer since graduation. There is therefore no real evidence from research of job hopping (moving after very short periods, for instance, one to two years).

However, the indication is that these engineers will be moving away from engineering (from their ambitions for the next 5 to 10 years) from proposition 3 above (table 10). This will negatively impact the engineering profession as the profession will lose experienced black engineers which could probably have been avoided if the organizations took the time to nurture this talent by supporting these engineers (through creating a conducive culture, well defined responsibilities and accountabilities with proper monitoring systems in place).

There were no advantages for organizations that were identified as a result of high demand for engineers. However, there were many disadvantages identified. Table 15 shows that 71% of the sample felt that the cost of replacing an engineer increases because of high labour turnover, "people leave as soon as they are recruited". This is supported by the work done by

Howard (2002) in the does not seem to hold for this research as the sample mobility seem to agree to suggested Broscio (2003) benchmark of about 4.5 to 5 years in a job before moving to another.

In conclusion, there seem to be a correlation to the other knowledge worker movements, indicating that these engineers are not as mobile as it is made out to be. It also seem to show through their behaviour (changing jobs) that they are making responsible choices in terms of when to change jobs which disagrees with the proposal that they job hopping amongst these knowledge workers in SA.

6.4 PROPOSITION 5

An additional proposition from chapter 3 says that the key factors for the shortage of black engineers in organizations are due to:

- **Poor education system,**
- **Poor career guidance at school,**
- **Lack of organizational/ government's planning,**
- **Brain drain, and**
- **Engineers not practising their profession (leave for other industries)**

Table 17 indicates that there is an agreement to the proposition that there is a short supply of black engineers in SA, with 60% of the engineers interviewed agreeing and 37% disagreeing. 63% of those who agree say that there is a lack of supply of students with appropriate maths and science at school level.

There is supporting evidence that the shortage of supply as Lawless (2005) and DOL (2006) suggest that the number of students with the necessary education is still very low. This agrees with the proposition that poor education contributes to the lack of supply of black engineers.

The research also shows that, 37% of the engineers say that of those who gain entrance into the tertiary institutions, there is high failure rate due to a number of issues such lack of support, family problems, financial problems, etc. Another 31% of the engineers feel that there is lack of career guidance at schools about, for instance, which subjects are necessary to gain acceptance in engineering or what grade (HG or SG) to choose in order to have a chance of being considered at university. The work done by Wessel *et al* (2003) supports this statement that this is an important issue to consider in the education system. Good career guidance helps learners to make informed decisions on the type of careers to pursue and how to ensure that they do the necessary preparations to have university admission.

Other engineers (less than 10% of the sample) felt that the profession is not as well marketed to the youth as other careers such as medicine, chartered accountants, etc. This is supported in the literature by work done, for instance, by Hill (2006) that indicates initiatives by organizations such as ECSA and ANCYL who joined forces to expose the profession to the youth of the country. This shows that there are some people who see the need to passionate students with love for engineering exposed to the profession with the hope that they will study it. Passion is a self motivator and getting

passionate students the risk of graduates leaving the profession once they graduate as some students pursue engineering purely for financial reasons (bursaries) and change careers as soon as they graduate to pursue their real passion.

Those engineers who disagreed, saying there is no shortages of black engineers, (31% of the interviewed engineers) mention that engineering graduates leave the profession because of lack of support and understanding of the career path in engineering. These engineers feel underutilised in their organizations and that they can be able to add more value elsewhere. Another 17% say that the demographics at universities have swung to having black students as the majority. This agrees to the proposition that engineers leave their profession for other professions.

Others feel that there is a general short supply of engineers across the colour spectrum, not necessarily black engineers. Given the government infrastructure spending on ASGISA program and 2010 soccer world cup preparations there are not enough engineers across the board with no distinction as Naidoo (2006) suggests.

6.5 PROPOSITION 6

The last proposition in chapter 3 says that the key factors for the shortages of skilled black engineers in organizations are due to:

- **Lack of supervision & coaching**
- **Lack of mentorship**

- **Lack of expos**

The research shows that there is a shortage of skilled black engineers in the country. In table 18, 80% of the engineers interviewed agreed with this statement while 11% disagreed with only 9% saying they did not know. This is supported by the Barker (1999) who says that the major inhibitor to economic growth in the country is due to the lack of skilled labour. Furthermore, the research shows that 51% of the engineers feel that the lack of support, training and development are some of the causes for black engineers leaving engineering. This supports the proposition as well that it is due to lack of supervision as this leads to lack of proper (with define training and development with milestones to measure growth and progress), as supervisors act as the coaches and trainers of the younger engineers. The issue on the lack of mentorship schemes is not for the lack of organizations from trying.

The research shows that due to the slow pace of transformation, there are still very few role models who can also act as mentors for the black engineers in engineering companies. So due to the lack of black role models in senior positions; who have gone through the same development path, who can impart their knowledge to the young black engineers, which the black engineers believe would help in encouraging them to stay, they may leave. As it is now, they see very few people succeeding, and so they do not want to struggle by themselves with no help from people with the same background advising them on how to overcome the challenges of being a black engineer in SA. This, obviously makes the situation worse as no one stays, with the

result that organizatio ers only want to be in business or other careers rather than being technical engineers, all the while, it has been the conditions that are driving these engineers away from the profession.

The fact that the engineers interviewed are planning to leave to either start the own businesses, become senior managers or change their jobs as per the proposition 3 (table 10) imply that they will leave with the gained experience. For as long as the perception that black engineers are not supported, the organizational culture and management in organizations do not change, these engineers will keep leaving the engineering profession. In the long run, the profession will suffer as the new engineers will not have coaches/ supervisors to train them, the managers might have to spend a lot of management effort training new engineers instead of concentrating on bringing in the business and as result the organizations will lose their competitiveness. It is in the best interest of the country to have these engineers staying in their profession and therefore every effort should be made by everyone to ensure equally distributed benefits.

The research shows that 37% of the engineers feel that there is lack of exposure to technical leadership challenges (which is in agreement with the proposition) while the remainder of the engineers needed to suggest something that could be done together with the other engineers.

6.6 MODEL OF T

The key findings in this research were brought together and presented in a model, as illustrated in Figure 4. The key areas of the model are:

- **Diversity management:** this is how well the organization has transformed its culture. The organizations where the working environment (especially emotional, social, etc) is welcoming will have a higher success of attracting black engineers. Most engineers, in their early career years will accept the physical environment (remote locations) because of their need for experience. This time can be extended provided there is a clear growth path and development plan for the engineer, especially of adding value to the organization. Management teams that “practice what they preach” about their commitment to transformation can gain the trust of these engineers, provided their actions illustrate this commitment.
- **The value proposition to the employee:** The research has shown how important development is to these engineers. The plan has to be in place and must be agreed to by both employer and employee. Continuous monitoring of progress and honest & constructive feedback is critical as it ensures the trust and alignment in expectation from both sides (psychological contracts) and most importantly, it leads to growth.
- **Accountability:** It is important to provide work that is balanced in terms of routine, challenge and responsibility. Most importantly these engineers want to know that they are held accountable for their deliverables and that their work will add value. They want to know that there will be serious consequences to the business for their non-

performance o) well done. In cases mentioned by these engineers, their responsibilities overlapped so much that even if they were not at work, nobody would notice and so they do not see the value they add, particularly on accountability.

- **Talent management capacity:** Both the government and business are equally responsible for supply of quality resources into the work place. Lacklustre workforce has a negative impact on not only the business but also the country's economy. This is critical to supply and business must be innovative in ensuring secured supply of engineers as proposed – through involvement in education, management effort and mentorship programs.
- **Measure of success:** This measure the success obtained through the implementation of this model. The measure can be done in various ways, one of which can be a balanced score cards with the issues identified as the performance indicators.

This model identifies the above five key factors as critical to the formulation of recruitment and retention strategies for black engineers by engineering organizations in SA. Each factor delves into the underlying detailed actions that may result in critical successes in implementation of these strategies. For instance, on diversity management, the organization has to focus on;

- Transformation
- Culture and
- Leadership



Transforming the org the SA environment.

However, once this is achieved, the next step will be to put effort on creating an encompassing culture, i.e. the culture that will be accommodative, that will create a conducive working (social) environment all of the organization's people. Leadership is another important issue in that they have to be trustworthy, provide role models for all the people (representative), and lead by example (practice what they preach in terms of values and culture). One critical success driver can be identified from this factor as a performance indicator and be included in the "measure of success" instrument for the organization (which may be a balanced score card, etc).

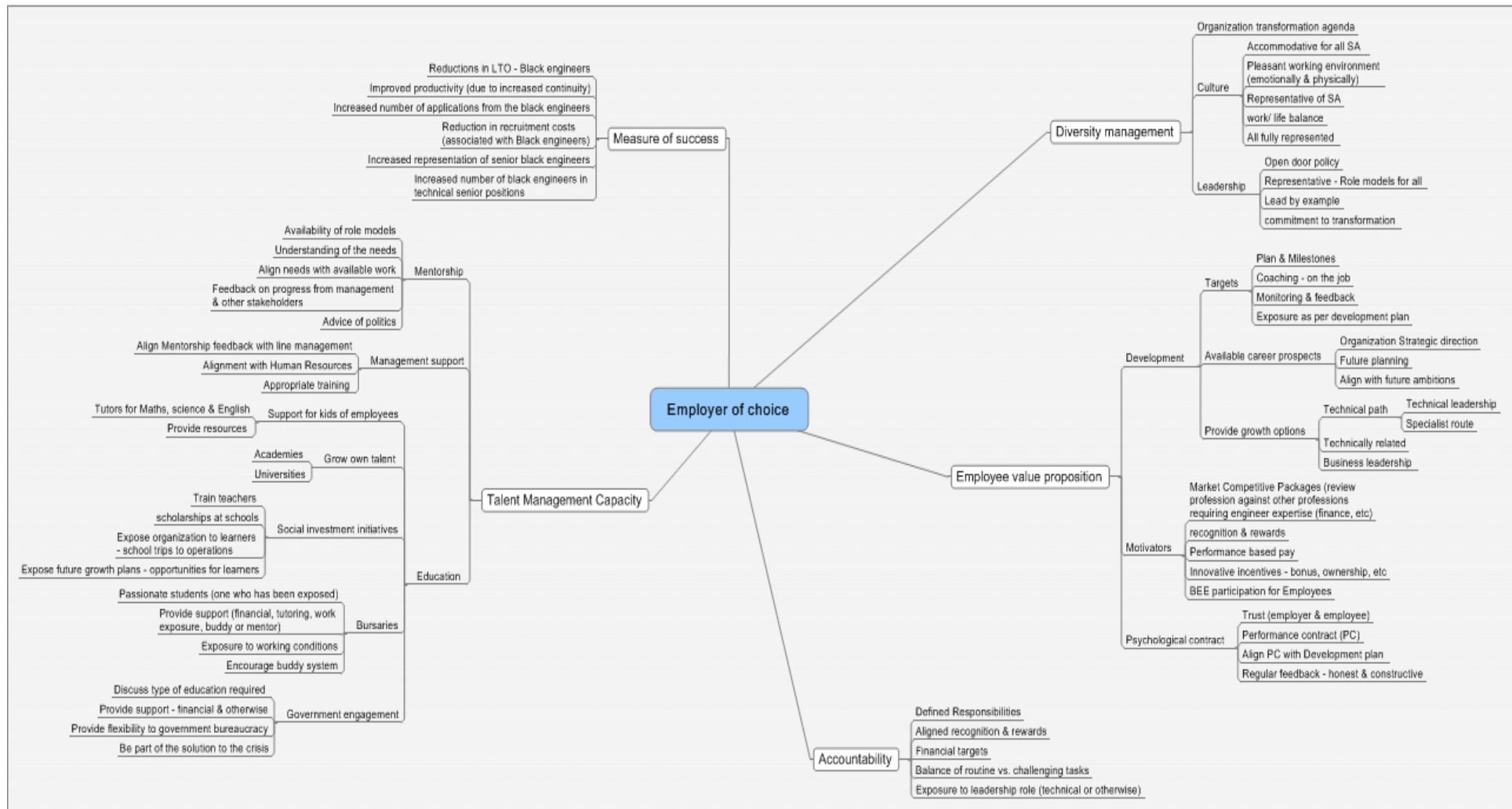


Figure 4: Model – Factors involved in being an employer of choice for black engineers in engineering organizations in SA

7 RECOMMENDATIONS

7.1 RECOMMENDATIONS TO MANAGEMENT OF ORGANIZATIONS

7.1.1 DIVERSITY MANAGEMENT

The major push factor that was identified by the research is that;

There still exists an unaccommodating culture for black engineers in engineering organizations in the SA. These engineers believe that the unwritten rule embedded to this culture was that; “Black engineers are incompetent until they prove themselves otherwise and white engineers are competent until they prove themselves otherwise”. The black engineers have felt that their organizations have;

- Unsupportive management with little or no focused coaching or mentorship programs,
- No clear career or growth paths to provide choices to the engineers and so the engineers concentrate on their own growth (which most times disregard the requirements of the organizations since they do not know them) by concentrating on their own career capital,
- Been unable to provide jobs that give these engineers responsibility accompanied by accountability instead training programs tailor made only for black engineers to “get them up to speed” are devised – resulting in what the engineers call “perpetual training”.
- Been lagging behind on transformation and so there are very few or no role models for the black engineers at technical senior levels.

Management teams \Rightarrow engineers have to seriously consider these issues. Transformation of culture and representivity of black engineers at senior positions should be implemented with proper supports systems put in place to keep a balance between training, responsibility and most importantly accountability.

7.1.2 INCONSISTENT TRAINING FOR BLACK vs. WHITE ENGINEERS

Black engineers feel that the white engineers progress quicker through the ranks because they have support, wider exposure and guidance (mostly informal discussions with senior people they know and not necessarily formal mentors). Mentorship, it is contested, works well where there is a personal relationship between the mentor and the protégé. Due to the lack of mentors that the black engineers can identify with, who are able to empathize with their difficulties while at the same time volunteering their view of how they dealt with similar instances, these engineers feel they are at an advantage and so they take longer to progress through the organization's ranks.

It is important that organizations review the average growth rate (career progressions & promotions vs. age) of black vs. white engineers to establish if any inconsistencies exist. Should they exist, measures must be implemented to provide the necessary support. When drawing up development and training programs, it should be clear what the exposure, responsibility and accountability will be. There also have to be milestones with regular honest feedbacks with the aim to ensure that there is commitment from both the

employee and emplc are also have to be consequences put in place for failure to achieve the requirements from both sides. This will help ensure trust from both in the leadership that they do care about the development of these engineers. When their needs are met and they are in line with their development plan (which usually is a function of opportunities available within the organization and the type of support provided by leadership to create conducive working conditions for their success.

7.1.3 RETENTION STRATEGIES

Organizations have had a very short term focus view for their requirements for engineers. It is important that organizations get involved in the education system of the country to;

- Invest in infrastructure (through academies and universities of their own),
- Take a proactive interest in training the teachers in order to be able to provide
- Expose their engineering careers to learners at an early age so they can ignite passion for engineering in black communities where there is a scarcity of such skills.
- Sensitize learners about the qualifiers for engineering (tertiary entrance requirements).

Organizations have concentrated on providing bursaries at university with no support to the students to ensure they qualify. Surely having support systems in place will ensure increased supply of graduates and thus a larger pool of

talent for organization need for financial aid, some students use the bursaries to obtain the degree as a stepping stone to other careers. In most cases, by the time these students graduate, they have lost interest in being engineers as they struggle to make it through.

7.1.4 CAREER OPPORTUNITIES:

Due to the need for growth that the black engineers have, they will go where they think there is a highest potential for growth is. The research shows that these engineers are proactive when it comes to their growth. Organizations have to ensure that there is alignment between the individual's aspirations and that of the organization. It is therefore important to provide the necessary information that will enable easier decision making. Organizations find it difficult to provide the information to engineers about available opportunities and this information might help in engineers planning around opportunities available in the organizations. It is important to note that there are always a number of career growth options available to an individual and the research has shown that the decision on which career to follow is based on the;

- Culture,
- Responsibilities and accountability,
- Career opportunities and
- Personal aspirations



7.2.1 MENTORSHIP PROGRAMS:

Since 1994, there have been many engineering graduates coming out of university. Even though they might have moved away from engineering, it is important that they stay involved, through mentoring the junior engineers, for instance. They must volunteer some of their time from their busy business schedule to sponsor some students (at university) providing some useful contacts that may make the students lives a little easier.

7.2.2 ENTREPRENEURSHIP:

Those engineers aspiring to start their own ventures should consider creating new engineering organizations with new culture and with the diversity that they seek so much. The research shows that these engineers stay in the profession until they are at senior engineer level (which is a fair amount of competence). They will be able to fulfil their dreams of ownership while using the skills they have been trained in.

Partnerships with their organizations should be seriously considered as well as this will be mutually beneficial to both parties, providing the much needed engineering resources to organizations while the organization gain the much needed experience as well as the meeting their targets for BEE, etc. This will help the engineers have the growth they need (business experience, while still practicing engineering).



7.3 RECOMMENI

RS

The research revealed many of the challenges being experienced nowadays is due to the government policies (old and new). The education system has been identified as one of the bottlenecks on the supply side of engineers. The challenges range from infrastructure (capacity of schools to accommodate the learners) to learning material such as laboratories, books and teachers.

The government has to identify a focussed approach. Focussing on every aspects of education simultaneously is complicated and shadowed by the bureaucracy as this approach is inflexible and will take long to yield desired results. Unfortunately an engineering qualification (and any other science related career, for that matter) requires a very solid base in terms of school mathematics and science.

Choosing the lower primary schooling system as a focus area, for instance, will ensure a solid foundations and understanding of the fundamentals of science. It will be easier to monitor results and will also provide easier flexibility in terms of rectifying mistakes and undesired consequences. It is crucial to admit that this should be a trial and error method to ensure an SA solution is found and to this end, flexibility is critical as it will allow for quick response and availability of resources to effectively deal with challenges. It is recommended that most of the education budget should be allocated there to ensure that infrastructure is in place, the teachers are well trained and reasonably compensated (with necessary import of external teachers from other countries who can impart their skills to SA teachers). The phased

approach will help in € | in an orderly manner with necessary changes being implemented where necessary.

Very close interface with the private sector should be maintained as the end results (students) will end up being employed by these industries and so they have to be happy with the type of education being provided. This goes back to flexibility in government policy to allow establishment of institutions (as shown in figure 3) and much more involvement of private sector in the education space. Specialised tertiary institutions focussed on providing skills for specific industries as is done by some of the organizations internationally such as CISCO from USA, etc.

A solution to the immediate shortage of engineers has to be through importation of skilled engineers from other countries. However, very clear goals should be set upfront to ensure imparting of skills to the local population with milestones and monitoring systems in place so that the engineers (and other skilled workers) in the country can be able to develop at a measurable pace.

7.4 POSSIBLE FUTURE RESEARCH TOPICS

The history of the country and its education problems is a long and complicated one. This research has explored one piece of the puzzle. The following section discusses other possible research topics which will help in holistically understanding the engineering skills challenges in SA.

- **Career cognitions of black and white engineers in SA:**

This research concentrated only on the African portion of the black engineer's definition in SA. It is therefore important to get these groups' perspectives as well with regards to their careers in SA. It will be useful to understand the similarities and differences in opinions that will be raised, specifically on their treatment compared to African engineers, given their minority status compared.

- **Comparison of career cognitions between black and white engineers in SA:** This research has indicated that there possibly is inconsistent training provided for the black engineers as opposed to the white engineers. This begs the question what is different in the careers of the white engineers that might be putting them at an advantage when compared to the black engineers. The research will have to look at the impact of culture and background of these engineers as well as explore their views of their careers as opposed to the black engineers (which has now been done)
- **What differences exist in the turnover of black engineers compared to the white engineers in SA engineering organizations?** This research was intent on exploring the career cognitions of black engineers in order to find their views of their careers to compare that to all the myths and anecdotes that have been formulated about the black engineers. This excluded the rest of the engineers in the country (other races). The results show that the black engineers on average change jobs twice in ten years. How different is

this value to 1 t the drivers for this turnover are and what retention strategies can be put in place to reduce this turnover.

- **What is the impact of employment equity legislation on the black and white engineers in SA and how does this affect the competitiveness of the engineering organizations?** It is understood that the employment equity has created a divide between the black and white people in SA. It is important to explore how true this statement is, how it has affected the engineers (both black and white). How can this challenge be exploited to the benefit of the organizations involved and the country's competitiveness?

7.5 CONCLUSIONS

Understanding the career cognitions of black engineers is an important topic for SA. This is especially important because of the challenges that the country is facing as it gears itself up for an economic growth rate of 6% by implementation of the infrastructure projects, municipalities' facing service delivery challenges such utility supply (power, telecommunication water, waste treatment, etc) and transport. Due to the previous dispensation, there are still huge backlogs in terms of housing and infrastructure, for instance, while the population growth and movements into the country continues.

The current infrastructure is old and beginning to fail due to lack of maintenance. All these issues require the involvement of engineering

expertise. However, t g so far to deliver on the quality required to enable an increased supply of engineers. The organizations have not committed as much resources to help in enabling a secured supply of engineers. Moreover the government has enacted legislation such EE, BEE, BBBEE, etc to rectify the inequalities created by the previous apartheid regime. It has been speculated that these acts are enacted at the back of limited engineering supply. The results seem to suggest that the number of black engineers has reached critical mass; however, the limited pool of practicing engineers is caused by engineers leaving the profession to pursue other careers or moving into management positions because of the many difficulties experienced in the profession, as discussed in chapter 6 above.

The many speculations and stereotypical ideologies that have been made regarding these individuals do not seem to be true. Some of the issues that have been raised at different quarters about these engineers are;

- They like to job hop (because of the high demand) and this leads to them being technically incompetent,
- They are paid premium salaries because they are in demand (EE legislation),
- They prefer to be in management because engineering is not glamorous,

The six propositions were made in order to design questions that could then be used to understand the extent to which all this anecdotal information is true. Interviews were conducted to explore the qualitative insights provided by

all the thirty five t organizations and backgrounds. The research seems to have achieved its objective, which was to understand amongst others the push and pull factors that lead to engineers resigning from their jobs; understanding the career path of the engineers as well as their ambitions for the future; understanding of the supply and demand for the engineers as well as availability of skilled engineers in the profession. Ways of retaining the engineers in the profession were also explored by understanding how these engineers actually saw their careers.

The analysis of the results seems to indicate that there are reasons for the choices that these engineers make and most of them are driven by the conditions under which they operate in the profession. This is a complex subject and the research was only a qualitative view of these engineers. Information is still required to get a better understanding of the career decisions of these engineers. Using the research, recommendations have been made to organizations, for instance, on ways of attracting, recruiting, and training, retaining and optimally utilizing these engineers in the engineering field. All these results were put into the model described in figure 4 above on dealing with these issues. However, more research topics which this research was unable to address have been proposed in section 7.4.

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9 APPENDICES

9.1 APPENDIX 1: INTERVIEW GUIDE

BACKGROUND: Thank you for giving me this opportunity to interview you. I am an MBA student at Gordon Institute of Science (GIBS). My research topic is “Career Cognitions of Black Engineers in SA”. This interview is conducted with aim to understand the career movements of these engineers in the quest to try and understand them better. The interview will be treated as confidential, your name is not necessary. The results of the research can be made available to you should you require it.

DEMOGRAPHIC INFORMATION				
Date:				
Gender	Male		Female	
Race (<i>Black</i>)	African	Coloured	Indian	Other
Years in current job				
What are your undergraduate qualifications?				
Which discipline?				
Age	20-25	26-30	31-35	36-40 > 40
Are you currently in a technical engineering job?				
If not, what do you do now?				
How long have you been working?				

Questions

Q1: What would force you to leave your current job? Give 5 reasons.

Q2: What would attract you to leave your current job? Give 5 reasons

Q3a: Tell me about your career up to now?

Q3b: Where do you see yourself in the next 5/10 years?



Q3c: How are you going to achieve this goal?

Q4a: Do you believe there is a high demand for black engineers in SA? Yes/No
Why do you say so?

Q4b: What are the advantages (give 3) for this demand to the individual engineer?

Q4c: What are the
engineer?

to the individual

Q4d: What are the advantages (give 3) for this demand to the organization?

Q4e: What are the disadvantages (give 3) for this demand to the organization?

Q5a: Do you believe there is a shortage of black engineers in the country? Yes/No

Q5b: Please give reasons for your reply in 5a? Give 5 reasons.

Q6a: Do you believe there is a shortage of experienced/ skilled black engineers in SA organizations? Yes/ No

Q6b: Please give reasons for your answers in 6a? Give 5 reasons

Q7a: What do you believe should be considered regarding the career movements of the black engineers?



Q6b: Any other comments you would like to make?