University of KwaZulu-Natal

An Evaluation of Transnet's Engineer in Training Programme: A Systems Thinking Approach

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DECLARATION

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ABSTRACT

The South African government is looking towards Transnet to grow the economy through its capital investment programme. In order to achieve this, the company needs to have within its ranks a highly competent workforce who possess the necessary skills. The Engineer in Training programme at Transnet is critical in ensuring that the current and future employees of Transnet are competent and have the necessary skills to perform at a level which is required of them and successfully deliver on projects. This study examines the Engineer in Training Programme at Transnet to determine how the programme is perceived by senior staff, if the programme is achieving its purpose and the ways in which the programme can be improved.

The aim of the study was to identify how the graduate programme currently offered by Transnet Group Capital can be improved. This was done by benchmarking the activities and outcomes of the program against the Engineering Council of South Africa's requirements for a professional engineer. A qualitative approach was adopted for this study. This was conducted in the form of a semi-structured focus group platform using predefined prompts to direct the discussions. The focus group session followed a soft systems methodology (SSM) approach, hence, SSM tools and techniques were employed during the session to gain a clearer understanding of the problem situation. This included the development of rich pictures, root definitions and conceptual models, which were carried out in three consecutive phases during the course of the session.

The data was analysed using thematic analysis, with the aid of NVivo 10.0 software. The presented themes were then used to compliment the findings of the SSM tools that were utilised during the data collection phase. The main themes which emerged were Competency, Programme Structure, Responsibility of Mentors and Mentees, Responsibility of Decision Makers, Responsibility of Programme Custodian and Knowledge Sharing.

There were a total of 31 change measures suggested. It will obviously not be feasible to implement all of these changes at once. It is therefore recommended that a phased approach is adopted by prioritizing the most critical change requirements as well as the most easily attainable changes first. It is also recommended that a committee be tasked to oversee the change measure implementation

and that, within that committee, a dedicated champion is assigned to each theme or category of change.

This study has been successful in revealing a deeper understanding of the Engineer in Training programme at Transnet and its deficiencies as well as the means to begin to address the identified problems. This will in turn have a positive effect on the quality of trainees being produced, thereby the quality of work being done by the company and ultimately the economic strength of the country. The study has thus been valid and useful, giving a number of recommendations for the improvement of the programme. Recommendations for further study have also been suggested and it is thought that if these studies are taken further, significant advancement of the programme can be achieved.

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LIST OF ABBREVIATIONS AND SYNONYMS

CPD	-	Continuous professional development
EBITDA	-	Earnings before interest, tax depreciation and amortization
ECSA	-	Engineering Council of South Africa
EIT	-	Engineer in Training
GDP	-	Gross domestic product
MDS	-	Market Demand Strategy
PR	-	Professional Registration
SSM	-	Soft systems methodology
TFR	-	Transnet Freight Rail
TGC	-	Transnet Group Capital
TNPA	-	Transnet National Ports Authority
TPL	-	Transnet Pipelines
TPT	-	Transnet Port Terminals
TRE	-	Transnet Rail Engineering

CHAPTER 1: INTRODUCTION

1.1 Introduction

The growth of the South African economy is dependent on the capability of its workforce. According to Goyal and Chhabra (2016), employment in a developing economy is characterized by an increasing demand for more highly-skilled workers. Perhaps the most important of these skills are technical skills in the form of engineers and technicians. One of the key drivers of the South African economy is the import and export of commodities through the countries rail, port and pipeline infrastructure, which is operated by Transnet, a state owned enterprise (Morris et al., 2012). The development of young engineers through Transnet's Engineer in Training Programme is a vital tool to aid in the development of a competent workforce. It is therefore critical that this programme functions at an optimal level and serves its purpose of producing capable engineers. This study examines the Engineer in Training Programme at Transnet to determine how the programme is perceived by senior staff, if the programme is achieving its purpose and the ways in which the programme can be improved.

This chapter introduces the study by first describing the background to the topic and thereafter offering a problem statement that will be further investigated throughout the study. The significance of conducting this study and how it will be beneficial will then be outlined. The aim and objectives of the study are then presented from which research questions are drawn. The limitations of the study will be provided and finally the chapter will conclude with a breakdown of the proceeding chapters.

1.2 Background

The events of unrest which took place during the Apartheid era in South Africa greatly destabilized the nation in many ways, including economically, politically and socially (Marais, 2011). Since the fall of apartheid the country has begun to recover in this new social amalgamation which looks to provide equal opportunity to all citizens. South Africa, now a young democratic nation, has the

potential for vast growth and expansion. The country has embarked on an ambitious growth strategy, termed the National Infrastructure Plan, to drive the economy by investing in its infrastructure. This strategy came into effect in 2012 and will give rise to considerable investment in key new and existing infrastructure. The bulk of this money was administered to South African state owned enterprises (Gordhan, 2013).

Transnet is a multimodal logistics service provider that deals with the import, export and distribution of commodities in South Africa (Nethathe et al., 2011). The parastatal is solely owned by the South African government and is managed by the Department of Public Enterprises. The responsibility of Transnet is to manage and operate the rail, port and pipeline network infrastructure of the country. This makes Transnet a key driver of the South African economy, contributing to gross domestic product (GDP), employment and other key socioeconomic drivers within the country (Maharaj, 2013).

The organisation is self-funded through its own operations and does not receive any government grants. Much of the capital in which it invests is gained through a combination of profits earned and money borrowed from international lenders (Maharaj, 2013). It is thus important that business operations are efficient in order to maximize on profits earned as well as to install confidence in lenders. Transnet looks to accomplish this through the operation of its five core operating divisions supported by its two specialist units.

Figure 1.1 outlines the organisational structure of Transnet which comprises of three core areas of operations; rail, ports and pipeline, as well as two specialist units.

- Transnet Freight Rail (TFR), dedicated to managing rail logistic operations;
- Transnet Rail Engineering (TRE), dedicated to the acquisition and maintenance of rail assets;
- Transnet National Ports Authority (TNPA), operates in a landlord capacity for South African ports;
- Transnet Port Terminals (TPT), dedicated to managing operations within the ports;
- Transnet Pipelines (TPL), dedicated to the operation of a network of pipelines leading from the ports to major inland hubs;

- Transnet Properties, manages all Transnet owned properties including the acquisition of new properties; and
- Transnet Group Capital, dedicated to the execution of capital investment projects across all operating divisions.

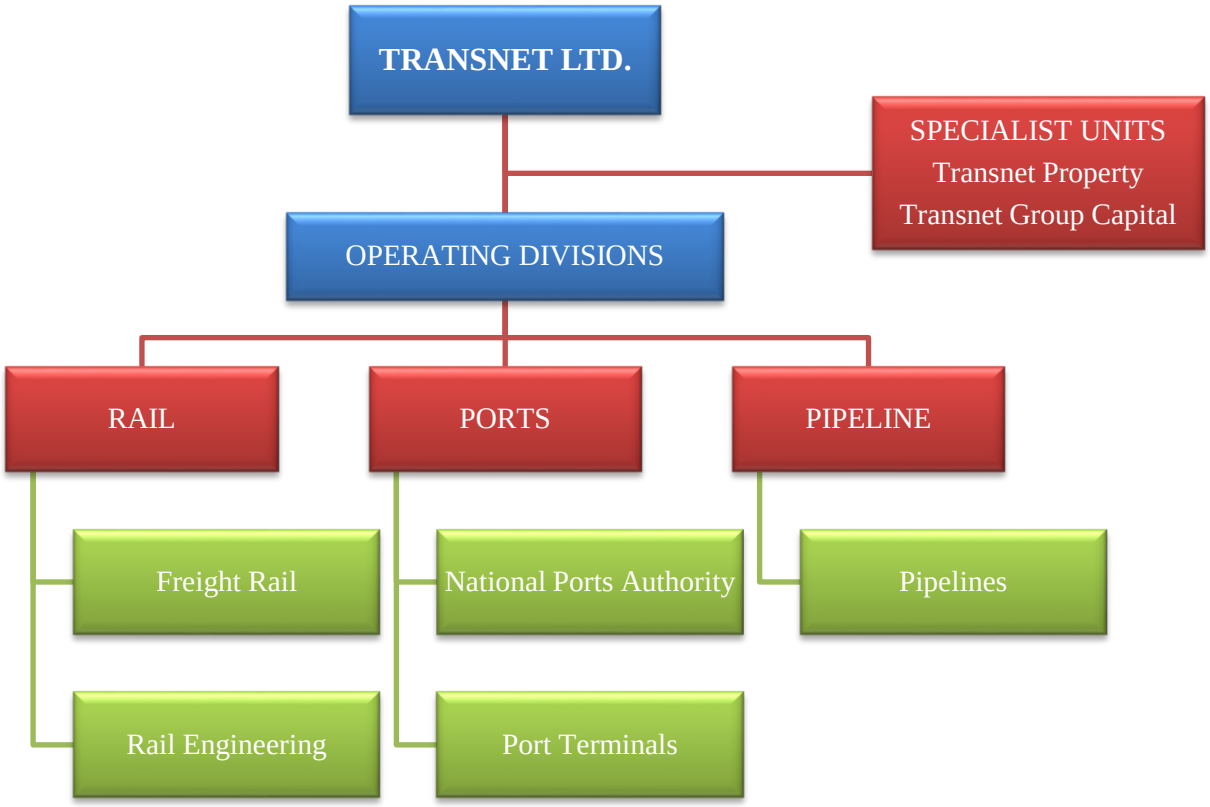

Figure 1.1: Transnet Organisational Structure

Source: Adapted from Transnet (2012)

Transnet Group Capital (TGC), previously known as Transnet Capital Projects, was established in 2004 as a subsidiary company of Transnet Limited. TGC is viewed as the project execution arm of the parastatal and houses the bulk of Transnet's practicing engineers. The mission of TGC is to deliver major capital infrastructure projects by providing specialist technical services in the form of Engineering and Project Management. The specialist unit is made of technical departments including architecture, electrical, structural, civil, rail, signaling, mechanical, and project management.

The South African government is looking towards Transnet to grow the economy through its capital investment programme, the Market Demand Strategy (MDS). This strategy consists of projects aimed at developing the countries ports, railway and pipeline infrastructure. The capital investment programme is an ambitious ten year strategy which forecasts investment of greater than 300 billion rand (Transnet, 2012). The key drivers of the MDS according to Transnet (2012) are:

- Expand rail, port and pipeline infrastructure;
- Increase capacity to meet market demands;
- Maintain financial stability and strength;
- Provide productivity and operational efficiency improvements;
- To enabling economic growth; and
- To provide job creation, skills development, localisation, and empowerment opportunities.

Transnet has a social responsibility to deliver on the MDS by executing projects on time, within budget and of a good quality. In order to achieve this, the company needs to have within its ranks a highly competent workforce who possess the necessary skills. In addition to the MDS, Transnet also has a commitment to create employment as well as to skills development (Cawe, 2015). They have for this purpose developed a graduate programme, known as the Engineer in Training (EIT) programme.

The purpose of the EIT programme is to develop young employees through direct and indirect training and mentoring. This training should equip these employees with the skills to operate at a level that will be expected of them as they progress in their careers (Liebenberg and Mathews, 2012). It is equally important to ensure that the skills and knowledge possessed by senior employees are transferred and retained within the organisation before these experts retire (Liebenberg and Mathews, 2012). This programme is critical in ensuring that the current and future employees of Transnet are competent and have the necessary skills to perform at a level which is required of them and successfully deliver on the MDS.

1.3 Problem Statement

The age profile of the current TGC engineering staff is typically young recently graduated individuals as well as seasoned veterans approaching retirement. There is a large gap apparent in the middle age bracket. This middle aged group of employees are especially important and should constitute a significant portion of a company's workforce. These employees are generally more stable, have higher efficiencies, and are more accountable and reliable (Muehlbauer et al., 2012). According to Black and Gerwel (2014), it is the middle aged bracket that needs to be populated with competent professionals.

There is an identifiable skills gap that exists within TGC especially within the middle aged group. The ultimate goal of the EIT programme is to enable young employees to eventually fill these gaps. There is, however, a number of vacancies on offer that should have been potentially filled by programme graduates. There are also no programme graduates who have progressed to a middle or senior management position within the organisation. There is a need to identify what it is that is undermining this progression by evaluating the structure and content of the programme and ascertaining the perceptions of senior employees of the programme and its participants.

The Engineering Council of South Africa (ECSA) defines specific competency standards and training areas that are expected of an engineer before they are deemed to be Professionals by an ECSA committee. A professional engineer, as compared to a candidate engineer, is able to sign off drawings and approve designs, thus assuming a higher degree of responsibility and accountability, and consequently are more valuable to any organisation (Machimane, 2014). Currently only a small number of programme graduates have gone on to obtain an ECSA professional status within TGC.

The problem involving the EIT programme at Transnet is one that involves a substantial number of variables. These variables are all connected such that a multitude of interactions exist between them, whereby, a slight change in one can result in a significant change in one or more of the other variables. It is consequently noted that this vast system of loosely defined, interacting variables, and the relationships which exist between them, is one which is complex in nature (Simon and

Schiemer, 2015). In order to better understand these relationships there is a need to identify the inputs of the system, the outputs, as well as the processes of exchange which occur or the throughputs. A means to examine complex situations such as the EIT programme is through the use of systems thinking. The approach of this study was systems thinking based.

1.4 Significance of Study

The responsibility of Transnet, and of TGC in particular, is immense for South Africa in the context of developing infrastructure, raising the economy, creating employment and ultimately improving the lives of South African citizens (Maroun and Garnett, 2014). This same level of responsibility is thereby shouldered by the employees of Transnet, especially those who are in critical positions such as engineers, senior managers and executives. Hence, it is highly important to ensure that employees who occupy these roles presently, and in the future, have a solid experiential foundation and are competent enough to purposefully complete their jobs.

The study will benefit graduates entering the programme and those currently in the programme through the evaluation of the activities and outcomes of the programme. The greater engineering staff of TGC will benefit in the long run as the calibre of young engineers coming through the programme will be at a higher level. TGC as a business and Transnet as a whole will also benefit as the competency and efficiency of its staff improves. Ultimately, the South African economy, and the South African public, will benefit as national infrastructure projects will be delivered on time, within budget and of a good quality.

1.5 Aim and Objectives

The aim of the study was to identify how the graduate programme currently offered by TGC can be improved. This was done by benchmarking the activities and outcomes of the programme against ECSA's requirements for a professional engineer.

The following objectives were established for the study in order to achieve this aim:

- To determine the level of competency of TGC trainees and programme graduates benchmarked against ECSA competency standards;

- To evaluate the structure and training outcomes of the programme; and

- To recommend ways in which to improve the TGC graduate programme.

1.6 Research Questions

The following research questions were investigated:

1. What are the competency levels of those employees who have graduated from the training programme and how is the programme perceived by current senior employees?

2. Is the structure and design of the programme achieving its intended outcomes?

3. What are the changes that can be implemented to positively affect the TGC graduate programme?

1.7 Chapter Breakdown

Chapter 1 – Introduction

Chapter 1 of this dissertation is the introductory chapter. This consists of an introduction, followed by the background to the research. A problem statement was then defined. The chapter proceeded to highlight the significance of the study and how it will be a beneficial body of knowledge. The

chapter also outlined the aim and objectives of the study as well as the research questions that were posed.

Chapter 2 – Literature review

This chapter contains a critical review of the relevant literature pertaining to the topic. The current trend in global and local employment was first discussed as well as the various concepts of learning and their benefits. Literature pertaining to mentoring, knowledge sharing and competency were then investigated and discussed. The approach of the study was to use systems thinking, therefore, a significant portion of the literature reviewed focused on systems thinking theories and concepts, including the concept of leverage and soft systems methodology tools, which were utilised during the data collection stage of the study.

Chapter 3 – Research Methodology

This chapter focused on the methodology applied in the study. It begins by outlining the research design and research methodology adopted for the study. The data collection strategy used for the study is then introduced. The population and sample and the sampling strategy was also detailed. Furthermore, the collection of data is discussed including the instrument used to collect data, the capturing of data and the manner in which data was analysed and displayed. The chapter goes on to review the validation and reliability of data as well as the elimination of bias before concluding with the ethical considerations that were taken into account.

Chapter 4 – Results and Discussion

This chapter presents the findings of the study conducted and discusses the data obtained. The presentation of results was illuminated by grouping the data into themes that emerged from the analysis. These themes were further expounded by linking them to the research questions that were drawn at the start of the study as well as the literature that was reviewed. The themes were broken down further into subthemes which encapsulated the problems experienced with the programme, and each of the subthemes were addressed by suggesting possible change items that could be

implemented in order to positively influence the system. The data was presented in three phases, dictated by the soft systems approach that was employed for data collection purposes. These three phases include the rich picture, root definition and conceptual model phase. The chapter concludes with a discussions of all the results presented.

Chapter 5 – Conclusions and Recommendations

The final chapter of the dissertation presents the conclusions and key findings of the study, which directly address the objectives set for the study. Recommendations are given based on these key findings and conclusions are drawn. The implications and benefits of the study have also been deliberated. The limitations of the study post data collection were then reviewed. Finally, the chapter is concluded by providing recommendations of important areas for future research that may further benefit the EIT programme.

1.8 Conclusion

The study undertook to investigate the ways in which the graduate EIT programme at Transnet may be improved. Transnet has a social responsibility to deliver on the MDS by executing projects on time, within budget and of a good quality. In order to achieve this, the company needs to have within its ranks a highly competent workforce who possess the necessary skills. The ultimate goal of the EIT programme is to enable young employees to eventually fill skilled and accountable positions in the company. There is a need to identify what is undermining this progression by evaluating the structure and content of the programme. Given the problem being faced by Transnet, it was valuable to see what literature stated on the topic. The next chapter presents a review of several sources of literature relevant to the study.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter examines literature that will support the study and aid in explaining concepts and theories that will elucidate the proceeding results and discussion. The literature review first explores the global trends in employment and skills availability. Concepts pertaining to how individuals learn are then investigated, followed by the practice of mentoring and how mentoring may be carried out in a work environment. The methods in which knowledge may be shared is investigated. Competency in the professional context is also considered to determine how the trainees themselves should be evaluated. Systems thinking, which forms the basis of the approach taken to gather data for the study, is then examined in detail, including the concept of leverage and softs systems methodology.

2.2 A Global Perspective

The first section of this review will look at the environment in which the engineering industry and Transnet are operating from a worldwide view and within a South African context. In the past century there has been a global change in marriage trends; where, historically people were getting married at a young age, people in current times are waiting, and as a result, are having children at a later age (Hayford, 2013). According to Harper (2014), people are currently also having fewer children due to the economic and social implications. Women in general are now more career driven and delay having children to focus on their careers or sometimes opt to not have children at all (Jesiek et al., 2014). There is, for this reason, an inherent age gap that exists which has had an effect on industry.

The Apartheid era saw the disadvantaged majority being restricted from progressing to an educational level that would enable them to enter professional careers (Chisholm, 2012). Following the fall of apartheid, opportunities became equal for all and education was a priority, especially for previously disadvantaged race groups (Horwitz, 2013). The influx of graduates in

all industries significantly increased, as previously disadvantaged youth were given the opportunity to educate themselves at a secondary and tertiary level. This again created an imbalance in the demographics when considering young employees versus senior employees (Branson et al., 2013).

In South Africa the age profile of the working class is typically young recently graduated individuals as well as seasoned veterans approaching retirement (Young and Muller, 2014). There is a large gap apparent in the middle age bracket. According to Black and Gerwel (2014), it is this area that needs to be populated with competent professionals. This can only be achieved by ensuring that young graduates entering the working world are well trained and are equipped with the skills to operate at a level that will be expected of them as they enter the middle aged bracket (Liebenberg and Mathews, 2012). It is even more important to ensure that the skills and knowledge possessed by senior employees are transferred and retained within an industry before these experts retire (Cappelli, 2012).

Technological advancement, globalization and economic integration has affected the engineering profession as well. According to Levonisova et al. (2014), it is important that these aspects are taken into consideration when we benchmark the competencies required for a modern engineer. In our current environment, however, technical skills are insufficient. An engineer also requires good communication skills, the ability to operate well within a team and a global awareness in terms of economic, social and environmental trends, to be technologically savvy (Levonisova et al., 2014).

The certification of an engineer to the status of ‘professional’ is a tool to regulate and develop the engineering profession (Chuchalin and Gasheva, 2015). The competencies, in terms of level and skill set, differ from a graduate to a professional according to the requirements of the Washington Accord. The idea of ‘continuous professional development’ (CPD), a term that refers to on the job practice and coaching, is given a lot of attention through mentorship and training programmes (Chuchalin and Gasheva, 2015). Every engineer should choose the route to their professional registration based on the requirements of the local authority, which in South Africa is the Engineering Council of South Africa (Streiner et al., 2014).

2.3 Pedagogy versus Andragogy

The following discussion relates to pedagogy and andragogy which considers the learning habits of children and how this transforms as they grow into adults. This is of particular interest as graduates must adapt from being in a situation where they were being taught formally in a classroom environment, to trying to learn in the working world where the circumstances are different and your colleagues and superiors are not always going to try or even want to teach you (Bowen et al., 2013).

According to Finn (2011), pedagogy is literally translated to mean the science of teaching children. This is based on the origin of the word which is derived from two Greek words. The first word is “paid”, which translates to mean "child", and the second word is “agogus”, which means "leader of” (Finn, 2011). As stated by Ozuah (2016), pedagogy has origins in early 7th century Europe where monks taught children in the monasteries. The monks began to notice patterns when teaching children basic skills and thus began to make certain assumptions as they continued to teach future generations. These assumptions became commonplace amongst teachers as the schooling systems evolved especially in Europe (Ozuah, 2016).

The study of learning progressed, focusing on how children responded to systematic instruction (Kali et al., 2011). Pedagogy is now commonly understood to be an authority-focused, systematic approach, but does not exclusively relate to the teaching of children, but teaching in general (Taylor and Kroth, 2012). The ultimate goal of a pedagogical approach is to transmit foundational knowledge (Turner, 2013). It regularly employs a grading system of some kind, such as those found in schools, and is considered formal in nature (Taylor and Kroth, 2012).

In the early 20th century the teaching of adults took a similar design, methodical in nature, to the pedagogic approach employed to teach children (Ivey, 2014). This approach was found to not be as successful. Knowles et al. (2014), claim that the major reason for this was that pedagogy operated on the principle that the reason for education was transfer of knowledge and skills, and adults at the time did not see merit in this reasoning. They did not respond well to typical pedagogic methods such as classes, assessments and homework (Knowles et al., 2014). It became clear that

the same assumptions about learners used in a pedagogic approach, could not be applied to adult learners.

The term andragogy became regularly used during the middle of the 20th century in a number of European countries (Ivey, 2014). It was developed to contrast the now well-known term of pedagogy. The word andragogy is derived from the Greek words "aner", which translates to mean "man, not boy", and again "agogus" (Ivey, 2014). The direct definition was taken to mean "the science of helping adults learn". Ozuah (2016), states that andragogy took on a parallel approach to pedagogy, steering clear of authority driven teaching and moving towards a self-directed approach. Learning through one's own experience and attempting to solve problems at an individual level was promoted in this regard (Ozuah, 2016).

According to Chinnasamy (2013), andragogy promotes a goal of reaching self-actualization, requiring adult learners to strive to find their own purpose and fulfillment. The learning is very much in the hands of the adult requiring them to operate within their own schedules and commit to study through their own motivations (Fornaciari and Dean, 2014). The teacher is thus a facilitator who directs adults towards taking responsibility for their learning (Knowles et al., 2014). As stated by Mac Callum et al. (2015), in most andragogic situations, learning is informal, and does not usually employ a grading system. A summary of the main differences between pedagogic and andragogic training are summarized in Table 2.1.

Table 2.1: Pedagogy vs Andragogy

Pedagogy vs. Andragogy		
	Pedagogic	**Andragogic**
The Learner	• The learner is dependent upon the instructor for all learning • The teacher/instructor assumes full responsibility for what is taught and how it is learned • The teacher/instructor evaluates learning	• The learner is self-directed • The learner is responsible for his/her own learning • Self-evaluation is characteristic of this approach
Role of the Learner's Experience	• The learner comes to the activity with little experience that could be tapped as a resource for learning • The experience of the instructor is most influential	• The learner brings a greater volume and quality of experience • Adults are a rich resource for one another • Different experiences assure diversity in groups of adults • Experience becomes the source of self-identity
Readiness to Learn	• Students are told what they have to learn in order to advance to the next level of mastery	• Any change is likely to trigger a readiness to learn • The need to know in order to perform more effectively in some aspect of one's life is important • Ability to assess gaps between where one is now and where one wants and needs to be
Orientation to Learning	• Learning is a process of acquiring prescribed subject matter • Content units are sequenced according to the logic of the subject matter	• Learners want to perform a task, solve a problem, live in a more satisfying way • Learner must have relevance to real-life tasks • Learning is organised around life/work situations rather than subject matter units
Motivation for Learning	• Primarily motivated by external pressures, competition for grades and the consequences of failure	• Internal motivators are self-esteem, recognition, better quality of life, self-confidence and self-actualization

Source: Adapted from floridatechnet (2013:1)

2.4 Mentoring

This section will examine literature related to mentoring concepts, the role of a mentor and the intricacies of the relationships that exist between mentors and mentees. Doerwald et al. (2015), define mentoring as an act of offering advice and guidance by an experienced individual to a less knowledgeable and less experienced individual. This process is built on communication and a strong relationship between the mentor, who guides, and the mentee, who receives guidance (Doerwald et al., 2015). Schunk and Mullen (2013:362), offer a more detailed definition of mentoring, "Mentoring is a process for the informal transmission of knowledge, social capital, and the psychosocial support perceived by the recipient as relevant to work, career, or professional development".

The mentor is someone who possesses a degree of expertise and need not necessarily be older than the mentee, although this is regularly the case (Schunk and Mullen, 2013). The success of mentoring is hugely influenced by the dynamics of the relationship between the two parties as well as the competency of the mentor in being able to fulfill the role (Masalimova et al., 2016). According to Masalimova et al. (2016), it is also important that the mentee is receptive to the guidance being offered and they are genuinely interested in learning and their development.

Table 2.2 lists the criteria suggested by Cohen et al. (2012) for the basic requirements of a competent mentor and a competent mentee:

Table 2.2: Mentor and Mentee Criteria for Success List

MENTOR	MENTEE
Helps mentee settle in organisation	Establishes goals which are *SMART
Is available to assist in tough situations	Is honest and transparent
Boosts self-confidence of mentee	Utilizes mentoring time effectively
Maintains proper communication channels	Is aware of mentors expectations
Encourages creativity and independence	Maintains confidentiality
Maintains confidentiality	

*SMART – Specific, Measurable, Achievable, Realistic and Time Constrained

Source: Cohen et al. (2012:10)

Similarly, Ilesanmi (2011) claims that mentoring in the workplace can have far reaching benefits for an organisation. Ilesanmi (2011), describes workplace mentoring as a learning partnership that exists between colleagues. In this partnership a bulk of information can be shared including technical nous, experiential recounts as well as personal insights and opinions (Roche, 2013). Pryce et al. (2015), goes on to state that mentoring can be effectively expressed as a developmental process; a process that differs from person to person.

Eller et al. (2014), lists the following qualities of a good mentor:

- Takes a vested interest in mentorship and the development of others
- Is mindful of others aspirations and career needs
- Is a good listener
- Is committed to the task
- Keeps private matters private
- Provides feedback and lessons learnt

Similarly, Eller et al. (2014) puts forward the following qualities of a good mentee:

- Is motivated and driven to develop in their career
- Is keen to acquire new skills
- Takes positive and negative feedback well
- Is able to think outside the box and discover new methods of learning

- Is clear on career goals and path

Mentoring relationships may spontaneously begin in an informal sense as senior employees develop a bond with a junior and look to take that individual under their wing. More commonly, however, these relationships form as a result of a predefined arrangement in companies (Straus et al., 2013). The establishment of a formal mentoring programme within an organisation can be a huge draw card to attract graduates of the highest calibre (Brown, 2015). According to Brown (2015), this provides a level of comfort to young employees entering the company as it ensures that all juniors are matched with an experienced professional.

As suggested by Silva and Yarlagadda (2014), establishing a formal mentoring programme in an organisation can be hugely beneficial for both the company, in terms of performance, and the employees, in terms of career development. Silva and Yarlagadda (2014), substantiate this by stating that it enables the transfer of skills and knowledge from senior to junior employees in a predefined, structured manner. It also ensures that senior employees are obliged to make time to mentor, while affording junior employees the care that is required in these early developmental stages. Clinton and Hokanson (2012), claim that the ultimate purpose of these programmes is to enable young employees to reach a level where they can assume a higher degree of responsibility within the organisation, as quickly as possible.

According to Wankat and Oreovicz (2015), a formal mentoring programme can lead to improved employee satisfaction as the professional aspirations of employees are acknowledged by the organisation and a path to reach these goals is defined in line with the company's goals. People are often more content in their jobs if they have a feeling of achievement and progression. This may consequentially result in enhanced employee performance as well as better employee retention (Wankat and Oreovicz, 2015).

As defined by Klasen and Clutterbuck (2012), other benefits of a structured mentoring programme in an organisation can be summarized as follows:

- The transfer of knowledge in a meaningful and planned manner

- Job specific training including technical expertise and soft skills
- Improved employee satisfaction and a positive work environment
- Training and development of a staff compliment in line with company objectives
- Increased assumption of responsibility and improved outputs from staff
- Identifying talent and potential future leadership/management

Ralph and Walker (2014), believe that the latest generation of graduates entering the working world require even more attention than previous generations when it comes to mentoring. Ralph and Walker (2014), state that society's perception of this latest generation, which they refer to as "millennials", is very negative in that they are seen as lazy, immature and having a sense of entitlement. Marcinkus Murphy (2012), are in agreement, however believe that, through nurture and attention, the potential of these millennials, who are in fact quite intelligent, can be unlocked.

In this technological age, children have grown up constantly seeking the advice and approval of others on social media platforms (Adams et al., 2011). For this reason, the current generation innately seek a mentor figure in all aspects of life, including social and professional. It is further put forward by May and Tekkaya (2014), that mentoring in a professional environment has evolved over the years to become a reciprocal relationship. Nowadays the mentor can also learn a certain degree from the juniors as well, especially in a technological sense (Streiner et al., 2014). This reverse mentoring is necessary to some degree on the part of the mentor in order to enable young employees to feel that their ideas and thoughts are valued (Levonisova et al., 2014).

Further to that, and in line with the statements of Pryce et al. (2015), a requirement of this generation of young employees is that they need a significant amount of feedback at more regular intervals than was the case in the past. They also are generally not content with only a single mentor, but rather a mentor for different demands and time periods. These requirements if met will aid in the mentees overall understanding of the direction in which they need to move in terms of their career (Silva and Yarlagadda, 2014).

2.5 Transfer of Knowledge

As mentioned in the previous section, the transfer of knowledge is an important activity that must occur in a mentoring relationship. This section will investigate what knowledge is, the types of knowledge that exist as well as how it may be transferred. According to Liew (2013), knowledge is the most valuable resource to any organisation. As demonstrated in Figure 2.1, there is inherent difference between data, information and knowledge. Data is purely objective facts which require context or interpretation in order to have meaning, such as the price of petrol currently being R11/litre (Mousavizadeh et al., 2015). Information is data that has been interpreted and has context, such as the price of petrol has risen by R3.50 over the last 2 years. Knowledge is information in context, which is interpreted and applied thereby influencing ones perceptions. It is generally based on experience and the understanding of patterns. For example, knowledge is recognizing that as the petrol price rises, the price of other commodities rises too, such as the price of food.

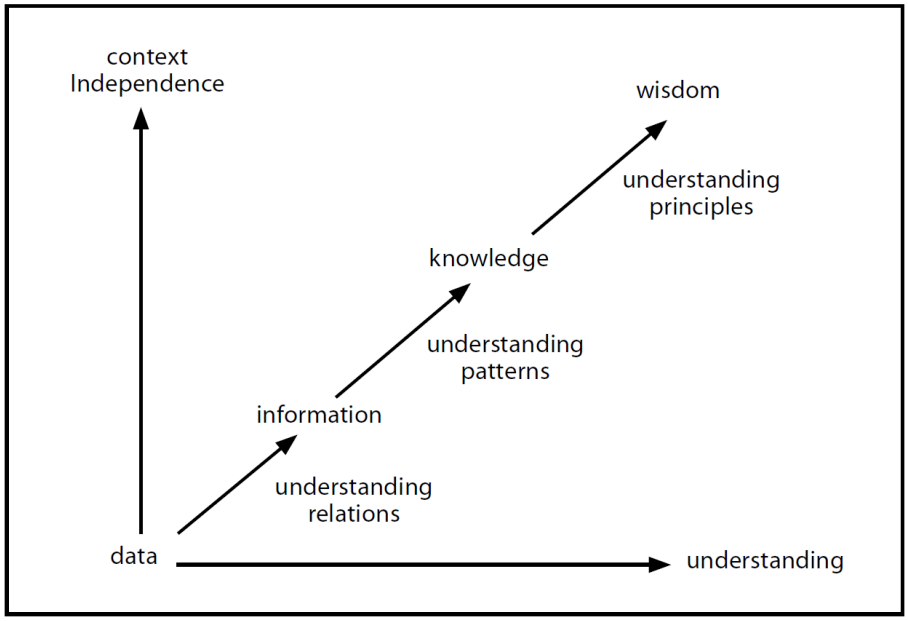

Figure 2.1: Relationship between Knowledge, Information and Data

Source: Adapted from Liew (2013:60)

Knowledge can be viewed as either explicit or tacit (Becerra-Fernandez and Sabherwal, 2014). As defined by Nissen et al. (2014), explicit knowledge is tangible, visible and public knowledge

commonly written in a formal manner. It is usually categorised and arranged within libraries or archives of some form. Explicit knowledge can be captured in a document or a database or expert system. It can also be expressed in rules or guidelines (Nissen et al., 2014). This makes it easy to access and share with others often using a structured, technical approach (Becerra-Fernandez and Sabherwal, 2014). Examples of explicit knowledge include equations or specifications.

Tacit knowledge is private and intangible knowledge. It is what people know within themselves through their own studies and experiences (Nissen et al., 2014). Venkitachalam and Busch (2012), go further stating that tacit knowledge consists of paradigms, viewpoints, beliefs, and concrete know-how such as crafts and skills. It is instinctive and subjective, making it difficult to express to others and to capture. Montcalm (2013), states that tacit knowledge is invisible, and cannot be stored in archives or databases, but rather carried in people's minds, which makes it difficult to access. Often people are not aware of the knowledge they possess or how it can be valuable to others. Tacit knowledge is considered more valuable than explicit knowledge as it is richer in nature and provides context to people and ideas (Montcalm, 2013). Figure 2.2 summarizes the differences between explicit and tacit knowledge.

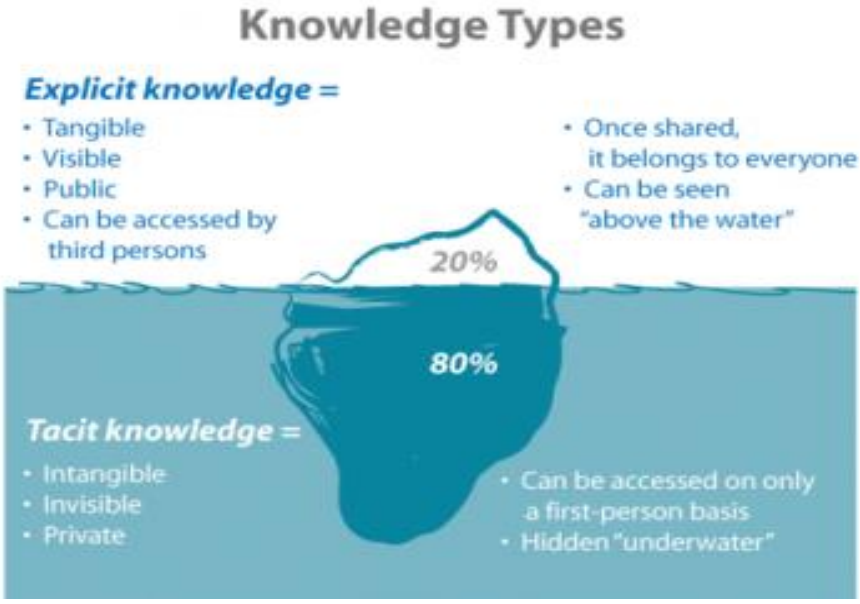

Figure 2.2: Explicit Knowledge versus Tacit Knowledge

Source: Montcalm (2013:1)

The effective transfer of tacit knowledge generally requires extensive personal contact. It is often relationship dependent and is built on trust and reciprocity (Hau et al., 2013). Reciprocity in the sense that both parties should gain from the transfer. The culture of an organisation, therefore, plays a huge part in influencing the sharing of knowledge within the organisation (Nakhchian and Bemani, 2013). Culture influences the way in which employees interact and treat each other.

Nakhchian and Bemani (2013), describe two types of organisational cultures pertaining to knowledge sharing; individualistic and collective. In an individualistic organisation, people prefer to be rewarded individually for their sharing of knowledge. In the collective culture, and if there is a collective team spirit, people are happier if everyone is rewarded and people are not possessive about their knowledge and experience (Nakhchian and Bemani, 2013). Culture also dictates the methods and procedures to be followed when effecting knowledge to particular situations. This is reverberated by Huang et al. (2014), who claims that if people are afraid to express themselves, they may be stifled and be reluctant to speak out and share knowledge.

The sharing of knowledge in an organisation can be encouraged by establishing platforms in which employees, especially those with significant experience, are given the opportunity to share stories and practical nous (Dong et al., 2016). In smaller segments or departments this may take place in small groups around a table or in a presentation format (Lamberts and Shanks, 2013). According to Dong et al. (2016), it is also important to try and encourage people to not only share their successes but also stories where they have made errors as you often learn more from these types of recounts.

Lamberts and Shanks (2013), suggests that on the job mentoring need not be the sole responsibility of senior managers and experienced employees, who are often heavily involved in the business and its operations. According to Paulin and Suneson (2015), retirees or staff approaching retirement should be engaged to mentor young employees. These individuals usually have a wealth of knowledge to share and often are not very keen on becoming too involved in the pressures and stresses involved with the business operations (Paulin and Suneson, 2015). Once these individuals do retire the organisation loses a resource with key knowledge and experience. It is important to try and retain as much of that knowledge in the organisation as possible (Lamberts and Shanks, 2013).

2.6 Competency

The ultimate goal of the EIT programme is to produce competent engineers who are able to deliver on projects. This section will look at the definition of competency, the various types of competency and a model for competency and how it can be developed. Competency is directly related to the success of an organisation. A competent workforce is generally a collection of individually competent employees as a majority (Rath, 2015). According to Rath (2015), competency is, however, relative and varies from person to person depending on the role and the function which they are expected to fulfill.

Brightwell and Grant (2013:1), define competency as "the ability to utilize knowledge, skills, and abilities to successfully perform functions or tasks in a defined work setting". Dato'R (2014), goes further and states that competency is an inherent quality of an individual, enabling them to persevere and perform at a level that is equal to or greater than what is expected of them in a work capacity. It is argued further by Bral and Cunningham (2016), that competency stems from ones personality and is built upon to perform depending on the task being set. Competency often sets the benchmark for what is the minimum requirement for skills or ability in a given role (Bral and Cunningham, 2016). If you are performing below this benchmark you are usually considered incompetent in that role.

We are able to distinguish between two types of competencies, namely; behavioural competencies and functional competencies (Omar and Fayek, 2016). Functional competencies are commonly referred to as technical skills and abilities (Omar and Fayek, 2016). These are more functional activities that enable one to achieve a set task. Examples of functional competencies are driving a forklift, designing a bridge or repairing a motor vehicle engine. Often the mentoring or training of young employees largely focuses on functional competencies (Parts et al., 2013).

Behavioural competencies are commonly referred to as soft skills, and relates to the way in which one goes about completing a task (Ahadzie et al., 2014). Behavioural competencies often refer to doing things in relation to people, usually when acting in a position of leadership (Ahadzie et al., 2014). An example of a behavioural competency would be remaining calm in a pressure situation

or being charming or seductive when dealing with people. It should be noted that behavioural competencies are generally more difficult to teach than other functional competencies (Parts et al., 2013). According to Omar and Fayek (2016), it is these competencies that require particular attention in terms of mentoring.

As depicted in Figure 2.3, Khapova and Jansen (2014) describes the competencies that one can develop and their primary vehicle for development. Things such as morals, values and beliefs are said to be developed through self-awareness and discovery. Personal conduct and soft skills are best taught through mentoring in practice. Technology management and hard skills are often best gained though facilitated training, and anything beyond this, moving into expert technical knowledge is achieved through self-study. It is clear from the figure that the vehicles for development can overlap in terms of competencies.

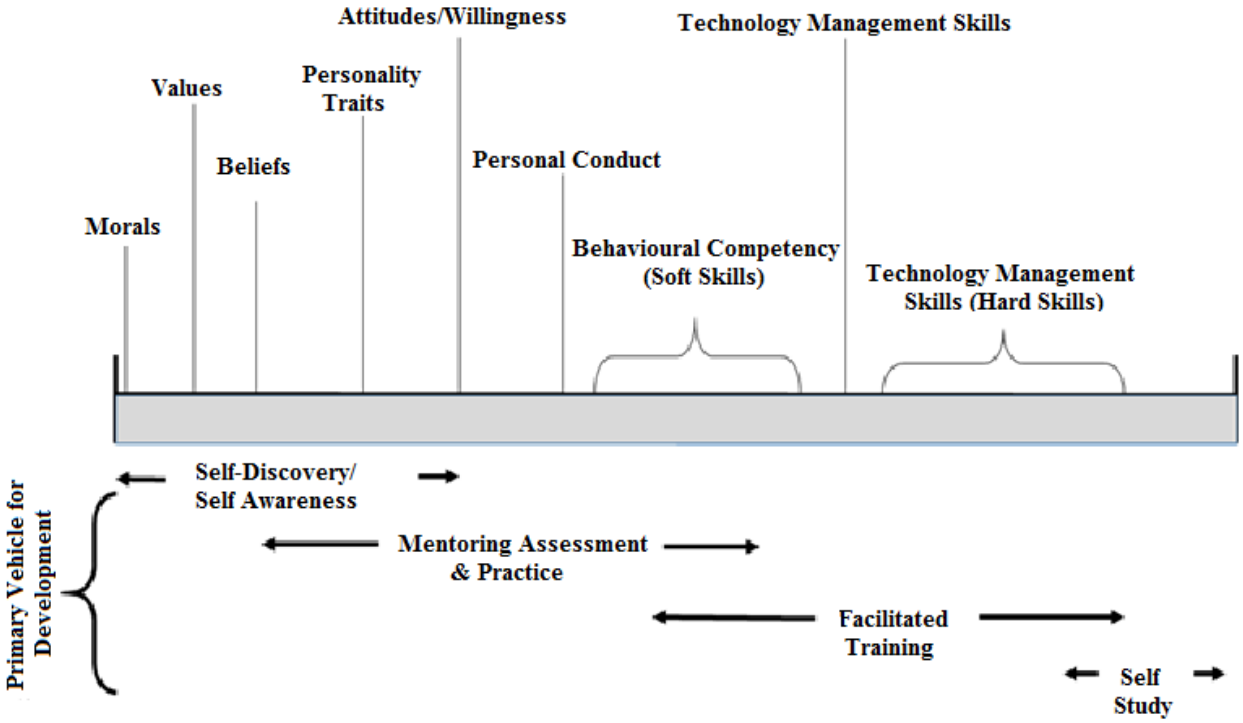

Figure 2.3: Continuum of Personal Attributes and Competencies

Source: Adapted from (Khapova and Jansen, 2014:709)

The level of competency of an individual can be determined through the utilization of a competency model (Mayhew et al., 2014). A competency model can be defined as a set of proficiencies that collectively must be applied by an individual in order for them to be considered a success within their work capacity (Stevens, 2013). It is often utilised as a tool for human resource functions including performance management, training and development and recruitment (Coetzee et al., 2014).

Crawford (2013), developed a general competence model that may be idealistically applied to any work position or function. As detailed in Figure 2.4, Crawford's model states overall competence is obtained through a combination of personal attributes and on the job performance. Personal attributes are broken down into input competencies, constituting personal knowledge and skills, and personal competencies which refers to one's core personality traits. Demonstrable performance is considered an output competency, which is the ability to use the attribute based competencies to perform within an occupational area. Crawford's integrated model for competency can be applied generally.

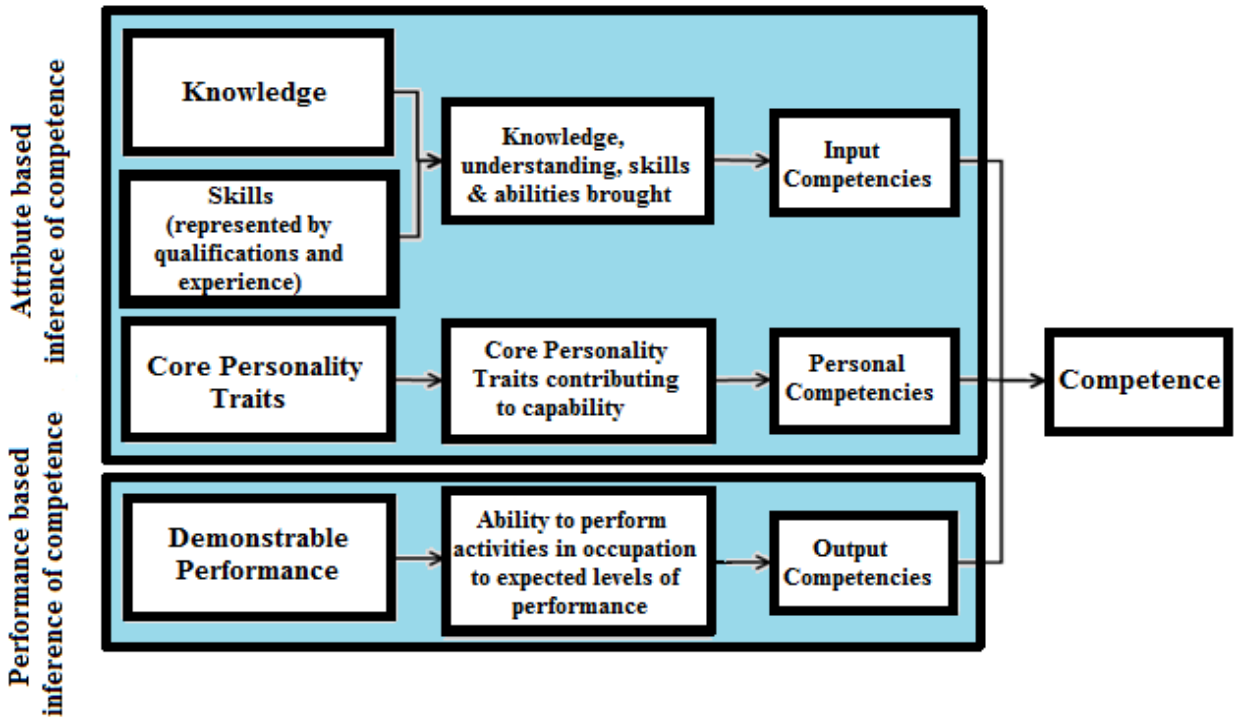

Figure 2.4: Integrated model of competence

Source: Adapted from Crawford (2013:3)

A more detailed competency model can be developed specific to a role requirement of any organisation. Competency models can take a variety of forms but the premise upon which they are constructed is largely the same (Baran and Klos, 2014). The following elements are typical inclusions when developing a competency model for a specific role as described by Baran and Klos (2014):

- Competency titles and comprehensive definitions.

  E.g. Competency Title – Teamwork

  Defined as: Working as a functional member of a group, good interpersonal skills to build strong relationships, taking decisions to the benefit of the group and able to mediate disagreements while working to maintain collaborative accord.

- Descriptions of associated actions and behaviours for each competency title.

  E.g. Teamwork

  Behaviours: Recognising strengths and weaknesses of team members and utilizing this to your advantages. Motivating members within your team to contribute and perform. Leading from the front to achieve group goals.

- A diagram of the model.

  E.g. Figure 2.5 below is an example of a diagram of the model.

  A graphical representation of the model enables users and prospective employees to gain a better understanding of the requirements of the role.

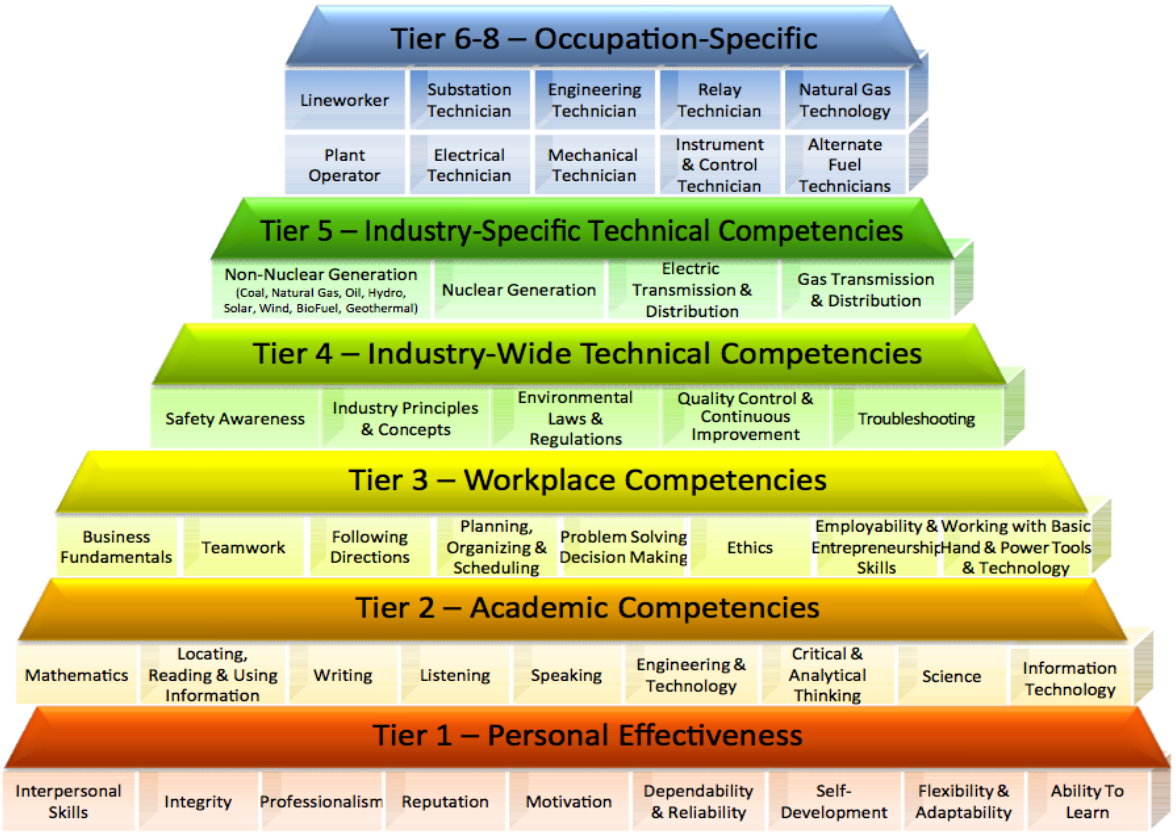

Figure 2.5: Tiered diagram of the model

Source: Kirk et al. (2016:1)

A competency model can be developed for all job profiles in any industry. As detailed by Mirzazadeh et al. (2014), the following steps can be followed as a guideline on how to go about developing a role specific competency model:

Step 1. Gather background information

The building of role specific competency model needs to be based upon something. This requires a degree of research and analysis pertaining to current industry standards set by national and local bodies and authorities (Mirzazadeh et al., 2014). Investigating the technical curriculum and certifications required within the industry is also necessary. It is often prudent during this stage to consult with industry experts who are familiar with the demands of the field, and what skills and

knowledge is required of an employee in the industry (Baran and Klos, 2014). This initial step requires a lot of ground-work upfront, including the arrangement and classification of resources and the analysis of the research to identify similarities that can be outlined as a benchmark competency (Mirzazadeh et al., 2014).

Step 2. Develop a draft competency model framework

It is possible to draft a framework by building on the current industry models that have already been developed. This will ensure that there is a solid foundation to build upon and that the draft will be comprehensive going forward. This step can be achieved by identifying patterns from the existing industry models, grouping this to form themes, relating it to the role profile and competency titles and using this information to develop a draft competency model (Mayhew et al., 2014).

Step 3. Acquire subject matter expert review and comments

This can be done via individual contact or through focus group sessions encouraging engagement and the sharing of ideas. These individuals should be based on their experience in the field and their familiarity with the requirements of what it takes to succeed in the industry (Mirzazadeh et al., 2014). It can be beneficial to consult with a host of experts from various localities and professions within the industry in order to obtain a range of perspectives regarding the draft model. This step can be achieved by first consolidating the purpose of the competency model with the experts. The model should then be reviewed by looking at each proposed competency individually and ensuring that the major competency themes have been addressed and that there are no missing competencies that should be included (Stevens, 2013). It should also check that all terminology used in the titles and definitions is unambiguous and that the requirements are clear.

Step 4. Refine the competency model framework

The development of a competency model is an iterative process (Adams et al., 2011). It requires review and amendment before refining and finalisation. The information gathered through Step 3

should be consolidated. Amendments to titles, definitions and behaviours can be made and additions or deletions to competencies can be completed. The process of Step 3 and Step 4 can be repeated until the subject matter experts and the developer is satisfied that the competency model is comprehensive and clear on what the requirements are in terms of skills, knowledge and proficiencies for that specific role or occupation (Mirzazadeh et al., 2014).

Step 5. Validate the competency model framework

The final step of validation is especially important in order to make sure it is fit for purpose and the model will achieve its intended outcome. It involves a sort of pilot study issued to potential users of the model to gather feedback and comments. Once the feedback has been consolidated and processed, consensus should be reached that the model is now complete and the competency model can subsequently be put to use.

2.7 Systems Thinking Definition

Systems thinking is the primary approach method used to gather data for the qualitative research of this study. The definition of systems thinking, concepts of systems thinking as well as the tools that can be utilised are all discussed to supplement and justify the choice of method adopted. This also includes a discussion on the concept of leverage, linked to the Iceberg Model and soft systems methodology.

To define systems thinking, it is necessary to first define the meaning of a system. Oickle et al. (2014), defines a system as a collection of interdependent variables that are connected directly or indirectly, and that interact to form a complex and integrated whole that serves a definite purpose. The requirement is then a minimum of two interrelated variables or components. Haines (2016), goes further stating the components of the system impacts the overall state and the value of the system. Ultimately systems have a purpose that holds the parts together. For example, an automobile is system which has a purpose to get you from one place to another.

A system is not necessarily equal to the sum of its parts. Rather, the properties of a system are essentially defined by the interactions which exist between the parts, and not the properties of the components themselves (Senge, 2014). The parts can, therefore, not assume the defining properties of the whole on their own. Systems thinking is being able to see beyond the individual parts and start looking at the system as a whole (Senge, 2014). Systems thinking is for this reason holistic thinking.

Shaked and Schechter (2013), state that systems thinking puts the system in the context of the larger environment of which it is a part and studies its role in the larger whole. Similarly, Caldwell (2012b), describes systems thinking as processes that are open to change through internal dynamics of self-regulation or interactive feedback with its environment. Taking a systems approach means that all parts of the system have to be addressed in concert, and acknowledging that adding one component to a system disturbs other parts of the system (Levin and Schrum, 2013).

This idea of holistic thinking is the fundamental principle of systems thinking, which is one of five disciplines of the 'learning organisation' theorized by Senge (Caldwell, 2012b). Systems theory, a discipline for seeing wholes, is the conceptual cornerstone of the learning organisation and integrates the other four disciplines (Caldwell, 2012b). Social systems involving people are almost always considered complex in nature. These systems usually comprise of purposive actors possessing a multiplicity of goals.

2.8 Systems Thinking Concepts

Systems thinking revolves around viewing situations as a whole. This is achieved by emphasizing the interrelationships among the components involved rather than the components themselves (Shaked and Schechter, 2013). "The whole takes a form that is unrecognizable from looking at its parts in isolation. These parts have meaning only as a result of the whole" (Shaked and Schechter, 2013:776). Systems thinking; a means for facing real world, richly interconnected problem situations, helps us to understanding complex situations (Flanagan et al., 2012).

Levy et al. (2014), claim that every systems approach is based on the view that every system in the universe is part of a hierarchy of systems. Levy et al. (2014), goes further in saying that every organism is part of systems and subsystems which act together to attain goals. All parts of the system have to be addressed in concert as adding or altering one component disturbs other parts of the system (Levin and Schrum, 2013). Levin and Schrum (2013), also state that a system is more than the sum of its component parts or practices and that these practices are more about interaction than action.

Neumann (2013), developed the concept of "Know Why" thinking, a systemic approach which he claims can be used to reflect on all kinds of complex situations. It is based on the idea that "everything in the world needs to adapt and develop in order to be successful" (Neumann, 2013:81). Most people shy away from trying to analyse complex situations. They tend to reuse old solutions that may have worked in the past but was in a different context (Graham et al., 2013).

Nguyen et al. (2012), claims that many people try to solve complex problems with simplistic arguments. This is seldom effective and never affects the system for a sustained period of time (Nguyen et al., 2012). Richardson (2016), states that if the same recipes always worked for a similar problem situation in any context, everything would always be successful. Neumann (2013), encourages one to ask the question, "Why are things the way they are?" And the answer put forward is that a system exists there for a reason; a reason to adapt and develop in order to be successful (Neumann, 2013:86).

Caldwell (2012a), discusses the concept of distributed leadership, which is a process of systems learning that could be shared by many people. He states that "Leadership of the many is far greater than leadership by the few" (Caldwell, 2012a:40). The idea put forward strongly in the article is that learning should be led by leaders throughout the system. Complex system issues cannot be met by isolated heroic leaders. It requires a mix of different people in different positons (Caldwell, 2012a).

2.9 Systems Thinking Tools

Systems thinking is a broad field in which there are many tools techniques, methods and approaches (Nguyen et al., 2012). Nguyen et al. (2012), goes on to explain that there are four levels of thinking models, namely; events, patterns, systemic structures and mental models. The tools of systems thinking include causal loop diagrams, system archetypes, leverage points, viable systems modeling, cybernetics, and soft systems approaches.

We are able to differentiate between two types of systems thinking approaches, namely; hard and soft systems thinking approaches. Hard systems thinking is more suited to situations in which the problems and factors involved are well defined, the desired outcome is known, and there is general consensus on the way to achieve this outcome (Dawidowicz, 2012). Soft systems thinking on the other hand is more reflective and holistic in nature. Soft systems thinking is better suited when the nature of the system and its relationships are less defined. The problem involves multiple and sometimes conflicting perspectives, thus there is a need for further understanding (Georgiou, 2015). Soft systems thinking is a process taking place over a period of time in order to better understand the nature of the problem (Dawidowicz, 2012).

Pagano and Paucar-Caceres (2013), describe causal loop diagrams as a tool to recognise cause and effect in a system. The diagrams also include elements which determine the boundary of the system, in terms of constraints or inputs, as well as targets or outcomes. Similarly, Levy et al. (2014), describe a causal model as allowing one to see the mutual impact of variables on one another due to the complex relationships which exist. Pagano and Paucar-Caceres (2013), suggest that there is a perceived gap between the target and the current level of the element being monitored. Intervention is thus required to reduce the gap (Pagano and Paucar-Caceres, 2013).

2.10 The Principle of Leverage

Systems thinking requires a complete change of mindset and behaviours. In problem situations the approach of a systems thinker takes a different form to that of conventional thinking. As illustrated

by Oickle et al. (2014) and summarized in Figure 2.6, a systems thinker must first look at the big picture, exercise patience and share and receive ideas. A systems thinker must look at all angles, consider change over time and recognise how these changes can be impacted upon positively. It is important to determine how thoughts and actions can affect the issue at hand before making any decisions. In this manner it is possible to identify how you can impact the system to maximum and enduring effect.

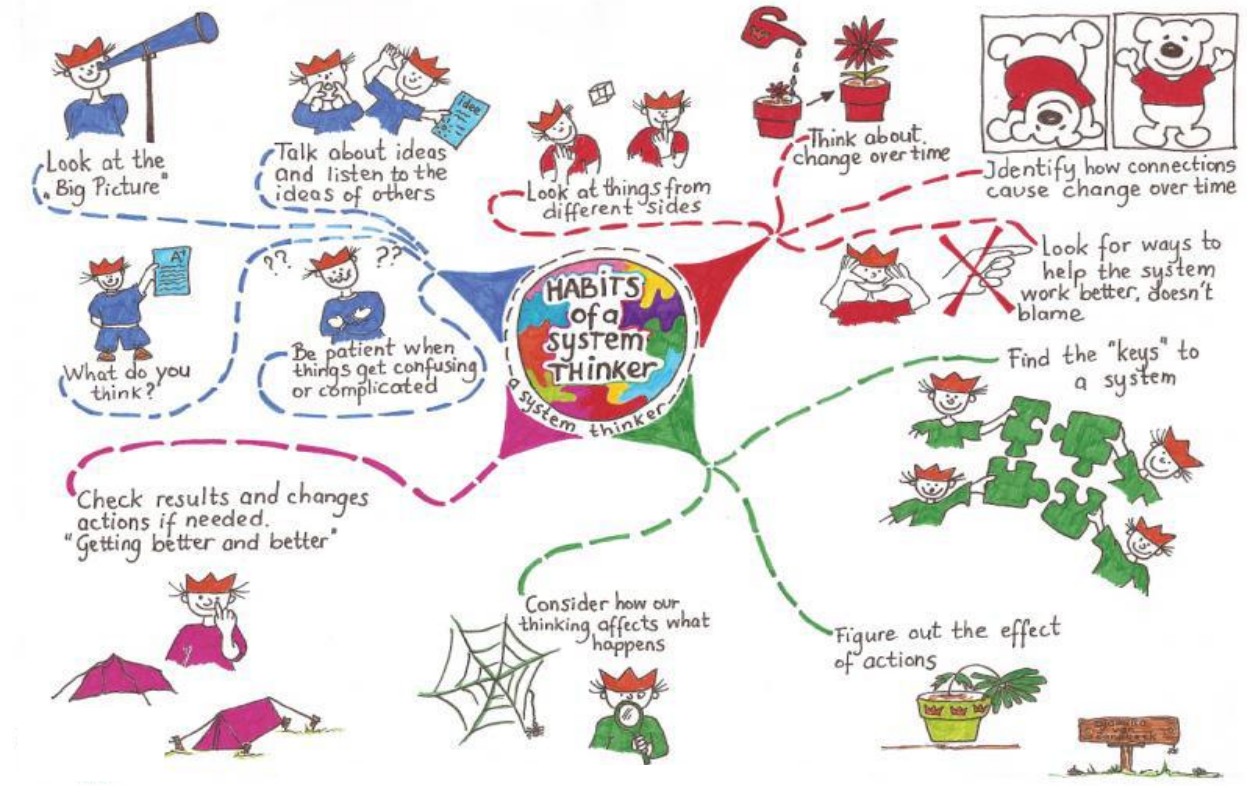

Figure 2.6: Habits of a Systems Thinker

Source: Oickle et al. (2014:1)

According to Checkland (2012), the essence and ultimate purpose of systems thinking is the concept of leverage. Leverage points in a system refers to areas of the system at which action can be directed in order to achieve maximum return based on objectives. These actions in the system ultimately result in substantial and lasting progress. As stated by Nguyen and Bosch (2013:11), leverage often adheres to the "principle of economy of means", whereby the largest or most

significant outcome is achieved through a small, concentrated effort rather than an extensive exertion.

In a non-systemic way of thinking, the areas of high leverage are not often sought, leading one to low leverage changes. This is a result of focusing on symptoms where the strain is the largest in a problem situation without investigating the underlying reasons for their occurrence (Whitehead et al., 2015). In this manner the problem is only temporarily addressed on the surface but will reemerge often in a worse state than the initial problem (Whitehead et al., 2015). These are short term fixes which do not have a sustained or substantial positive effect.

Leverage is not always altogether apparent to actors within a system, as they are unable to perceive the underlying structures and how they are interconnected (Nguyen and Bosch, 2013). It is a fundamental goal of systems thinking to facilitate the identification of high and low points of leverage in complex systems, especially social systems. Systems thinking ultimately helps people to make sense of complex situations (Senge, 2014). This does not mean that systems thinking looks to simplify complexity, but rather appreciate it for what it is and try make light of the situation by acknowledging the many variables and their interactions. This concept of systems thinking and the principle of leverage to address complex situations can be further explained through the Iceberg Model.

2.11 The Iceberg Model

The Iceberg Model was developed to illustrate how underlying structures exist and need to be appreciated in order to affect events on the surface (Stephens, 2013). In exposing the underlying structures of complex situations it is then possible to discern high leverage points from low leverage points of change. The metaphor of the iceberg is used, as an iceberg is almost entirely concealed beneath the surface of the water and roughly ten percent is visible above the water. This is interpreted in a systems thinking capacity as only being able to perceive a small portion of the whole situation (Sheffield et al., 2012).

As depicted in Figure 2.7, the events above the surface are clearly visible. This is often where problems manifest themselves. Often people will try and address these problems at this level without looking at the behaviours which caused them; however, this is the lowest point of leverage and any corrective action at this level is not sustained (Sheffield et al., 2012). The events which occur are often caused by behaviours lying below the surface, which are not so apparent. By observing these behaviours it is possible to draw patterns which give further insight into the events on the surface (Monat and Gannon, 2015a).

Deeper than the patterns of behaviour is the systems structures, which influences the patterns (Stephens, 2013). This relates to how the system is constructed and how the variables are connected. The area with the highest point of leverage is the values and beliefs that shape the system and ultimately drive the actions of people and the events on the surface (Stephens, 2013). It is this area that needs to be impacted in order to achieve lasting change (Sheffield et al., 2012).

The iceberg model effectively depicts how there is much more occurring below the surface of events and the actions of people. Most of what is taking place in this world is not plain to see. By surfacing these underlying structures it makes it possible to better understand the situation at hand (Castillo, 2015). According to Senge (2014), this deeper level of understanding enables us to prepare and execute better reactions to complex problems.

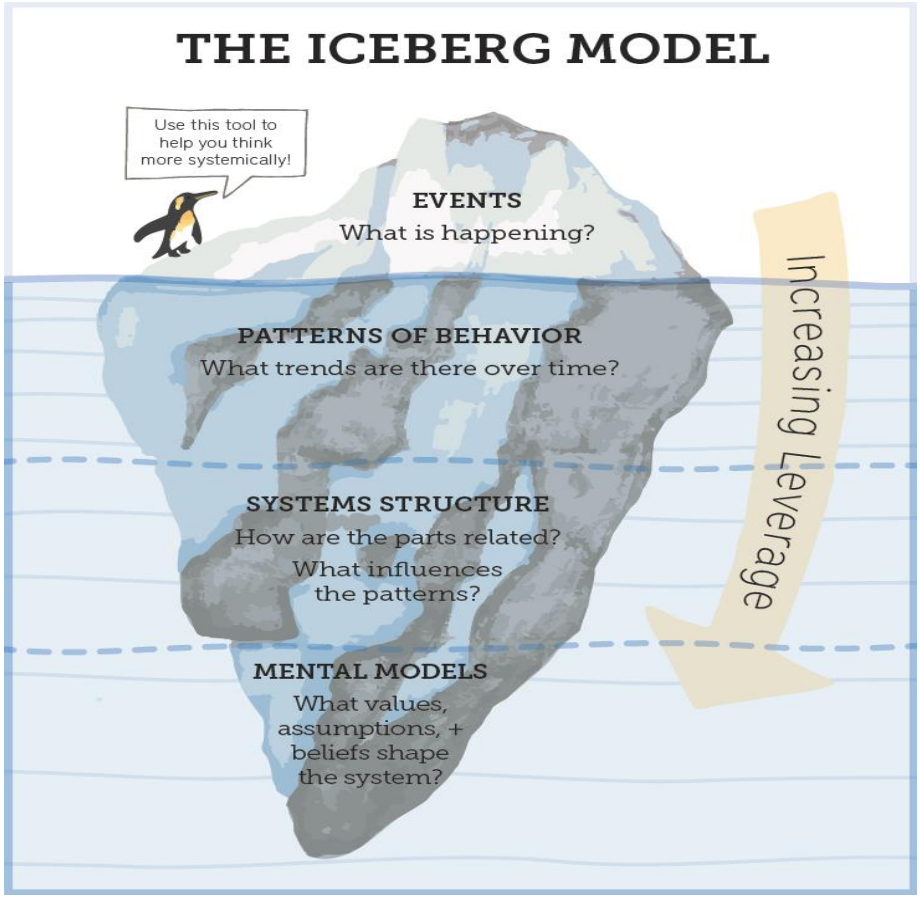

Figure 2.7: The Iceberg Model

Source: Stephens (2013:1)

2.12 Soft Systems Methodology

Soft systems methodology (SSM) was developed by Peter Checkland to rival the approaches proposed by hard sytems thinkers in a management capacity (Cundill et al., 2012). The approach to management at the time was very systematic and goal-seeking, using the analogy of a well oiled machine to address problems within the organisation. If the machine was not working as desired it was taken to mean that a "part" in the machine needed to be fixed or replaced in order to achieve optimization (Monat and Gannon, 2015b). SSM focuses on relationships and maintaining these as much as it does goal-seeking. As quoted by Kish et al. (2016), SSM draws attention to the fact that "what" should be done about a situation is as important as determining "how" to do it.

The development of SSM was necessitated by the recognition that large complex problems existed in organisations. These problem situations were, however, very ambiguous, unstructured and difficult to articulate (Cundill et al., 2012). SSM was aimed at uncovering more details about these "soft" problems rather than directly looking at solutions. Cundill et al. (2012), states that it is exploratory in nature looking to build a clearer picture of the problem situation with the hope of making gradual progress, unlike hard systems thinking which aims at immediate solutions. Table 2.3 below, adapted from Monat and Gannon (2015b), summarizes the main differences between hard and soft systems thinking.

Table 2.3: Hard Systems vs Soft Systems Approaches

HARD SYSTEM APPROACHES	SOFT SYSTEM APPROACHES
World made up of systems which can be optimized	World is made up of different perceptions of reality
Prediction & Control of such systems possible	Purposeful improvement brought about by working with differing perceptions, facilitating systemic learning
Functionalism: Objectivist and regulative in orientation	Interpretive: Systems seen as mental constructs
Organisation as a fixed, static entity.	Organisation is more about management of relationships, than taking actions to achieve goals.
Organisation as a machine	Organisation as an evolving culture

Source: Adapted from Monat and Gannon (2015b:14)

SSM acknowledges the fact that the world is seen differently through each persons eyes (Hakami et al., 2013). Differing world views are accepted and explored in order to encourage learning. As depicted in Figure 2.8, Checkland proposed the following seven stages when using a soft systems approach to address problem situations in an organisation:

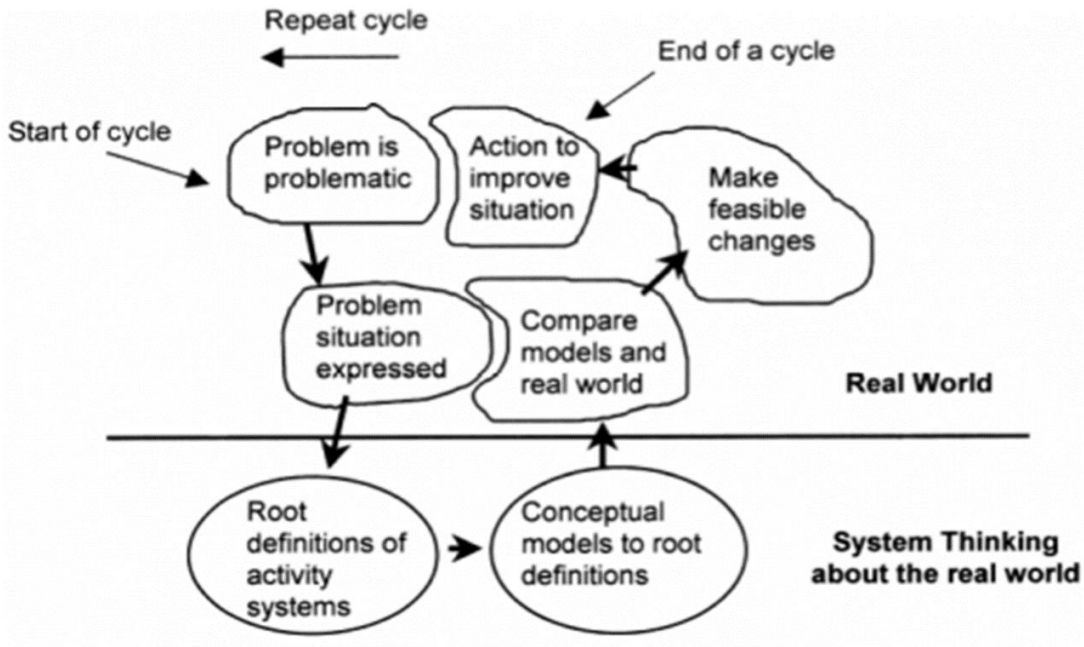

Figure 2.8: Soft Systems Methodology Steps

Source: Adapted from Hudson (2013:4)

Stage 1 – Discussion of unstructured problem situation

The first step is acknowledging that a problem exists, however, it is also accepted that it is not clearly defined or understood (Hudson, 2013).

Stage 2 – Expressing problem situation

This stage can take a number creative and interactive approaches. One of the most popular methods used is illustrating thoughts and paradigms through the drawing of a rich picture (Kish et al., 2016). A rich picture is essentially a sketch which depicts such things as the organisational structure, the locality, the interrelationships which exist and an expression of issues experienced. A rich picture can encourage creativity, facilitate the sharing of ideas and discussion and serve as an effective memory aid (Richardson, 2015). An example of a rich picture is shown in Figure 2.9.

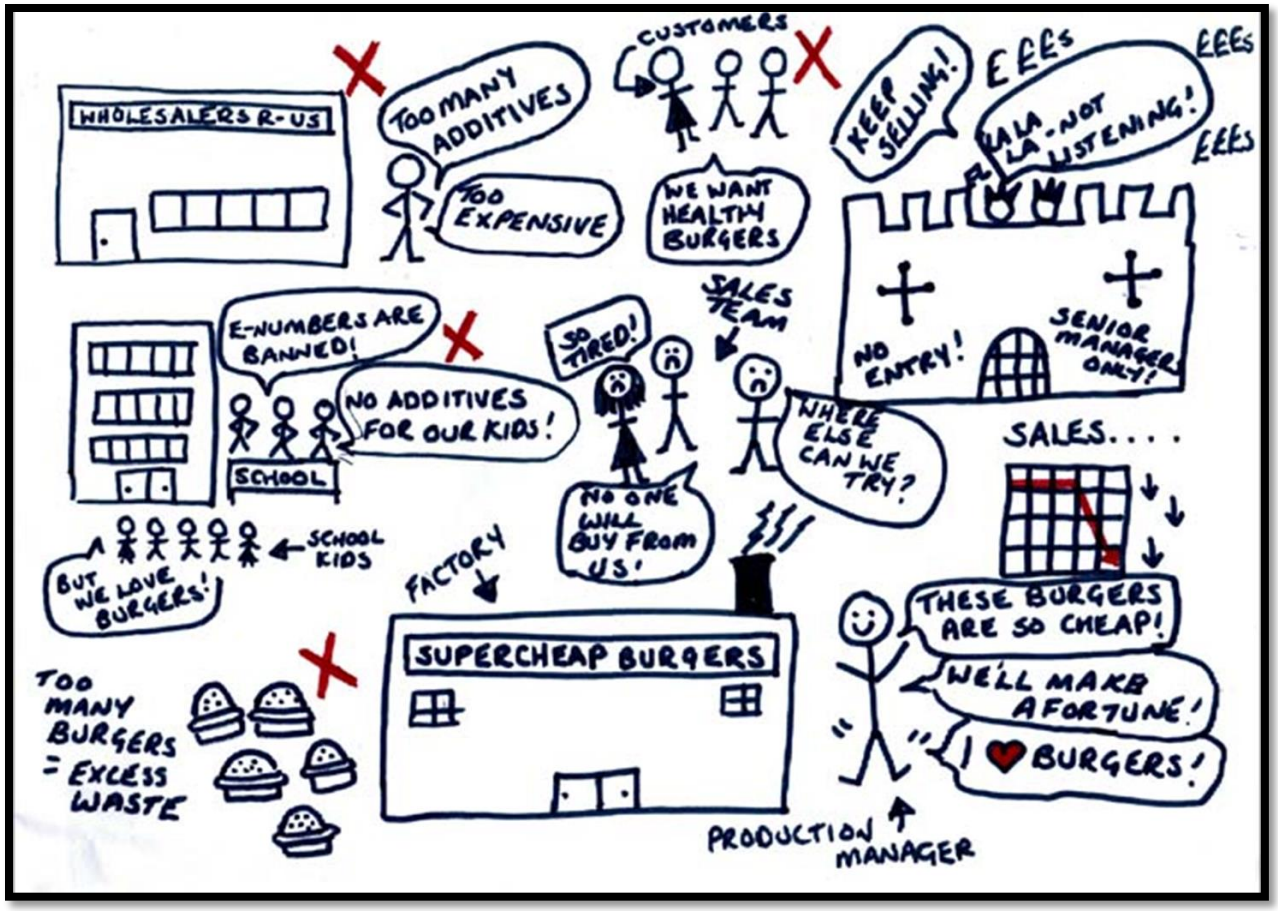

Figure 2.9: Example of a Rich Picture

Source: Adapted from Tinsley (2015:8)

Stage 3 – Root definitions of purposeful human activity

A root definition is a short statement describing the system in its most fundamental form (Hudson, 2013). It essentially describes the purpose of the system, how it goes about doing it and why it exists. It idealises the system in describing how it should be functioning.

Stage 4 – Creating conceptual models

A conceptual model can be developed from the root definition. The purpose of the conceptual model is to look at activities that can be done in order to move the system from its current state, to that resembling what has been idealised in the root definintion (Liu et al., 2012). The concepual model stimulates further debate about the changes that coud and should be made. It is usually

described in verb form describing the activities in a logical and methodical manner (Cundill et al., 2012).

Stage 5 – Compare models and the real world
This stage involves now looking at the conceptual model and the proposed actions and discussing how it will fare in the real world application.

Stage 6 – Make feasible changes
The changes that were deemed to be plausible in terms of execution and effectiveness should, thereafter, be made.

Stage 7 – Action to improve situation
Finally, the problem can be reviewed and actions taken to improve the situation. Once implemented the process can be repeated as progress is gradually made through further exploration and debate (Hudson, 2013).

2.13 Conclusion

This chapter summarises some of the literature relevant to the study. The engineering profession was briefly examined from a global outlook and thereafter from a South African context. This section explained how a skills gap has developed for various reason in the middle-aged bracket. Pedagogy versus andragogy, the differences in learning propensities between children and adults were then discussed. This was important to note as the graduates move from a child based to an adult based form of learning, as the need to propel these graduates to more accountable roles as they progress in their careers is made clear in the first section.

The pedagogy versus andragogy section also gave an indication of what motivates an adult learner to succeed and gives an idea of ways to approach the teaching of individuals as they age. This is of particular relevance to mentors of the graduates. Mentoring and the success factors for mentoring relationships is thereafter discussed. Directly related to mentoring is the transfer of

knowledge, and the concepts related to what is knowledge and how to share knowledge in an organizational setting. Knowledge transfer is thus considered after mentoring. In order to ascertain the successful transfer of knowledge one needs to determine competency levels. Competency and the way in which competency can be distinguished, developed and assessed are then presented.

Finally, the concepts of systems thinking, which forms the basis upon which the study was carried out, are investigated. This included the concept of systems thinking, the principle of leverage coupled with the Iceberg Model. Soft systems methodology and its tools were given due consideration as these tools were the primary drivers for data collection in the execution of the study. The next chapter will expand on the data collection strategy as well as other methodology considerations that were made throughout the research process.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research strategies and techniques that were utilized to address the research problem. This chapter also explains the approach that was used to address the research questions stated in Chapter 1. This is done by first outlining the participants involved as well as the location in which the study was conducted. This is followed by a description of the research design and research methodology that was adopted. The study population and the sampling methods drawn from the population are also described. This is followed by a description of the instrumentation to that was used to gather data. The data collection process and data analysis which followed are then presented. The chapter concludes with the elimination of bias and the ethical considerations pertaining to the study subjects in administering the research.

The aim of the study was identify how the graduate programme currently offered by TGC can be improved. This was done by benchmarking the activities and outcomes of the programme against The Engineering Council of South Africa's requirements for a professional engineer. The following objectives were established for the study in order to achieve this aim:

- To determine the level of competency of TGC trainees and programme graduates benchmarked against ECSA competency standards.

- To evaluate the structure and training outcomes of the programme.

- To recommend ways in which to improve the TGC graduate programme.

3.2 Participants and Location of the Study

The study was conducted at Queens Warehouse, the offices of TGC, located at 237 Mahatma Gandhi Road in the Point area of Durban. The participants that were targeted were senior employees within the organisation operating in a management or senior engineer position. These

individuals were targeted because of their experience within the industry, as well as their experience with the programme itself, having operated as a mentor or supervisor to a number of trainees during their careers.

3.3 Research Design

A research design maps out the method used for collecting, measuring and analysing data such that conclusions may be drawn in order to address the research problem (Flick, 2015). There are two main types of approaches that can be taken when conducting research, namely, quantitative and qualitative. Quantitative data is administered most often in the form of a questionnaire, analyzing the data and drawing statistical conclusions. It is a more objective and passive form of research (Creswell, 2013). Qualitative research sees the researcher become more of an active participant in gathering data. It deals more with words rather than numbers, as is the case with quantitative research (Creswell, 2013). It is most often administered through interviews and discussions either in a one on one or a group platform.

Given that the problem of the EIT programme is one which is not clearly defined and a better understanding is first required, a qualitative approach was adopted for this study. The researcher chose this method as it allowed for the probing of the issues in order to gain a clearer picture of this complex system. As stated by Merriam and Tisdell (2015), a qualitative approach gives a greater insight and understanding into personal views and experiences, which directly addresses the investigative objectives of the study. The qualitative approach was exploratory in nature, accounting for different paradigms and perspectives as well as individual opinions and feelings (Maxwell, 2012).

According to Taylor et al. (2015), a qualitative approach can be labour intensive; however, it is the best method in acquiring high quality, informative data. The degree of freedom allowed to the sample in interpreting and responding to questions allows for diverse and revealing data to be gathered. According to Merriam and Tisdell (2015), qualitative research of this nature is aimed at exploring the problem and understanding the paradigms surrounding the problem. It is meant to

make sense of and articulate how people interpret what they experience in line with the subject matter. Ultimately, the exploratory qualitative approach was chosen as it was best suited to address the research questions of the study.

3.4 Population and Sample

As defined by Sekaran and Bougie (2011), the population is the consideration of the entire group of people, events or other items of interest that the researcher wishes to investigate. A sample is a subset of people, events or items drawn from the population (Sekaran and Bougie, 2011). A sample is drawn when it is difficult to investigate the entire population due to reasons such as size and logistics. It is, hence, a representation of the population which can be analysed to make inferences about the population as a whole (Creswell, 2013).

The population of this study includes all engineering staff at TGC, which is in the region of 110, as the entire engineering department is affected by the EIT programme, be it a managerial, supervisory, mentoring or project team member relationship with trainees.

3.5 Sampling Method

The interview of the entire population of 110 engineering staff was unpractical due to the geographical dispersion of the population, budgetary limitations and time constraints (Flick, 2015). As suggested by Neuman and Robson (2012), in this situation it is advisable to draw a sample from the population. Uprichard (2013), states that the two main methods of sampling are probability sampling and non-probability sampling. One involves being selective in choosing from the population and the other involves random selection from the population.

3.5.1 Probability Sampling

This method adopts a random selection approach in order to gather a sample. There are a number of types of probability sampling, namely;

- Simple Random Sampling – This is the most random of the types where the participants are basically drawn from the population without any considerations given to any criteria for selection (Levy and Lemeshow, 2013).
- Stratified Random Sampling – This type of probability sampling involves some sort of categorization into groups before randomly selecting from each of the categories a predefined number of participants (Rossi et al., 2013).
- Cluster Sampling – This is applied when dealing with very large populations, such as the citizens of South Africa being the study population. It is then necessary to select a random cluster in order to proceed with the study (Rossi et al., 2013).
- Systematic Sampling – This type involves listing the population and selecting systematically, such as every 2^{nd} or 5^{th} or n^{th} person (Fowler Jr, 2013).

3.5.2 Non-Probability Sampling

Non-probability sampling does not employ a process of random selection. The sample is chosen by the researcher to satisfy criteria needed to effectively execute the study (Rossi et al., 2013). There are a number of types of non-probability sampling, namely;

- Theoretical Sampling – this bases selection on the participant's capacity to add value to the study based on the knowledge of the theory contained in the research that they possess (Bhattacherjee, 2012).
- Purposeful Sampling – This is a biased form of sampling whereby the researcher selects participants based on their own preference, often basing their choice on who they feel within themselves will add the most value to the study (Fowler Jr, 2013).

- Convenience Sampling – This, as the name suggests, is based on convenience, often where the participants happen to be "in the right place at the right time" (Levy and Lemeshow, 2013)
- Volunteer Samples – This is simply participants who have volunteered to be part of the study (Levy and Lemeshow, 2013).

As suggested by Levy and Lemeshow (2013), due to the nature of qualitative research, the time required to conduct interviews and transcribe data, as well as the focus on word related results, non-probability sampling is the best suited and was, for that reason, selected for use in this study. The sampling method was chosen because the researcher does not want to generalize the findings but actively seek out participants who are able to add specific data and meet the goals of the study (Fowler Jr, 2013). The targeted participants were selected based on their professional status as well as seniority, but are still at a level whereby they are frequently in contact with the trainees.

There are currently four professionally registered engineers and six senior managers who are mentoring or managing trainees. The departments in which these individuals reside are Civil, Structures, Marine, Signals, OHTE and Electrical. The sample was, therefore, a total of 10 focus group participants. They were selected on the basis of their knowledge and experience in the area of inquiry. Purposeful non-probability sampling was therefore chosen as the most useful means of gathering valuable data. These participants are regularly in contact with young engineers and understand what level is required of these employees in line with company needs (Adams et al., 2011).

3.6 Data Collection

The first step in obtaining data was to obtain a gatekeeper's letter from TGC. A copy of the letter that was submitted can be viewed in Annexure A. An application for ethical clearance was then made via the University of KwaZulu-Natal Ethics Committee in order to allow the study to proceed. The Ethical Clearance certificate granted can be viewed in Annexure B. The instrument used for the qualitative study was a focus group discussion amongst senior engineers and senior managers.

To this end, an invitation to attend a focus group was sent out via email. The invitation was accompanied by a covering letter detailing the background and purpose of the study as well as ensuring confidentiality. This informed consent letter is detailed in Annexure C. It was made clear that participation is completely voluntary. The focus group was interviewed on the topic of the graduate programme and ways in which it can be improved. This was done using a soft systems methodology approach as well as a group discussion. The focus group session was held in a private boardroom at the offices of TGC.

3.7 Data Collection Instruments

According to Lewis (2015), a data collection instrument is a tool that aids the researcher in gathering data. The collection of data for the purpose of this study took the following approach:

3.7.1 Focus Group

According to Kamberelis and Dimitriadis (2013) a focus group is one of the most valuable tools for gathering rich information in a qualitative study. Kamberelis and Dimitriadis (2013), continue stating that a focus group approach is used to draw on participants attitudes, feelings, views, experiences and reactions in a manner that would not be possible through the use of other methods such as surveys or one on one interviews. This is because the thoughts of one individual may inspire thoughts in others and aid in the flow of ideas. The accounts are given in the own words of the participants from which deeper emotional conclusions can be garnered. There may also be healthy debate through differing opinions which could lead to discovery (Stewart and Shamdasani, 2014).

In this study a focus group was selected as it enabled the researcher to stimulate a multiplicity of views and emotions within a group setting (Cleary et al., 2014). The researcher also wanted to discover the degree of consensus on the responses to the research questions (Stewart and Shamdasani, 2014). The researcher was also able to obtain a larger amount of information in a

shorter period of time. There are a number of methods that may be employed when conducting a focus group session, such as structured, semi-structured and unstructured. A semi-structured approach was adopted for this study.

3.7.2 Semi-Structured Group Discussion

According to Kamberelis and Dimitriadis (2013), a semi-structured approach when conducting a focus group session allows the researcher to direct the flow of discussion without constraining the flow of ideas and opinions. The researcher primarily wanted to address the objectives of the study; however, these objectives were largely based on staff perceptions and opinions relating to the programme, therefore, the researcher chose a semi-structured approach in order to direct the flow towards the objectives without restricting the participants from expressing themselves.

3.7.3 Focus Group Prompts

The focus group discussion was driven by pre-constructed prompts aimed at steering the discussion in a direction that would enable the research questions to be addressed. These prompts were ultimately of the authors own construct but were devised with the target of probing the research questions of the study. Consideration was also given to the literature that was reviewed including mentoring, knowledge transfer and competency.

The prompts, which can be viewed in Annexure D, were used to guide the conversation while still allowing it to flow and encouraging the sharing of opinions and views. The focus group session followed a soft systems methodology approach, hence, SSM tools and techniques were employed during the session to gain a clearer understanding of the problem situation (Hudson, 2013). The SSM activities were therefore the primary driver of the conversation, while the prompts acted to steer the direction in a secondary capacity.

A pre-testing of the prompts was carried out prior to the actual focus group session. The primary objective of this activity was to establish if the prompts were clear, coherent and unambiguous. Given the secondary nature of the prompts, only two individuals were enlisted to review the

prompts and give feedback. These individuals were from the engineering department but not part of the sample of the study. The feedback received indicated that the prompts were comprehensible and straightforward.

3.7.4 Administration of Focus Group

The focus group was conducted in a boardroom at the TGC offices in Durban. As advised by Kamberelis and Dimitriadis (2013), the boardroom was set up with desks and chairs in a horseshoe arrangement to facilitate easier interaction and conversation. At the front of the boardroom there was a whiteboard, and whiteboard markers were made available, as well as a projector which was used by the researcher to display a presentation. The presentation was used as a tool to assist and explain the focus group session and the proceeding SSM activities.

The presentation first detailed the background and purpose of the study, outlined the objectives of the study and was also used to display the ECSA outcomes for a professional engineer. This was done as a refresher as it was assumed that the participants were familiar with the outcomes given their seniority in their profession and their understanding of the programme. The presentation went on to explain and give examples of rich pictures, root definitions and conceptual models, which were all carried out in three consecutive phases during the course of the session.

The three SSM tools were strategically selected in order to correspondingly assist to answer each of the research questions. Each phase saw the completion of an SSM activity with the intention that the task and subsequent conversation would aid in addressing one of the research questions. The three phases of the focus group session were broken down as follows:

Phase 1	Rich Picture
Research Question 1 What are the competency levels of those employees who have graduated from the training programme and how is the programme perceived by current senior employees?	

↓

Phase 2	Root Definitions
Research Question 2 Is the structure and design of the programme achieving its intended outcomes?	

↓

Phase 3	Conceptual Model
Research Question 3 What are the changes that can be implemented to positively affect the TGC graduate programme?	

It was, however, found that a lot of the comments that were made during Phase 1 assisted with the following activities and thereby the answering of the final two research questions. Moreover, the discussion which took place during Phase 2 assisted the development of the conceptual model as well as the answering of the final research question.

3.8 Data Capture

The first phase of the focus group session was the drawing of a rich picture. Rich pictures are often used as a means to express views and feelings in a graphical way, which can sometimes be easier for some people who struggle to express themselves in words (Berg, 2015). The reason the researcher chose to develop the rich picture, and in accordance to what was stated by Bell and Morse (2013), was to stimulate the conversation, facilitate the sharing of ideas and discussion and to serve as an effective memory aid. Some of the key themes and points of discussion stemmed directly and indirectly from this rich picture. The concept of a rich picture, as detailed in Chapter 2, was explained to the participants. The participants were then asked to, as a group, come up to the whiteboard available in the boardroom, and, using one of the whiteboard markers provided,

develop a rich picture for the EIT programme at Transnet. A discussion around the drawn rich picture was then held using the prompts developed to guide the flow of conversation. The developed rich picture is presented in Chapter 4.

Each participant was supplied with a blank sheet of paper on which they were then requested to write down a root definition for the system of the EIT programme within Transnet. Each participant was asked to read out their root definition, and draw on these to discuss the structure of the programme and the outcomes that should be being realised. A conceptual model was then constructed by encouraging the group to suggest actions in which to improve the programme using the root definitions as a guide. Each action was grouped and linked to determine which actions are interdependent or complimentary towards another. This was again captured on the whiteboard available in the boardroom. The root definition constructed by each individual as well as the developed conceptual model are presented in Chapter 4.

The entire discussion was recorded using a voice recorder. The discussion was held in English, given that it is the primary medium for discussion in Transnet. The recordings were supplemented by the utilization of a scribe who captured the key points of the discussion on paper.

3.9 Data Analysis

The first step in the process of analysis was ensuring the collected data was comprehensive, free of error and of a good quality. This was achieved by reviewing the recordings and ensuring that all predefined prompts had been addressed. The recordings and scribed data was checked against each other, to ensure the correct information was captured and was of a good quality. Transcripts were then made from the audio recordings from which summaries were developed. The summaries, rich picture, root definitions as well as the conceptual model were all used in the analysis process. This was done to get a better understanding of the views and experiences of the participants as well as to address the research questions.

As stated by Garr and Dewe (2013), one of the means to gain a better insight to qualitative data is to use thematic reduction. By identifying, classifying and linking themes it is easier to make sense of the large amounts of data. This process was executed using NVIVO 10.0 software which is a computer aided qualitative programme. The themes that emerged were then drawn back to the rich picture that was developed.

3.10 Data Display

The SSM data that was captured during the focus group session is presented in Chapter 4 as it was drawn and written by the participants. This was done in the form of pictures that were taken from the day as well as photocopies of the written articles. The thematic reduction is also presented in the form of graphical representations. The action items that were suggested were then linked back to the themes and displayed in a hierarchical graph.

3.11 Measures for Ensuring Trustworthiness

According to Miller et al. (2012), trustworthiness in qualitative research can have a significant impact on the bearing of a study. This is because the data is the only resource at the disposal of the researcher in order to achieve the aims and objectives of the study. It will be used to draw conclusions and make recommendations for the study including recommendations for further research on the topic. If, however, all or a portion of the data is ineligible in terms of its trustworthiness, then the study may serve little purpose. Trustworthiness in qualitative research is linked to credibility, dependability, confirmability, transferability and authenticity, which will be discussed in this section.

3.11.1 Credibility

As defined by Sousa (2014) credibility in qualitative research deals with the measure of how consistent are the findings of the study with the reality. It looks to ensure that the data being

presented is in fact what is actually going on in the real world situation which, as claimed by Sousa (2014), is one of the most important factors to ensure trustworthiness. For this study, the researcher looked to maintain credibility by adopting research methods that are conventional and reputable in the research approach, as described under Research Design and Data Collection Strategies.

The data was also triangulated during the focus group session discussions as well as the various soft system methodology tools that were employed, which assisted with ensuring a true representation of the data. The objectives of the study required experienced engineers and managers to account for the characteristics and competencies required to work as a proficient engineer. This directed the selection process towards all available senior engineers and managers. All were invited to participate in the focus group session.

Each person who was approached was also given the opportunity to refuse participation in the study, which some individuals pursued, and this ensured that the data given was done so without persuasion and of free will (Kornbluh, 2015). The concluded study will also be made available to all participants and the organisation itself so that the results can be scrutinized and confirmed. Finally, a tape recorder was used which aided in the capture of statements made as well as the capture of tone and emotion (Kornbluh, 2015).

3.11.2 Dependability

According to Fassinger and Morrow (2013), dependability relates to the manner in which the study can be replicated if it was conducted in the same place, using the same people and carried out in the same way. The changing nature of the problem situation, in terms of the situation currently being experienced and how it may differ in future, makes the study difficult but not impossible to replicate (Lyons et al., 2013). For this reason, the methodology used and approach taken have been reported in detail enabling a future researcher to repeat the work. The researcher has presented the prompts that were used to guide the focus group discussion without limiting the views and experiences of participants. All errors or failures on the part of the researcher are reported as well as the limitations that the study experienced. The details of the way in which data was collected

are also stated clearly. Finally, the effectiveness of the approach taken, which in this case was a soft systems methodology approach, was reviewed and presented in Chapter 5.

3.11.3 Confirmability

Anney (2014), defines the concept of confirmability as the ability of the researcher to remain unbiased and objective in the collection, analysis and presentation of data. The researcher should ensure that the results, views and experiences of the participants are reflected plainly, and are not affected by personal views and preferences. The reasons for choosing the methodology and approach used for this study have been clearly defined by the researcher. The effectiveness of this approach is reviewed in Chapter 5, and the limitations of the study have also been acknowledged in this Chapter. The link between major themes and subthemes that were developed and the recommendations that were made have been diagrammatically displayed (Caillaud et al., 2016).

The researcher in this study acknowledges that this form of study is exploratory in the sense that it attempts to make light of a very large complex problem. Any progress or failure in this regard will, therefore, still be of value to take the study forward. The limitations of this study are also acknowledged. The researcher has committed to remain unbiased in every possible manner to maintain credibility and ethical standing. The researcher has not attempted to influence the outcome of the study in any manner. The purpose and intention of the researcher was made clear to all stakeholders and was conducted transparently throughout the study.

3.11.4 Transferability

According to Anney (2014), transferability relates to the extent to which the findings of a study may be applied to other situations or a wider population. The findings of qualitative research are generally confined to a small environment, thus it is very difficult to achieve this. As stated by Fassinger and Morrow (2013), this sort of generalisation of findings can actually never be achieved as circumstances will never be exactly the same. Taylor et al. (2015), offer a contrasting view stating that even though each context may vary, the results are representative of a wider group and thus may be transferrable.

The researcher has tried to ensure that a detailed account of the context in which the study was conducted is given without jeopardizing the confidentiality of participants. A full description of all the contextual factors has been provided by the researcher. Ultimately, the results of the study must be understood within the context of which it was conducted in terms of the organisation and the characteristics of participants as well as the approach adopted. This study was not specifically developed to be applied to other contexts. New phenomena and concepts related to the findings can be gradually built on through further studies of a similar nature.

3.11.5 Authenticity

According to Miller et al. (2012), authenticity can be further broken down in to five criteria, namely; fairness and balance, ontological authenticity, educative authenticity, catalytic authenticity, and tactical authenticity. Fairness and balance relates to the need for different interpretations to be sought and kept in the findings of the study (Sousa, 2014). Ontological authenticity is linked to fairness in the sense that the ideas of the participants should be further improved upon and elaborated on through discussion and consensus. Educative authenticity requires that views and beliefs of participants are understood and appreciated by others. Catalytic authenticity involves how the research process has stimulated and facilitated the participant's behaviours (Sousa, 2014). Tactical authenticity refers to the level at which participants are empowered to take action. The methods adopted to guarantee authenticity have been addressed in the following section which discusses the elimination of bias from the study by the researcher.

The ability to conduct a focus group session is something that is not inherent in everybody. One needs to ensure that the flow of conversation does not go off topic and that the data collected is relevant to enable the answering of the research questions. You also need to make sure that everybody gets an opportunity to speak while at the same time not cutting people off, risking the loss of valuable contributions. People may feel reluctant to share their views if they are rushed or, conversely, if they are not encouraged. As a result, the researcher sought the use of prompts and the tools of SSM to ensure the data gathered was relevant, while encouraging contributions from those individuals who were less vocal than others.

In a group forum such as the one encountered in this study, there may sometimes be a reluctance of individuals to speak candidly, as they were conscious of the people around them and how they may be judged based on their comments. The risk of confidentiality being exposed is much more prominent in a group environment as well. The participants were, however, asked to sign a non-disclosure agreement to ensure the conversation did not extend beyond the boardroom. No photography or note taking was permitted aside from the researcher, who also signed an informed consent letter declaring confidentiality. This was reiterated at the start and end of the session as well. In general the participants were of a similar level and age within the company and consequently felt no fear of repercussion or prejudice as a result of speaking openly on the topic.

3.12 Ethical Matters

The goal of ethics in research is to ensure that no subject of the study is negatively affected or discriminated against because of their involvement (Williams-Jones and Potvin, 2013). As stated by Miller et al. (2012), the formulation of the research topic, the research design, the collection and analysis of data as well as the presentation of results all has bearing on the research ethics. The following considerations were given the highest priority when gathering the data for the purpose of this study.

- Ensuring permission is obtained.
- Ensuring participants gave their informed consent to use their comments by explaining the purpose of the study and how the data will be used.
- Ensuring no victimization comes to the participants by structuring the interview design such that it will not reveal the identity of any one participant.
- Ensuring confidentiality and anonymity during the focus group.

3.12.1 Ensuring permission is obtained

A formal motivation memorandum was developed and submitted to the General Manager: Human Resources - TGC, requesting authority and the necessary permission for the study to be undertaken at TGC and for the employees to participate in the study. The memorandum contained the overview of the study and demonstrates how Transnet is a critical stakeholder. It also listed the benefits that will be realized to improve operating performance of the organisation. A final certificate of ethical clearance was granted from the university's ethics committee.

Annexure A: Gatekeepers Letter
Annexure B: Ethical Clearance Certificate

3.12.2 Ensuring Participants are given informed consent

The participants were issued with a signed informed consent letter detailing the background and purpose of the study. It was made clear that participation was voluntary and that there would be no consequence as a result of them declining to participate; an option which some invitees chose. Confidentiality and anonymity was outlined and assured. The participants were also requested to sign a consent letter to indicate that they understood the contents of the issued letter and the nature of the research project. They also indicated their consent to participate in the research project and to be recorded using an audio recorder.
Annexure C: Informed Consent Letter

3.12.3 Ensuring no harm comes to participants

All data obtained from respondents was stored on a computer which was secured and locked through password protection and drive encryption. The computer is the sole property of the researcher and is only accessible by the researcher. The data was backed up on an external drive which is also password protected and is the sole property of the researcher. Personal information of participants is concealed where required and completely deleted from records on completion of the study.

All data which was represented on paper was stored in the researcher's home, a secure premises, in a locked cabinet. These papers will be shredded following 5 years of storage. All audio recordings obtained from the qualitative focus group meeting were transposed into transcripts following the meeting. The electronically captured audio recordings will be deleted from the computer and the hard drive, including all back up files and the Recycle bin files. On completion of the 5 year storage period, all data and transcripts will be submitted to University of KwaZulu-Natal for storage before being thoroughly deleted from the computer and hard drive, including all back up files and recycle bin files and.

3.12.4 Ensuring confidentiality and anonymity

Confidentiality and anonymity is maintained through a non-disclosure agreement which was signed by all participants including the researcher. The data does not link the identities of the respondents due to the information not being linked to a particular respondent but packaged in a general format. The responses are anonymous to anyone who will review the data following the focus group. No identities are divulged in the presentation of the research in the form of a thesis. Any subsequent presentations or reports based on this study will, therefore, not be able to divulge any personal information or identities.

3.13 Conclusion

This chapter has detailed the research methodology that was adopted for the study. This was done by explaining the research design and strategies that were devised in order to achieve the objectives of the study. A qualitative approach was adopted for this study which looked to gather information that was rich in nature using soft systems thinking tools. Non-probability sampling was the sampling method employed to select the 10 senior engineers and managers who participated in the study. The data collection was conducted in the form of a focus group which facilitated a semi-structured group discussion. Soft systems methodology tools were a primary means of gathering data and encouraging discussion. Systems thinking tools were also used to analyse the data, as well as thematic analysis. The chapter concluded with the elimination of bias and the ethical

considerations pertaining to the study subjects in administering the research. The following chapter focuses on the presentation of the data and the associated discussions on the findings.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1 Introduction

This chapter contains the findings of the study conducted. The results from the study are presented to aid in determining the relationship between the various factors affecting the graduate programme and the way in which the programme is perceived within the organisation. The chapter also contains discussions of all the results presented. Relevant themes have been identified and these are presented and discussed making comparisons to the literature that has been reviewed in Chapter Two.

The aim of the study was to identify how the graduate programme currently offered by TGC can be improved. This was done by benchmarking the activities and outcomes of the programme against ECSA's requirements for a professional engineer. The following objectives were established for the study in order to achieve this aim:

- To determine the level of competency of TGC trainees and programme graduates benchmarked against ECSA competency standards.

- To evaluate the structure and training outcomes of the programme.

- To recommend ways in which to improve the TGC graduate programme.

4.2 Presentation of Data

The data was analysed using thematic analysis, with the aid of NVivo 10.0 software. The presented themes were then used to compliment the findings of the soft systems methodology (SSM) tools that were utilised during the data collection phase. These tools included the collective illustration of a rich picture, the individual development of root definitions and the combined construction of

a conceptual model. In order to preserve confidentiality and anonymity, each participant was allocated a code, P1 – P8.

The following graphic represents the major themes that were identified throughout the focus group session. Not all themes surfaced in every phase of the SSM activities, however, many of the themes were common throughout. There were also many instances where comments made applied to more than one of the identified themes. Figure 4.1 below is a graphical summary of the themes that were identified and will be elaborated on throughout the discussion of the three phase SSM activity presentation of data.

Figure 4.1: Summary of Relevant Themes

Source: Own Construct, Adapted from NVivo 10.0 Analysis

Competency

One of the most commonly used words throughout the discussion was the word ‘competent’. The major discussion focused on what does it mean to be competent in the context of the engineering profession and more particularly, being a competent engineer within Transnet. The definition of competence was a major talking point in the eyes of different bodies, namely; being competent in the eyes of Transnet, and being competent in the eyes of ECSA, and how they compared. The theme also encompassed the views of the participants towards the current trainees, how they are performing and where they are lacking as well.

Programme Structure

This theme mainly addressed the second objective of the study which was to evaluate the structure of the programme and determine its effectiveness. In evaluating the structure of the programme, however, there were a number of actions that stemmed from the conversation that assisted in developing the conceptual model and thereby the answering of the third research question of the study. This theme focused on the way the programme is currently structured and how this may be restructured in order to better achieve the goal of the programme. The outcomes of the programme were also taken into account.

Responsibility of Mentors and Mentees

The responsibility of the mentors and the mentees was another talking point stemming from personal experiences of the participants. The senior staff discussed their dealings with certain trainees and the impressions they had of them. They also recalled some of their own personal experiences of their years as a training engineer. The current environment both external and internal to Transnet was also considered by the group including how it affected the way employees needed to adapt in order to succeed in terms of the programme.

Responsibilities of Decision Makers

There was a general consensus that actions needed to be taken that were above the duty of the mentors and mentees themselves. Strategic decisions that needed to be taken by Human Resources as well as Executive and General Management were debated. This involved dialogues around the current structure of the engineering department and recruitment strategies. It also led to the

development of the next theme which was the custodianship of the programme and who was ideally placed to drive the programme. This was especially evident during the conceptual model phase of the session.

Responsibility of Programme Custodian

This theme formed a large part of the conversation throughout all the SSM activities that were conducted. A number of the inner procedures and activities that occur during the training period were examined and their effectiveness deliberated. The participants felt that, whoever it was that took ownership for the programme, needed to do change and implement certain things that may improve the programme overall.

Knowledge Sharing

The theme of Knowledge Management was another large subject of conversation throughout the session but was particularly evident during the conceptual model stage. Many of the participants relayed sentiments that in order for a trainee to reach a level at which they would be ready to apply for professional registration with ECSA, they needed to gain experience and further knowledge. This was further elaborated on by discussing the need for practical as well as gaining knowledge from other individuals. The means to obtain these things were the major topic of conversation.

Digital Advancement

The last theme, Digital Advancement, was predominately encountered in the third phase of the SSM activity session which was the development of the conceptual model. The discussion here centred on making the programme stronger by using technology as a tool. This theme is strongly linked to the preceding theme, Knowledge Sharing. All the participants felt that the use of electronic databases and the internet would increase accessibility to explicit knowledge and provide a platform for tacit knowledge to be shared. They also discussed actions that could be taken to increase the consistency and the continuity of the programme using digital aids.

4.3 Phase 1: Rich Picture

Research Question 1
What are the competency levels of those employees who have graduated from the training programme and how is the programme perceived by current senior employees?

Figure 4.2 below shows the rich picture that was developed on the day by the participants of the focus group session.

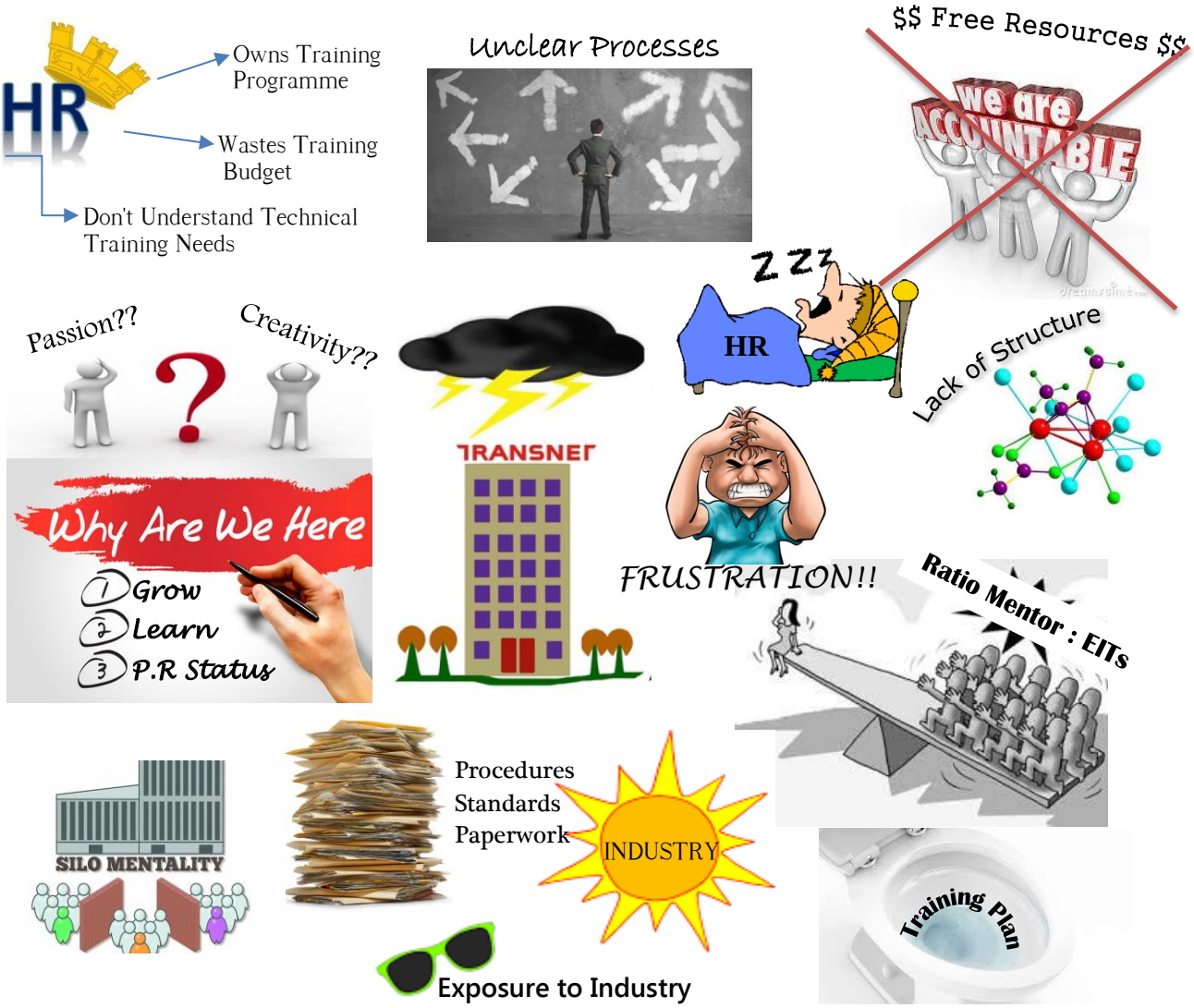

Figure 4.2: Rich Picture Developed by Participants

The main themes which emerged as a result of the rich picture, that addressed the first objective of the research was ‘Competency’, ‘Responsibility of Mentors and Mentees’ and ‘Responsibility of Decision Makers’. Within ‘Competency’, four subthemes were identified; this being, ‘Poor Competence on Completion’, ‘Lack of Practical Knowledge’, the ‘Definition of Competency’ and ‘ECSA Outcomes’. Within ‘Responsibility of Mentors and Mentees’ theme there were three subthemes that emerged which was ‘Economic Environment’, ‘Self-Actualization and Attitude’. Finally, within the theme of ‘Responsibility of Decision Makers’, there was just one related subtheme which was ‘Human Resource Expectations’. These themes and subthemes will now be discussed as directly addressing the first research question of the study.

4.3.1 Competency

Figure 4.3 illustrates the theme and subthemes that will be discussed in this section.

Figure 4.3: Competency Subthemes from Phase 1

4.3.1.1 Poor competence on completion

The overwhelming feeling amongst the group was that there was poor competence observed in graduates of the programme when performing deliverables on projects. This was encapsulated in the statement made by P2:

> "*The majority of graduates of the EIT programme are unable to take on tasks without close supervision*" (P2).

The expectation being that on completion of the programme, you would require minimal supervision and the new trainees coming in to the programme would be able to get more attention, as they should. As suggested by Clinton and Hokanson (2012), the ultimate purpose of these programmes is to enable young employees to assume a higher degree of responsibility as quickly as possible. The programme is, therefore, not succeeding in this regard. This does, however, relate well to the view of Ralph and Walker (2014), that this generation of graduates requires extra attention, beyond what is currently expected, in order to unlock their potential.

This observation was echoed by P6 who stated:

> "*There has been some really good guys, who illustrate a good level of professionalism and competence. But there's also been a large* (emphasis on the word large) *portion of guys just not"* (P6).

The question that was being considered throughout by the group was, is it the fault of the trainee or the fault of the programme. The answer that emerged from the discussions was that it is in fact both at fault. The mentality and drive of the trainees was questioned as well as suitability of the training programme itself. The lack of confidence in the latter was summarized by P2:

> "*For me the TP is not effective. It is actually a failure… a complete realignment where this is concerned is required*" (P2).

It is noted that the capability of the mentors, as defined by Eller et al. (2014), was not considered as a defining factor at this early stage of the discussions.

4.3.1.2 Lack of Practical Knowledge

> "*I was able to identify what the trainees, the EITs, were lacking - it was practical experience"* (P3).

This was a claim made by P3 regarding the trainees that P3 mentored. P3 went on to clarify this statement, explaining that they had, a few years ago, sent their trainees on a training course where there was physical work on site that the attendees of the course had to complete and test. P3 said of those EIT's:

> "*They were able to identify, what they had learnt on the theory side, in a practical way*" (P3).

P3 went on to explain how the cut in training budgets, due to the current economic situation, meant he was unable to send the new trainees to this same training, which was said came at quite a cost. P3 then noted that there was a visible difference between those who had gone on the practical training and those who did not, P3:

> "*I can immediately see this gap between the newer guys and the guys that went on the training*" (P3).

Others in the group agreed with that view including P2 who stated:

> "*We expect trainees to go and provide a design, tell someone else how to do it, they themselves don't physically know how to do it. Yes they'll be able to draw a few things on paper and tell you in a theoretical way, practically they didn't know*" (P2).

P8 added:

> "*Knowing that what you're doing in your drawings will impact what will happen on site … So for me that's a big gap that people don't understand what's going on, on site*" (P8).

P8 went on to quantify what they was referring to:

> "*The delays that happen on site, not having detailed things properly, not having designed things properly, not having gone through that process, the fact that you haven't coordinated the design - If you understand that, you will actually make more of an effort during the design phase to understand all the disciplines and what they're doing*" (P8).

One subject which stemmed directly from the rich picture was that of a silo mentality or people working in silos. Similar to having practical knowledge, it suggests that people should try to learn how things function in areas of work outside of that which they are directly involved. This was intimated by two participants, namely P6 and P8:

> "*We're sitting in a multidisciplinary organisation, you need to know what everybody's doing*" (P6).

> "*We shouldn't be working in silos. We must understand what everyone's doing, and so when you working in a team, you know what all the people in your team actually contribute to that design so it's not just the contracting aspect you need to understand you need to understand the full design impact and array of design that actually puts this thing together*" (P8).

These views are in line with that of Levonisova et al. (2014), who state that technical skills alone are insufficient, and that team work and a global awareness is required for modern engineers.

4.3.1.3 Definition of competency

The persistent discussion around one being competent gave rise to a number of participants questioning what the definition of competence actually was in the context of the programme. The ultimate aim of the programme was to deem the trainee either competent or not competent at the end of the 2 year training period. P2 gave his own definition through his own knowledge of what makes up competency, illustrating it on the whiteboard as well:

> "*The definition of competency is a combination of your skill, your experience, and your ethics. And the starting (of) this is your education. When you can as an individual use these four things that you've acquired, you can use these in a balanced way, then you are competent*" (P2).

This definition holds similarities with that of Brightwell and Grant (2013), but does not consider the individual's personality as being a component as in the view of Bral and Cunningham (2016). It is also comparable with the Integrated Model of Competence by Crawford (2013), with ethics being a component of your core personality traits.

The question asked by P8 was how competence was defined by Human Resources, the custodians of the programme and the ones who have structured the programme as well as the assessments:

> "*How do they define competence – competent to be registered as a professional? Because I would think that, to call yourself a competent engineer you should be PR registered*" (P8).

P8 suggested that the term competence should be aligned to that of ECSA's definition of being competent, or being competent in the eyes of ECSA. ECSA states that you need to exhibit all of the 11 outcomes, in order to be deemed competent and be capable to operate as a professional engineer:

> "*I think you should be aiming for PR Eng. at the end of it. And only once you get that then you take the next step*" (P8).

It is clear that the level of competency required for a graduate is not well defined. The programme may benefit from the development of a competency model as suggested by Mayhew et al. (2014) and detailed by Mirzazadeh et al. (2014).

4.3.1.4 ECSA outcomes

The 11 outcomes communicated by ECSA were also considered by the group in the context of what sort of proficiency a competent engineer should be displaying. The observation made by P2 was that the outcomes do not suggest that an individual needs to know everything there is to know about their discipline. They are more indicative of an engineer who is well rounded and able to demonstrate soft skills as well as technical nous.

> "*If you look at ECSAs outcomes, not one of them talk about becoming a master in a particular space. It is all process driven. They talk about what you should be able to do by applying your basic knowledge that you got from varsity*" (P2).

The statements of Streiner et al. (2014) hold true, in that it is important for an engineer to select their route to professional registration based on the requirements of the local authority.

P1 gave an aligned view of what ECSA was looking for stating that you need only demonstrate proficiency in an area of your discipline, and that to learn everything there is to know about your discipline would take an immensely long time. This was indicated by relaying a story of two engineers that P1 had encountered who had both applied for the professional registration:

> "*Let me give you a classical example, I know of an engineer who only did air-conditioning, and he did all the different types of a/c as a mechanical engineer… and when he submitted his report to ECSA, ECSA gave him his PR Eng. Then I know of an engineer that did everything, HVAC, bulk materials, etc. and when he went to ECSA, ECSA said you need to spend more time. It's not how much you know. It's the quality of what you developed in that area of specialization. That's what ECSA is looking for. And in that little area of specialization, you need to demonstrate all those outcomes… They know that every individual can't learn everything, it takes a whole lifetime*" (P1).

P1 discussed how the previous monthly report format had been directly aligned with the requirements of ECSA. Human Resources had subsequently amended the monthly report which in

the opinion of P1, was a step backwards because the ultimate goal should be to apply for professional registration, therefore, the reports should mirror the format required by ECSA for PR application. P1 described the previous report format as follows:

> "*So for every activity that you did for that month you would have to give a level of responsibility and so forth. It gets you used to actually preparing to write your reports for your ECSA registration*" (P1).

4.3.2 Responsibility of Mentors and Mentees

Figure 4.4 depicts the 'Responsibility of Mentors and Mentees' theme and the associated subthemes that will be discussed as a component of this theme.

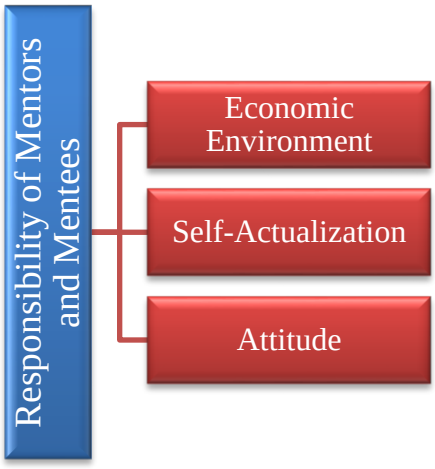

Figure 4.4: Responsibility of Mentors and Mentees Subthemes from Phase 1

4.3.2.1 Economic Environment

The circumstances in which the mentors and mentees have to operate was also a consideration of the group. The main factor from an external perspective that was affecting the functionality and freedom of the programme, was the constrained economic environment. The reason for this affect was explained by P2 who stated that the only way to increase profits was to decrease costs:

> "*We could increase EBITDA in one of two ways. One way is to increase sales and the other way is to decrease spending. We are going through severe austerity measures, because we were not seeing our turnover through sales, therefore, we had to reduce cost*" (P2).

P2 went on to explain that non-essential costs, such as training budgets and travel costs, were the first to be cut. The majority of participants felt that, due to the widespread cost containment, as a result of the worldwide economic crisis, they were very restricted in their training methods, especially in terms of critical training interventions from external service providers. This sentiment was reflected by P3:

> "*There's no money available. We can see the areas in which they are lacking but unfortunately we…, our hands are tied in us being able to implement measures to close the gap*" (P3).

This statement gave rise to a major theme and subsequent action items which were developed during the conceptual model phase; that of Knowledge Sharing. This entailed the invention of a number of creative ways in which these "gaps", which P3 was referring to, could be addressed, without spending money or approaching external service providers.

The group started discussing means in which this could be achieved, some of which were personal recollections, such as P7, who recounted a case where two of his trainees were sent to specialist designers, who were contracted to Transnet through agreements written in the contract itself at no charge to the company:

> "*What we did was we included in the contract for Alpha and Beta to go and spend a week with these guys and go through the entire design and have this knowledge transfer*" (P7).

This indicates a need for the organisation to move away from an individualistic culture to a collective culture where there is spirit in which everyone wants each other to learn and share knowledge as expressed by Nakhchian and Bemani (2013).

4.3.2.2 Self-Actualization

> "*What is it that you are actually trying to achieve and what does it mean to you. It's something each individual has to ask themselves*" (P8).

What P8 was saying was that a large part of the success of the trainees in the programme stemmed from the actions and initiative of the trainees themselves. This idea links directly to the definition of Andragogy, as defined by Chinnasamy (2013), in that the graduates must now strive to find their own purpose and fulfillment. A number of participants felt that as an EIT you needed to take control of your training and be responsible for your development, and that you could not always rely on your mentor to do this or wait on others to initiate learning. This was reflected in the statement made by P4:

> "*A large percentage of that lies with the individual himself ... in reality things are not always spoon fed to you*" (P4).

The converse was also discussed, in that there were some participants who felt that the mentor should also bare some of the responsibility because they had the power to influence the training experience of a given trainee. It was also noted that this affected the consistency of the training programme as some trainees received better training than others simply because their mentors were better at mentoring. This was identified by P3:

> "*It all depends on, my feeling is depends a lot on the individual. How you go about empowering the EITs and giving them responsibilities. Letting them take accountabilities for stuff*" (P3).

P6 related his own approach to enabling and developing the trainees that he mentored:

> "*As they develop I increase the amount of deliverables that they need to provide*" (P6).

The approach taken by P6 is a good tactic to ensure that there is steady development of the trainee who assumes more responsibility as they learn more as indicated by Cohen et al. (2012).

4.3.2.3 Attitude

This subtheme is strongly linked to the previous subtheme of self-actualization. It suggests that if the trainee realizes this is what they actually want to do, then their attitude needs to reflect that. The group felt that a lot of the trainees possessed a poor attitude towards their training and that it seemed as though they felt like they no longer had to work hard now that they had started working.

The group collectively agreed that the opposite was in fact true, and that the achievement of attaining ones degree enabled you to get a foot in the door and provide a platform from which true development could be launched. This notion was summarized nicely by the statements of P3:

> "*It all depends on the attitude of the trainee … it's all about attitude, how much are you willing to give towards your training. When you were at university, on a week day did you go and sit in the restaurants or the clubs – No – because you knew you had to do certain things, and you knew you needed to pass, so why now, when you are in this practical, if I can call it a practical portion of your learning curb, you now want to slow down, take it a little bit more easy*" (P3).

The desirable characteristics described for the trainees is consistent with the basic requirements for a competent mentee portrayed by Cohen et al. (2012) as well as the qualities of a good mentee as defined by Eller et al. (2014)

P5 sought to make it clear that there were in fact trainees that did have the right attitude and that did try to go the extra mile in order to maximize on their training:

> "*You do have those certain EITs that spend that extra time in the office, they come in on weekends, and they give that little bit extra*" (P5).

P5 did concede, and the entire group agreed, that these trainees with the right attitude were in fact a minority, rather than the majority.

4.3.3 Responsibility of Decision Makers

The theme of 'Responsibility of Decision Makers' and the sub-theme of 'Human Resource Expectations', which manifested during the first phase of the focus group, are examined in the following section and is captured in Figure 4.5.

Figure 4.5: Responsibility of Decision Makers Subthemes from Phase 1

4.3.3.1 Human Resource Expectations

A substantial portion of the discussion centred on the Human Resource department of Transnet and their ownership of the programme. A few of the participants felt that Human Resources were not well learned on the requirements of ECSA in terms of professional registration. They also felt that Human Resources were not familiar with the demands of the profession itself, the proficiencies required and how learning is encountered through design and construction work experiences. This led to the development of a further subtheme which will be discussed later in the chapter; that of custodianship of the programme. All of the participants felt that HR should not be the custodians of the programme:

"*So honestly I feel like so much power shouldn't be given to HR because they don't really understand how the professional registration works*" (P1).

Further to HR not understanding how learning occurs in the profession and the requirements of ECSA, participants felt that HR had unrealistic expectations for the trainees. This was especially true for the timelines expected by HR to achieve professional registration. The minimum time prescribed by ECSA to apply for registration is 3 years:

"*You just read something and you think that minimum is for everybody and that everybody should just do the minimum and do it in 3 years*" (P1).

The participants, who are all senior employees, gave their own view that, although the minimum prescribed period by ECSA is 3 years, in reality it takes a bit longer than that for one to be in a position to apply and obtain their professional registration. HR, however, have on a number of occasions insisted that in the third year of working a candidate must apply for and subsequently be awarded their professional registration. Similar to the statements of Clinton and Hokanson (2012), the aim here is for the employees to reach a higher degree of responsibility within the organisation as quickly as possible. It is important, however, to also not have unrealistic expectations that do more damage than good.

4.4 Phase 2: Root Definitions

Research Question 2
Is the structure and design of the programme achieving its intended outcomes?

The construction of root definitions was an activity to assist the participants with thinking about the structure of the programme and the overall purpose of the programme in terms of what it is trying to achieve. Each participant gave their view of what the programme was meant to do, how it was meant to do it, and the purpose for such. Many elements of this construct was similar across each participants root definition. "Competent" was the one word that was repeated more than any

other during this phase of the focus group session. Almost every participant in their individual root definitions, labelled the purpose of the EIT programme as being a system to develop competent engineers.

P1 : The EIT programme is a system to train EITs and develop competent professional engineers by experienced engineers' exposure to practice and other disciplines to contribute to achieving skilled engineers in the country and Transnet and promote engineering and the sciences.

P2 : The EIT programme is a system to produce competent engineers through a structured, rigorous programme in order to deliver value engineered, sustainable and fit for purpose technical solutions that can improve the efficiency and effectiveness of Transnet's logistic operations.

P3 : A system to oversee the training of individuals to be competent design engineers in their respective Transnet field using a formal means of theoretical and practical training plans in order to contribute to achieving professional engineering registration and further competency in the field.

P4 : A system to develop engineering graduates into competent engineers by exposing the EITs to real life projects and the engineering industry in general within Transnet in order to provide Transnet and South Africa with a strong and efficient engineering team that can undertake and deliver projects successfully.

P5 : The EIT programme is a system to produce competent engineers within the organisation through the implementation of a sound training programme to address the skills gap that the country is currently experiencing.

P6 : A system to provide guidance as to what training graduate engineers should undertake in order to become professionally competent by providing technical training and experience through the guidance of other experienced professionals in a project

environment to produce competent engineers capable of achieving Transnet's business objectives.

P7 : A system to plan, organise and align the work done by trainees at Transnet to the requirements outlined by ECSA by creating an environment in which to learn and encouraging self-development in order to develop a competent workforce who set world class professional standards.

P8 : A system to train graduate engineers to become competent and professional engineers through a combination of skills transfer from experienced to graduate engineers and exposure required systems and components in order to have capable engineers within the company for the future.

4.4.1 Competency

The sub-theme of 'Expectations' under the theme of 'Competency', as illustrated in Figure 4.6, was first considered in Phase 2.

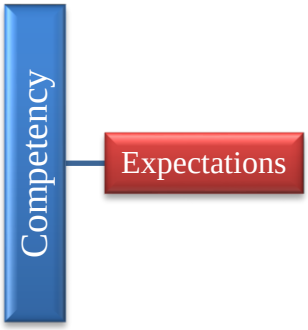

Figure 4.6: Competency Subthemes from Phase 2

4.4.1.1 Expectations

The expectation of each of the participants of the focus group session for the trainees was discussed. This was done in order to determine if the programme was producing engineers in line with what was expected of them by senior employees. This was particularly directed by P2 who stated:

> "*The day someone puts on a report, that you have met the training programme requirements and you are competent, there's an expectation on you*" (P2).

P2 went on to clarify their own expectation of an engineer after the graduate programme:

> "*The expectation of an engineer after 2 years is that they would be able to stand on their own, be resourceful in undertaking engineering work, design work, management work, any engineering type work with the occasional engagement with a supervisor or mentor to ensure that he's on the right path*" (P2).

Thus, the expectation is that trainees will work independently in terms of work deliverables, such that the engineer is able to produce meaningful outputs without too much reliance on someone else. This relates more towards functional competencies as described by Omar and Fayek (2016), which enable one to operate independently within a technical capacity.

P4 felt, and there was an agreement from the rest of the group, that the programme is meant to prepare you to take on engineering problems by applying, not necessarily technical skills, but skills that allow you to understand how to go about solving a problem. Engineering problems are never the same, thus, it is not always a case where existing knowledge can be applied, but where unique solutions need to be developed.

> "*What this 2 years is supposed to do is to develop your mindset in such a way that no matter what comes your way you'll be able to research, analyse, consult develop and propose a solution*" (P4).

This relates more to behavioural competencies and the way in which one goes about completing a task as explained by Ahadzie et al. (2014).

4.4.2 Programme Structure

Figure 4.7 depicts the subthemes of 'Length of Programme' and 'Not Accountable for Time' under the theme of 'Programme Structure'. These subthemes directly addressed the research question at hand which was the suitability of the programme structure.

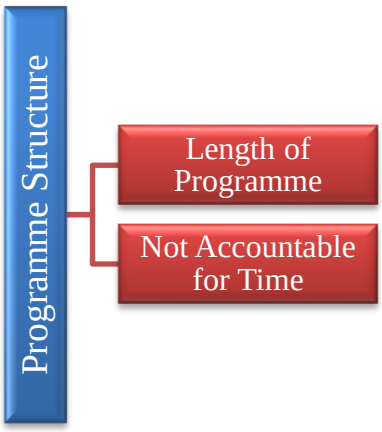

Figure 4.7: Programme Structure Subthemes from Phase 2

4.4.2.1 Length of Programme

The major criticism of the structure was the length of the programme. The majority of participants felt that the two year format was insufficient to produce engineers who are capable of meeting the expectations as detailed in the previous subtheme:

> "*The way the programme is currently structured, it is set for failure … two years is not enough to get the right exposure. It is not enough time to explore all the possible combinations of projects, activities, infrastructure or design that will enable you to stand 90% independent at end of programme*" (P2).

It is important to consider the role and function which the individual is expected to fill on completion of the programme, as suggested by Rath (2015), in order to calculate a suitable timeframe in which one can achieve a sufficient level of competence for that role.

There was also an argument put forward by P1 who claimed that some of the departments within Engineering at Transnet had functions that were not specifically taught at university such as perway, marine and signal engineering. Hence, it was necessary for trainees to go through a period of further study at work in order to become familiar with these specialist functions. It was suggested by P1 that the programme in these instances needs to be designed such that a consistent outcome is achieved:

> "*Two years is not adequate for you to be able to perform in these specialised departments. Further study is required, there are skills, knowledge and principles required that is not generally taught at university; therefore, a very structured training programme is required*" (P1).

As stated by Khapova and Jansen (2014), these hard skills venturing into the domain of expert knowledge can only be achieved through a combination of facilitated training and self-study.

There was an alternative view, or a note of caution, from P3 regarding the length of the programme. Having previously alluded to the fact that there was a few trainees who did perform at a good level and worked hard during their training, he posed the question of whether increasing the training period could have a negative effect on these type of individuals. P3 felt that if you alleviated too much pressure, then there may be a reduction in effort expended by trainees who may get disheartened given the length of time:

> "*If we make it a thing where we just say like 4 years then, unfortunately, it's going to impact on those guys that are giving that little bit extra now. So they might end up taking it a bit easier now. So it's something that we need to think about*" (P3).

4.4.2.2 Not Accountable for Time

Another major criticism of the programme was that the trainees were not required to book time to projects in the way that other employees are required to do. Two negative results of this lack of booking time were identified; the first one being a lack of accountability. Linked to the lack of accountability, it was also suggested that because the trainee's did not have to book to projects there was a sense of laziness that had arisen. This was articulated by P8:

> "*One of the flaws in the EIT programme is you don't book to projects, you are not accountable for the work done, and you are not accountable for EPCM hours. If you were accountable for your hours you would be looking for work, you would go to your manager and say I need more work, otherwise I will be 0% utilised*" (P8).

Cohen et al. (2012), criteria for a competent mentee, as listed in Table 2.2, requires the mentee to utilize their time effectively, and to be aware of expectations. The booking of time to projects would greatly enable the trainees behave in this manner.

The second negative result of the lack of booking time was the misuse of trainees by mentors or supervisors. It was acknowledged by P1 that there were in fact mentors who were utilizing resources to do undesirable tasks that were not part of their training plan. This directly opposes the qualities of a good mentor defined by Eller et al. (2014), as these mentors are not supportive of the development and aspirations of their trainees. P1 went on to say that trainees were seen as a free resource and were therefore often given non-project-related tasks because they did not have to account for the time that they were working. This was seen as a negative because it did not aid in the development of the individual, and often resulted in the trainee becoming dejected or disillusioned:

> "*Because the resources are not booking time, they are sometimes made use of in a non-technical way which serves no benefit to their development*" (P1).

The feeling of achievement and progression illustrated by Wankat and Oreovicz (2015), is not being experienced by the trainees, leading to employee dissatisfaction.

4.4.3 Responsibility of Mentors and Mentees

The next subtheme discussed was that of 'Assessments', which is illustrated in Figure 4.8, and is presented in the following discussion.

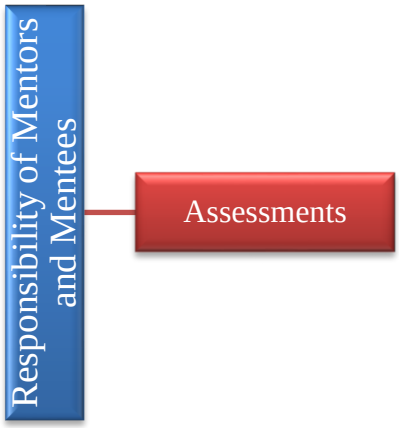

Figure 4.8: Responsibility of Mentors and Mentees Subthemes from Phase 2

4.4.3.1 Assessments

The assessment process of the programme was also scrutinized by the group, particularly in terms of the responsibility that the assessors had to the trainees. It was felt that, if a trainee graduated from the programme and was still not able to function as required by the department, then that trainee should not have passed one or more of their assessments in the first place. It was thus noted that many of the mentors and supervisors who completed the assessments, were merely pushing people through either because they thought it may reflect badly on them, or they felt that they would be seen as the bad guy in the event they failed somebody:

> "*People got scared because they thought if they do that, then they were not seen as team players, but they did the greatest injustice to the individual*" (P2).

This again lacks the qualities of a good mentor defined by Eller et al. (2014), who states that a mentor needs to be committed to the task. As intimated by P2, this was only detrimental to the trainee as they were given a false evaluation of the capability. It was also detrimental to the success of the business as these employees, who were now expected to produce tangible outputs, were unable to deliver.

P2 also challenged P3 who, as detailed in Section 4.3.1.2, had earlier described a training intervention which P3 had sent two trainees, Alpha and Beta, on, by means of writing it into a contract. It was revealed that these two individuals had already completed and passed their final assessments and were no longer trainees at the time of their secondments:

> "*See now there's where I have a problem P3. P3 has done all these initiatives, now, I'm going to ask you a question, why is Alpha and Beta still going for training initiatives when their training is complete. Why should those opportunities not be opened to other EIT's? Alpha and beta are engineers now. They have already been deemed competent, in the eyes of their peers, in the eyes of their management, but yet they still learning at a basic level*" (P2).

This confrontation reinforced the belief that trainees were being evaluated as competent in the assessments when they were in fact not and should, as a result, not be allowed to progress.

4.4.4 Responsibility of Decision Makers

This section deals with two subthemes discovered within Phase 2, under the theme of 'Responsibility of Decision Makers', and as represented in Figure 4.9.

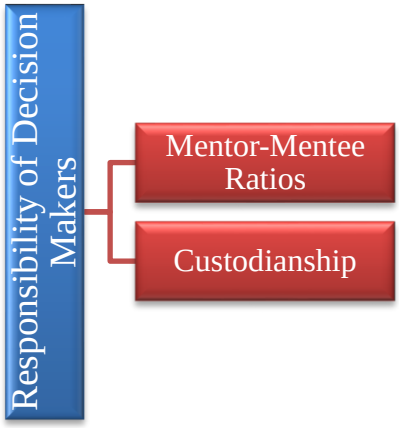

Figure 4.9: Responsibility of Decision Makers Subthemes from Phase 2

4.4.4.1 Mentor-Mentee Ratios

A huge concern that surfaced from the beginning of the session was the fact that there was a large number of trainees when compared to the amount of senior staff available to mentor these trainees. One of the first statements made by P1 was:

> "*A lot of trainees have been taken on in the last few years, and the company is just not able to handle these numbers*" (P1).

P2 gave further insight into this problem seeking to explain what he had recently heard in terms of the ratio of mentor to mentee:

> "*The ratio between the EIT and the mentor is currently 1:20, that was what we found on average, and the right ratio should be something like 1 is to 6 to 1 is to 8. That is a chronic problem that TGC suffers with, we have an insufficient suitably professional experienced individuals to provide this role of mentorship*" (P2).

This is in contrast to the needs of the current generation of graduates, as detailed by Ralph and Walker (2014) as well as Pryce et al. (2015), who require additional attention and regular feedback.

P2 went on to say that this could be a direct reason for the poor performance of the programme and the standard of graduates being produced. The benefits of a structured mentoring programme, as listed by Klasen and Clutterbuck (2012) are consequently not being realised. The development of a trainee is strongly determined by the interaction or attention that they receive from a competent mentor. P2 stated that there were large gaps evident in the trainees coming out of the programme and that the lack of sufficient mentors is a likely cause:

> "*Unfortunately it's just coming out that way and we need to make sure that we have strong people at the top to try and bridge those gaps*" (P2).

The issue was further expanded on by P7 who expressed his own observations of the unfavourable ratio problems. He explained how he is aware of some departments who have lacked an experienced mentor for a number of years, yet the department is still recruiting trainees within its ranks. These trainees are essentially being mentored by experienced professionals from a different engineering discipline, which is not ideal. They subsequently do not have a strong technical sound board which they can go to when dealing with highly technical problems pertaining to their discipline.

> "*Some disciplines never had exposure to a suitable experienced professional engineer, for example, mechanical. In the signaling department we have one and the access to him is very limited because he's delivering on operations*" (P7).

The obvious solution which the group immediately arrived at was that there needs to be a major recruitment on the side of senior engineers and managers. In this manner the large number of trainees, who it was decided could not be let go due to the social responsibilities of Transnet, could be given the attention required in order to properly aid their development.

> "*In order to close that ratio we need to get more senior professionals so that we can spread it to all the individuals and get more one on one engagement*" (P2).

Finally, there was an inherent problem identified with the role of the mentors within Transnet which further added to the problem of the ratio of mentor to mentee. This problem was essentially that even in departments where there was a decent ratio between mentors and mentees, the attention given to trainees was still strained. This, in line with the views of Lamberts and Shanks (2013), was essentially was due to the fact that the mentors were heavily involved in business operations and deliverables.

> "*It is the same people around this room who are trying to take ownership of this, but at the same time still run operations. So it's like a part time job*" (P5).

It further reinforces the need for additional recruitment of senior engineers as alluded to by P2:

> "*Interactive supervision needs to be there. That's where that 1:20 that I was talking about can't allow that, because, for me, if I was going to supervise all 20, it will be a full time job for me and I can't do it*" (P2).

This idea also led to the development of another action item which was developed during the third phase of the session, which was the recruitment of retired professionals to purely mentor.

4.4.4.2 Custodianship

As discussed in the previous phase, the custodianship of the programme was brought in to question when discussing HR's perceptions and their understanding of the engineering profession and professional registration. It followed from the rich picture which was initially picked up by P2:

> "*Someone put there HR is dead, and that is true because this whole initiative is sitting with HR*" (P2).

P4 went further stating that HR were not even adept at assisting with the development of the Training Plan at the start of the programme:

"*HR are unable to articulate what needs to go in to that plan and what needs to come out of it*" (P4).

It was generally agreed that HR are the wrong entity to be driving this programme. P2 alluded to an initiative which was currently in the process of changing ownership of the programme from HR to Engineering. P8, however, disputed this saying that this has not occurred yet and that nothing appeared to be imminent:

"*HR is still controlling … still sets the dates for their assessment etcetera, there's been no interaction with engineering, as far as I have seen. That transition hasn't happen and if it needs to happen it needs to happen very soon*" (P8).

Caldwell (2012a), who stated that "Leadership of the many is far greater than leadership by the few", claims that the leadership in a system such as this cannot reside with one group, but should be led by many parties throughout the system. In this instance, HR could still have involvement, but the programme should be driven by those closest to the participants.

4.4.5 Responsibility of Programme Custodian

Figure 4.10 illustrates the theme and sub-themes that will be discussed in this section.

Figure 4.10: Responsibility of Programme Custodian Subthemes from Phase 2

4.4.5.1 Budgeting and Planning

The custodian of the programme, no matter who it is, has certain responsibilities that directly relate to the structure of the programme. The first of these is the budgeting and planning for the programme.

> "*The last time I wanted to send my trainee on a course I was told that there was no funds. The training budget finished very quickly, within 3 months …. So it feels like it wasn't properly planned for, and I think more organisation is required*" (P1).

P2 sought to clarify situation, reminding the group that the training budgets had also been substantially reduced:

> "*So it was a case of poor planning and also of tough environmental conditions*" (P2).

The second critical thing that the custodian must ensure is that there is strong supervision and leadership of the programme especially at the start of the programme, there needs to be increased presence as each trainee tries to find their feet. It was noted that a lot of the trainees struggled at the beginning to settle in and complete tasks because of poor planning and preparation. The transition into the company is not as smooth as it could be. The hardware requirements are not preempted, such that trainees are sitting without computers for over a month while one is procured. The seating arrangements are not clarified and the network connectivity has not been engaged. Amid this ill-prepared first month the trainees are still expected to develop their own training plans without much guidance.

> "*The supervision that I'm taking about is, when you start anything, someone should be able to conceptualize this thing to you and how it fits in the big picture, then you will get very overwhelmed and someone needs to break it into meaningful things that you can understand*" (P2).

4.4.5.2 Training Plan

All the participants of the focus group session believed that the training plan was a critical tool for ensuring that the trainee has a structured path, which allows them to develop, based on predefined criteria and targets. The participants generally felt, however, that this tool, compiled at the start of the programme, was not being taken seriously enough by the HR department, mentors and ultimately the custodian of the programme.

> "*The training plan should be structured. You come in here and do 1, 2, 3, 4. People are unsure, however, what to put on the training plan when they first come in because they don't know the organisation*" (P5).

P6 also stated his discontent with the training plans, asserting that the guidance which the plan is meant to offer throughout the programme is not being easily derived by its users:

> "*It's not spelling out what you're learning or outcomes that you need to achieve*" (P6).

The failure to do this is directly resulting in the ineffectiveness of the programme and the lack of direction of the trainees"

> "*So consistency and robustness in the plan is very important for me*" (P6).

This problem of an ineffective training plan is recurring in nature, as described by P2, due to the fact that new trainees coming in are taking the plans of past trainees and amending it wherever they can. This doesn't offer huge improvements each time the training plan is revised, or any improvement in some instances:

> "*You come in, mentor says please do Training plan – how do you know what to put in a TP – you go and smell it from the guy who just came through and you take what his work and you try to tailor it to try and make it suite*" (P2).

This was acknowledged as not being the fault of the new trainee, as they are being thrown in the deep end by being requested to develop a training plan for themselves without knowing much about the company or its functions, or having any technical insight from an industry perspective.

It was thus suggested that there needs to be a generic guideline or a template which can be used to assist new trainees with the development of their training plans. In this manner the trainees would come in and use this generic template as a basis from which they can build.

> "*There is no generic plan that one can take and tailor and customize for an individual based on what opportunities becomes available from the projects currently being executed*" (P2).

As suggested by P2, the training plan needs to suite the circumstances at the time of entry into the company. It depends on what projects are available currently and are foreseen in the near future. P2 explained further that it was pointless a trainee putting on their training plan that they would like experience in a certain area, when none of the projects that Transnet is executing has contains elements of that training experience and the trainee will consequently not likely get exposure to that experience. P8 added to this saying that the trainee and mentor needed to consider the experiential requirements of Transnet when developing the training plan in the sense that, if Transnet requires Rail engineers going forward, then the experience of the Trainees should be focused on rail type projects.

> "*…you supplement it with "what else does Transnet need*" (P8).

P2 also added that the generic document should be developed out of best practice and previous successes. In this way the plan establishes the trainee on the best possible path towards making a success of their training. The outcomes of the programme and expectations of an engineer at the end of the programme need to therefore be given due consideration in order to achieve this best practice document:

"*There should be general guideline, there should be a little document that spells out the full extent of what is expected at the end of this thing*" (P2).

The last thing that was discussed regarding the training plan in this phase of the session was the feeling that the responsibility of developing this did not only reside with one individual, nor the three parties of Human Resources, mentor and mentee. This was articulated by P8:

"*I don't think that should be a responsibility sitting with one person. It is a combination of different parties. Not only those three people. But there's a whole host of other stakeholders*" (P8).

P8 wanted to make clear that everybody was responsible, and that we collectively need to sit and develop this generic plan. P8 expounded on this statement by saying that the management of these trainees is very difficult and often lacking direction without a clear plan:

"*If Transnet doesn't have a plan then maybe we should go back and plan together. Because you cannot be managing new people coming in if you don't have a plan*" (P8).

4.4.5.3 Progress Tracking

The next item that was discussed pertaining to the second research question revolved around the tracking of progress during the training programme. The group collectively felt that there was no clear method or available tool to track the progress of the trainee as they progressed through the programme aside from the 6 monthly assessments, which, as previously discussed, did not necessarily reflect the true ability of the individual. This was revealed in the statements made by P6:

"*I feel like there's also not a proper way of tracking the progress during the training programme. The feedback we get* (from HR) *is sufficient for you to make decisions on what changes you need to make*" (P6).

P8 suggested that the training plan could be a tool to track the trainees progress if it was properly designed as discussed in the previous subtheme. P8 made reference to the ECSA outcomes saying that these formed the basis for tracking progress as this is ultimately the proficiencies which you need to demonstrate. P8 also alluded to the fact that all individuals are different, they work at a different pace and have different strengths, and that this needed to be considered when tracking progress:

> "*You need to start ticking of these boxes* (gestures to ECSA outcomes). *I found generally everyone is different, and I had to actually now form different plans* (for different people). *They're ticking boxes here they weren't ticking boxes elsewhere…*" (P8).

The generic template as previously discussed, should be conscious of the ECSA outcomes so as to make it clear in the plan that once you have done a certain task or tasks then you would have achieved that outcome and you are able to on your plan tick it off as completed.

> "*They should actually give you a basic template to start off with, and you sit with your mentor/supervisor, and you must make sure that at the end that you've covered every one of these* (gestures to ECSA outcomes) *in that plan*" (P8).

P8 was vociferous in this view that the plan would be a good tool if it was properly developed, properly followed and intermittently consulted to see what areas you have completed and where you need to focus going forward:

> "*All I'm saying is you need a plan, you need to work that plan, and you need to identify the gaps*" (P8).

4.4.6 Knowledge Sharing

The theme of 'Knowledge Sharing' had four subthemes, as shown in Figure 4.11, which were discussed in this second phase of the session, and is presented below.

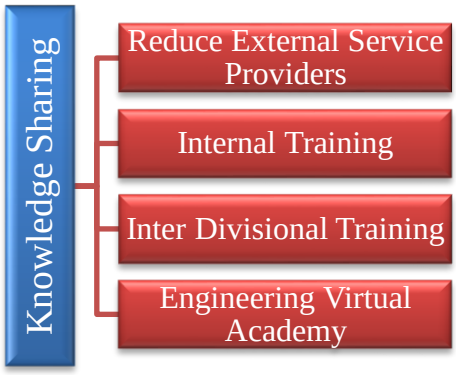

Figure 4.11: Knowledge Sharing Subthemes from Phase 2

4.4.6.1 Reduce External Service Providers

The poor economic climate gave rise to a major theme that developed throughout the session. The structure of the programme had previously catered for a substantial training budget which enable mentors to send their mentees on training experiences relevant to their work. This was no longer possible as training budgets had been cut and cost containment was a priority for senior management. After acknowledging the difficulty in operating in the current economic environment, it was strongly voiced that the training and the success of the training programme should not be dependent on the amount of courses you send the trainees on. The bulk of the training can be done in house, because there was enough experience within the company that could be passed on. This was identified by P1 who stated:

> "*It doesn't necessarily have to be hiring some expensive company to come in and train your students*" (P1).

Comments made by P2 supplemented what was said by P1 and went further, stating that the programme itself should be the catalyst for learning and application and not the influence of service

providers. These comments reverberate the view of Klasen and Clutterbuck (2012), who states that one of the key benefits of a mentoring programme should be the transfer of knowledge in a meaningful and planned manner, thus reducing the need for external facilitation. P2 went on to state that often, you go for a training course and two weeks later you have forgotten everything you learnt in the course. P2 claimed that it was more important to learn how to approach a problem and find a solution by being resourceful, continuing that it is more important to know where to look and who to approach and how to apply things that you have learnt rather than getting a certificate in a course. P2 concluded by saying that they would rather see this quality in a trainee then a constant demand to go on training courses:

> "*So this training programme that we are talking about must not be based on service providers giving your courses and so on. This training programme must be about gearing you up to be able to solve problems, research, find information's that's available through journals, and be able to apply it, engage. That's the skill that we need to see*" (P2).

4.4.6.2 Internal Training

The discussion around looking at alternative ways to train EIT's led to the view that there was a lot of experience and expertise within the company that was not effectively being tapped in to, and it was thus not necessary to approach external service providers as often as was currently being done. This led to the group discussing various means to enable the sharing of knowledge within the organisation itself, especially given the current economic situation.

> "*The organisation is not in a good place currently and all of us need to understand that and try and implement other ways in which we can learn. There's other means in which to learn*" (P3).

This subtheme of developing creative ways in which knowledge may be shared within the organisation is similar to the approach suggested by Dong et al. (2016) and was especially developed during the third phase of the session.

P1 recounted a personal story whereby there was a type of knowledge sharing session in which their department was currently engaging. P1 explained how once a month their team would get together to have a technical review session in which they discussed current project problems that anyone was experiencing and collectively discuss possible solutions to the problem. P1 also described how the senior staff would set a design problem for the group and they would all go away and come back and compare and discuss their solutions. This was done particularly for the benefit of the younger team members.

> "*Its things like that, where you're not just going and looking at booklets and trying to do things on your own. It's where you actually have an interactive session where you can implement that knowledge and show how much you know from those books you've been studying*" (P1).

The reciprocal nature of this suggested knowledge sharing initiative is in line with the views of Hau et al. (2013).

4.4.6.3 Inter Divisional Training

The other argument that came about when discussing means in which training could occur without the use of external service providers was to utilize other divisions within Transnet. It was commonly agreed that Transnet is a large organisation and that the different divisions needed to work together in order to improve on the training programme that they offer. P5 was particularly passionate about this topic stating that even if projects were quiet within TGC there will definitely be other projects being undertaken by other divisions such as TFR or TNPA, which are much larger divisions:

> "*Somewhere we are doing something in one of the OD's, we can arrange for trainees to go and visit them, work on it*" (P5).

P5 went on to say that if TGC were made aware of these projects, especially if they were going in to construction where a number of employees could be accommodated on site, then they can come

to an agreement of some sort which will allow trainees from TGC to be based there for a defined period:

> "Why don't we arrange secondments to these contractors so that they can work with them, learning what they are doing?" (P5).

4.4.6.4 Engineering Virtual Academy

The was a compelling point raised by P3 who stated there are so many more means to learn available to us today especially living in a digital age with the technology available to us. The internet was touted as an excellent source of learning:

> "*The environment is continuously changing. The organisation is not in a good place currently and all of us need to understand that and try and implement other ways in which we can learn. There's other means in which to learn; go on YouTube, there's lots of videos*" (P3).

P2 responded to this claim made by suggesting that it would be beneficial for Transnet to look into the setup of an online virtual academy for engineering. P3 was in agreement:

"*That is such a good idea, because if you want to learn anything it can be on a directory*" (P3).

In this manner you could have information pertaining to all things engineering easily accessible and organised for continued use over many years. This included training material that could be uploaded and downloaded by users. This could also serve as a good platform for those people who are reluctant or shy to share knowledge as explained by Huang et al. (2014).

P8 also felt this was a good idea, however, P8 felt that there needs to be sufficient resources allocated as this was not a small initiative:

"*Suitable operating budget and timeframe needs to be set in order for the academy to be successful. In order for this academy to be realizable, you need to have budget, you need to have timeframe and you need a scope of what the operating model is going to be*" (P8).

4.5 Conceptual Model

Research Question 3 What are the changes that can be implemented to positively affect the TGC graduate programme?

The participants were given a brief presentation overviewing the function of a conceptual model. The main characteristics and functions were highlighted in accord with the literature given in Chapter 2. This was done in order to establish actions that may be implemented in order to positively influence the system. Figure 4.12 is a replicated image of the conceptual model that was developed during the focus group session. All the themes which emerged during the first two phases were present during this phase as well. Some actions were stated and unpacked or discussed in more detail, whereas some actions were merely stated without any elaboration, but were suggested based on discussions had in the previous two phases.

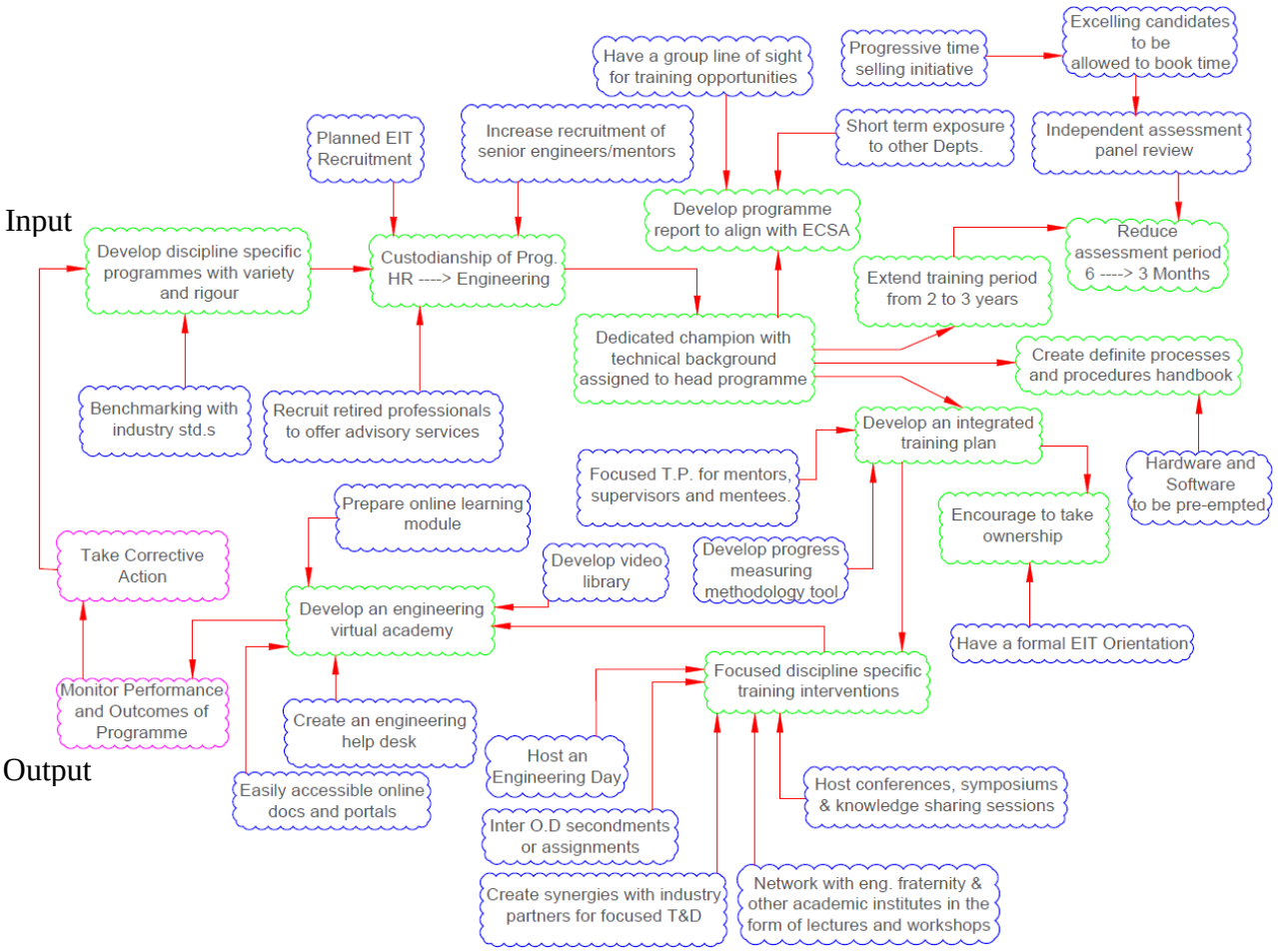

Figure 4.12: Conceptual Model Developed by Participants

4.5.1 Competency

The suggested change items pertaining to the 'Competency' theme are detailed below and summarised in Figure 4.13 at the end of the section.

- Reduce assessment period from 6 monthly to 3 monthly

This change item was suggested to have more control over the programme by evaluating the progress of the trainee more frequently.

> "*Cos 6 months, just looking at it every 6 months and your progress, it's just too short of a space of time to say what you've done*" (P1).

Even though it was not well articulated, P1 was trying to suggest that the 6 monthly reviews, which are just a half hour presentation by the trainee, was not enough time for them to adequately go through what they have done and for the panel to safely say that they have achieved what they should have achieved during that period.

- Have a group line of sight for training opportunities

The discussions around Transnet being a large organisation who, across all operating divisions, always have projects ongoing, resulted in the participants stating that we need more collaboration across the divisions to identify training opportunities. That bode the question of how do you go about coordinating overview. The answer supplied by P2 was that the body best suited to identify these opportunities is Group. At a Group level there is complete oversight of all the projects that were currently being undertaken by all divisions. Hence, they are in the best position to co-ordinate training across operating divisions especially on site training.

- Short term exposure to other departments

This action was raised by P2 who drew on the issue raised by P8 in Phase 1, when P8 described the problem of working in silos:

> "*Then P8 spoke something about exposure to other departments... Short term holistic exposure to other functional departments… To learn the value process, value chain, operational value chain*" (P2).

In this manner the trainees will have a better understanding of the function of other disciplines and departments and how each of them contribute to projects.

- Develop discipline specific programmes with variety and rigour

This action item can be linked to the defining of competency, and how this needs to be made clearer in the context of the programme. By looking at discipline specific programmes it enables the programme to differ based on the type of engineer you are, as the requirements for competency for different disciplines will not be the same.

- Benchmarking with industry standards

The one way to set yourself up and to ensure you are operating at the correct level, in the sense that you are not aiming to over or under achieve. This will enable you to know what you are expecting to achieve out of this programme. If you are expecting competent engineers you can define what level of competence by looking at how other companies are measuring competency and using this as a sounding board.

"*Also learning from other companies. Benchmarking. How are they doing things*?" (P2).

- Develop programme report to align with ECSA

The current monthly report format is not aligned to the reports required for professional registration by ECSA as it previously had was. The recommendation of the group is that the monthly reports revert back to resemble the ECSA registration format. In this way the trainees are prepared from the beginning of their careers to write in a way that puts them in a better position to apply for PR as early as possible.

- Focused training programme for mentors, supervisors and mentees

This was a suggested action that can be linked to the expectations held by mentors for the mentees. It was commonly agreed that the training programme needed to be realigned such that competent engineers are produced who are able to do their work with minimal supervision. The training programme thus needs to focus on achieving this and this programme should be aligned and followed by mentors, mentees and supervisors.

Figure 4.13 presents a summary of the suggested change items relating to the 'Competency' theme.

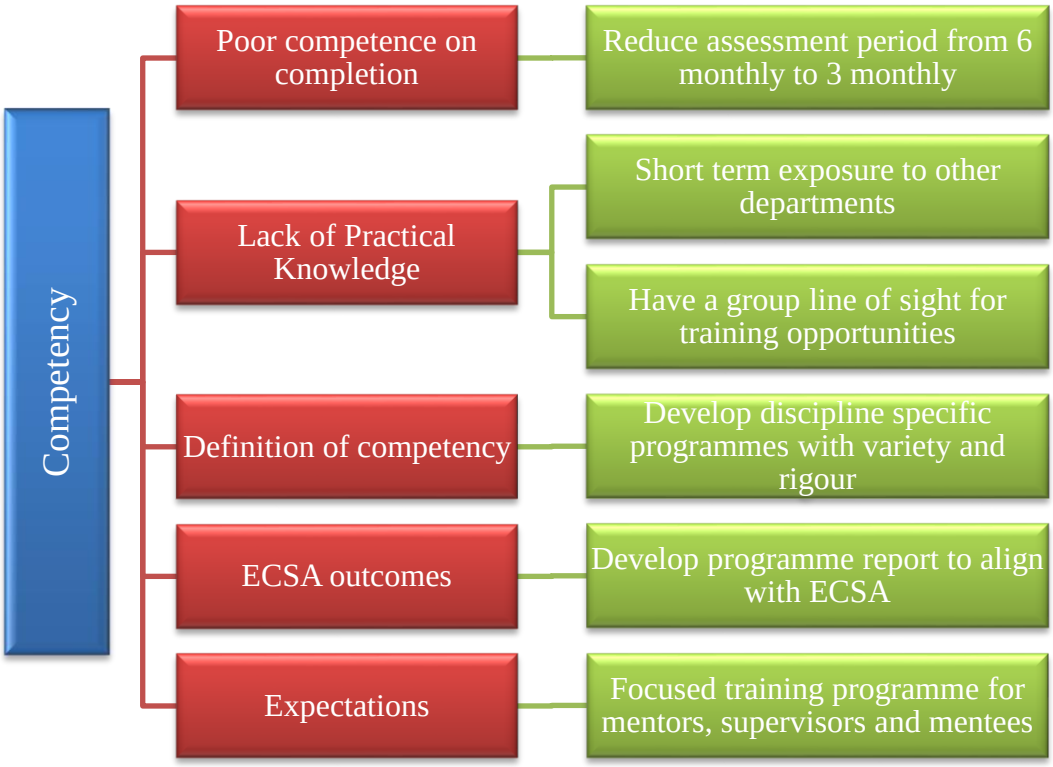

Figure 4.13: Suggested Change Items against Competency Theme

4.5.2 Programme Structure

The suggested change items pertaining to the 'Programme Structure' theme are detailed below and summarised in Figure 4.14 at the end of the section.

- Extend training period from 2 years to 3 years

This change item was raised to directly address the problem of the length of programme as discussed in Section 3.1.5. The item was discussed in length in the previous phase and was, for that reason, not dwelled on in this phase. P3 put it simply:

> "*Increase the training programme from 2 years to 3 years, will be a step in the right direction*" (P3).

- Progressive time selling initiative

"*I would say that we need an environment with more responsibility and pressure. The environment is quite a relaxed environment*" (P1).

"*How do you change the environment?*" (P2).

"*Progressive selling of time until they're fully utilised and of use to the organisation*" (P8).

The preceding exchange resulted in the development of the first of two action items to address the problem of trainees not being accountable for their time. It was suggested that the trainees after every 3 month period should increase the amount of time they were required to book to projects. For example, after 3 months the trainees could start booking 10% of their time to projects, which would then increase to 20% after 6 months and continuously increase in that fashion.

- Excelling candidates to be allowed to book time

P4 recognised that a negative effect of increasing the length of the programme was that Transnet would have to bear the costs of their salaries for a longer period if they were not booking to projects:

"*From a business perspective, it's hard to have all the trainees be free resources for 3 years. So maybe after a year, based on assessments, EITs could be deemed fit or unfit to start booking hours … Even at a lower rate, Transnet could charge them out*" (P4).

"*So you can get a feel for reality*" (P3).

This ties in with the progressive selling of time, and goes further saying that if it can be seen that a trainee is really excelling, then they can be fast tracked in terms of project delivery hours.

Figure 4.14 presents a summary of the suggested change items relating to the 'Programme Structure' theme.

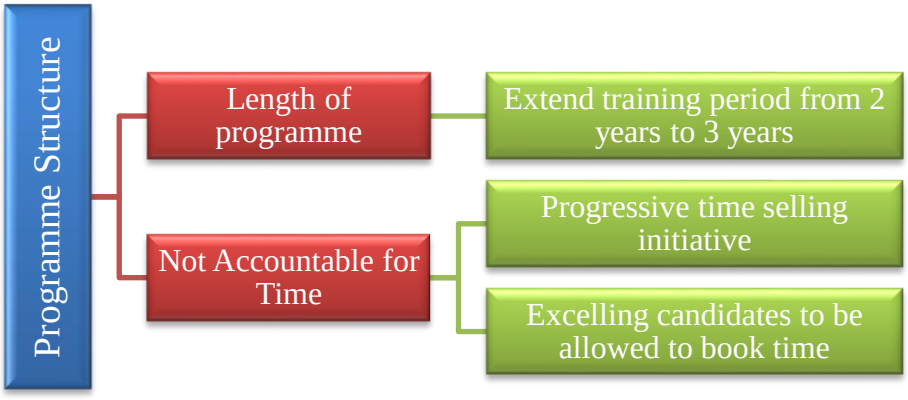

Figure 4.14: Suggested Change Items against Programme Structure Theme

4.5.3 Responsibility of Mentors and Mentees

The suggested change items pertaining to the 'Responsibility of Mentors and Mentees' theme are detailed below and summarised in Figure 4.15 at the end of the section.

- Create synergies with industry partners for focused Training and Development

As suggested in Phase 2, one of the means to combat the tough economic circumstances was to write a training and development clause into the contracts that Transnet was awarding to specialist consultants and contractors. This can be added as one of the tender evaluation criteria so that tenderers know that they will have to give it due attention if they want to be awarded the contract.

> "*What about having partnerships with not only other business units, but external companies, and the other thing is also including something in your documentation to include skills transfer during the construction phase*" (P3).

- Encourage to take ownership

Allowing the trainees to grow by increasing their responsibilities over time was one of the subjects discussed during the rich picture phase. It was also noted, however, that the trainee within

themselves needs to know that this is what they want and they need to work hard to graduate from the programme and make a success of themselves as a professional engineer. It was suggested by P8 that as mentors and senior staff needed to incite this mentality by encouraging and enabling the trainees:

> "*We need to foster self-development by encouraging individuals to take ownership of their training needs by promoting initiatives like individual development plans and 360 review sessions and areas for continuous improvement*" (P8).

It was also noted in phase one that the attitude of the trainee is critical. If the trainee has a poor attitude then it is unlikely that they will get the most out the programme. Again it was suggested that the attitude can be influenced by the positive encouragement of the mentor.

> "*It's an attitude that needs to be there for the individual to develop his own plan. You need to have the right attitude which is the encouragement of ownership*" (P7).

This also led to the development of another action item which was the setup of a formal orientation in order to instill the correct attitude from the off.

- Have a formal EIT orientation

As mentioned above, the establishment of a formal EIT orientation would serve as a means to evoke the right attitude in trainees from the start of the programme. This was suggested to take place over a day or a period of days. In this manner the ethos of Transnet, the vision, the expectations and the mindset could be instilled in order to ensure that the trainees begin with the correct attitude. This could be carried out in an informal and fun way so as to generate a feeling of positivity as well.

- Independent assessment panel review

This action item was developed to address the problems described in Section 3.1.7 related to the assessments. The main problem being that he mentors who assessed their mentees felt too afraid to deem them not competent. The solution to this was that the evaluation should be conducted by

an independent review panel. The idea came from P3 who claimed that TFR had recently implemented a similar approach:

> "*The EIT evaluation, currently in TFR, the line manager is just an observer, sometimes he does not even attend those sessions. They have a separate evaluation committee*" (P3).

Figure 4.15 presents a summary of the suggested change items relating to the 'Responsibility of Mentors and Mentees' theme.

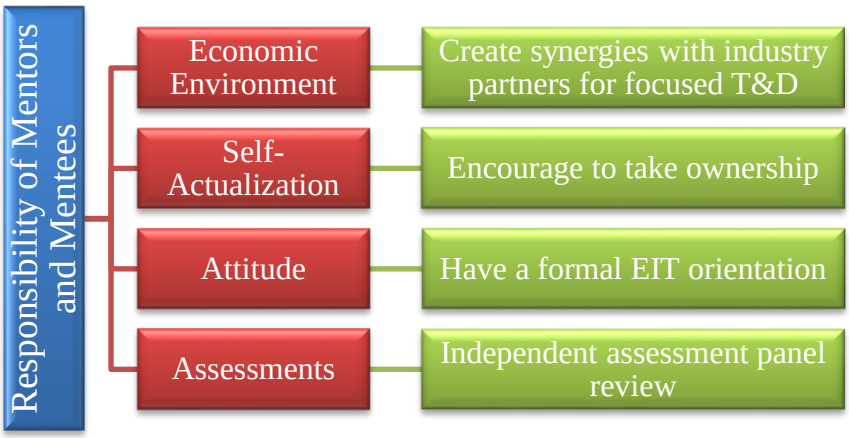

Figure 4.15: Suggested Change Items against Responsibility of Mentors and Mentees Theme

4.5.4 Responsibility of Decision Makers

The suggested change items pertaining to the 'Responsibility of Decision Makers' theme are detailed below and summarised in Figure 4.16 at the end of the section.

- Planned EIT recruitment

This change item as well as the next two change items were all derived as a solution to the unfavourable mentor-mentee ratios which exist in the organisation. The first of these actions was to properly plan the intake of trainees every year not only based on the amount of work and money available, but also based on the amount of senior employees available to mentor them. A stricter

stance in this regard was felt necessary as a persistent imbalance in the ratios may begin to affect company performance.

- Increase recruitment of senior engineers and mentors

The converse of reducing the intake of mentees, which is to increase the intake of mentors, was also considered as a means to correct the ratio imbalance. This was seen as a very positive action as the senior engineers would not only assist with mentoring activities, but will also improve performance on project delivery.

> "*Recruit experts and specialists experienced in the various disciplines. Their purpose will be to facilitate mentoring coaching and advisory services, and teaching roles within the organisation*" (P2).

- Recruit retired professionals to offer advisory services

The final of the three change items to address the imbalance in the mentor-mentee ratio was to recruit retired professionals.

> "*Where you have recruitment of senior engineers, we can also have retirees ... On call retirees, seasoned professionals that can be brought in to facilitate mentoring etc. I think the EITs want to have more experts that they can speak to*" (P2).

This was seen as an ideal solution to alleviate the pressure on senior employees who had to balance mentoring with actual design and operational functions. The retirees could be employed solely for the purpose of mentoring, which will be beneficial as it is not a high pressure job. The mentees would benefit from the wealth of experience held by these individuals.

- Custodianship of Programme to move from HR to Engineering

> "*I think it's a step in the right direction to move from HR back to engineering and hopefully they'll correct the whole report writing issue and mentoring of the Training Programme*" (P1).

This suggestion was not contested or deconstructed further. The reasons for wanting the change of custodianship had already been detailed in the first two phases. The group felt that the programme could be better handled and structured if it was done by engineering or at least some one with an engineering background. This led to the development of the next change item which was to install a dedicated champion with a technical background to head the programme.

- Dedicated champion with a technical background assigned to head the programme

This was designed to accommodate the ownership of the programme within engineering without requiring resources who were committed on projects to be disturbed. By employing and assigning someone with a technical background within engineering whose sole purpose is to manage the programme, you are able to achieve both.

"*You need to have a focused champion, you know, leadership champion that will drive this thing and this thing only. Not to be distracted with operations and that type of thing. So you want like a technical person that takes ownership for this whole initiative and then drives it*" (P6).

This can combine with the earlier suggested action of recruiting retired professionals, in the sense that it may be the most viable to have one of these individuals to fulfil this role.

Figure 4.16 presents a summary of the suggested change items relating to the 'Responsibility of Decision Makers' theme.

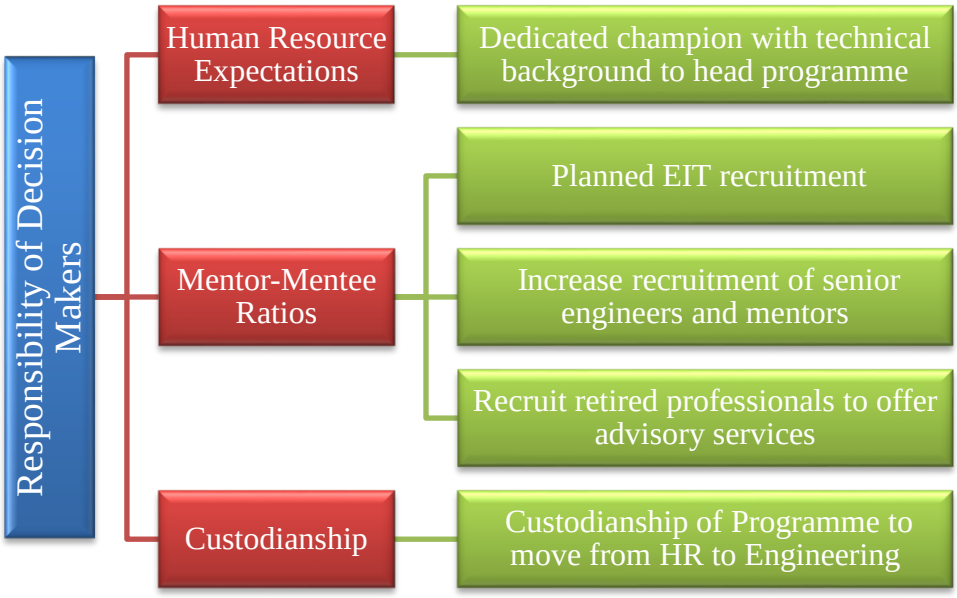

Figure 4.16: Suggested Change Items against Responsibility of Decision Makers Theme

4.5.5 Responsibility of Programme Custodian

The suggested change items pertaining to the 'Responsibility of Programme Custodian' theme are detailed below and summarised in Figure 4.17 at the end of the section.

- Hardware and software to be preempted

The planning and budgeting of the programme custodian needed improvement as discussed in Section 3.1.9. The budgeting portion is unfortunately out of the hands of the custodian as mentioned when discussing the current economic environment. The planning portion was where immediate action was requested by the group. This was particularly true when describing how the company needs to be prepared to receive these individuals, especially when procuring computers and network permissions. P5 initially directed his concern to software:

> "*Software packages. Sometimes we have staff sitting without the tools that they need to do their work*" (P5).

P4 argued that it is "*not beneficial for the company*" to buy expensive software packages that are not being fully utilised. P8 counter argued that it still needed to be looked, not only for software but for other requirements as well:

> "*Yes but we still need to plan for it. Even if you want the guys to share but we need to have foresight or preempt the EITs for software and other arrangements to be made*" (P8).

- Develop an integrated training plan

This refers to the generic training plan or template that needs to be developed as discussed in the previous phase.

> "*They need to develop an integrated training plan and that links to everything*" (P8).

This topic was discussed at length in the previous phase and was subsequently not expounded on any further.

- Develop definite processes and procedures handbook

> "*When you come in fresh they must just take the procedure, read it and know exactly what is expected of them, where to go; give me an example of a nicely populated training plan, give me an example of a good template that I can use, then I can organise myself. We're trying to create here a little handbook. You're an engineer you come in, the first thing you need to do is develop a training plan. In order to develop a training plan you need to go to this drive, find the generic training plan for mechanical engineering, download it and sit with your mentor, find a mentor, register with ECSA. You know little processes and procedures on what you should do that's nice and definitive. Then when you sit with your manager, agree timeframes to which initiatives are available and how it is available, when and where and what the durations you should need*" (P2).

This entire dialogue by P2 directly addresses the concern of the poor quality of the training plan and how it fails in its purpose to guide the training of the EIT. The development of a handbook to

guide proceedings, beyond just the training plan but all aspects and requirements of the programme, would aid in achieving consistency as well as in making processes easier and more streamlined.

- Develop progress measuring methodology tool

One of the complaints by the participants was that there was no tool available to accurately track the progress of a trainee. The obvious solution was to develop a tool that enables you to do this, as captured in the words by P6:

> "*The other question is if you can't measure it, you can't manage. And because we haven't got a way to measure progress against plan then it's hard to manage it. So develop a measuring methodology or tool in order to measure progress against plan*" (P6).

Figure 4.17 presents a summary of the suggested change items relating to the 'Programme Custodian' theme.

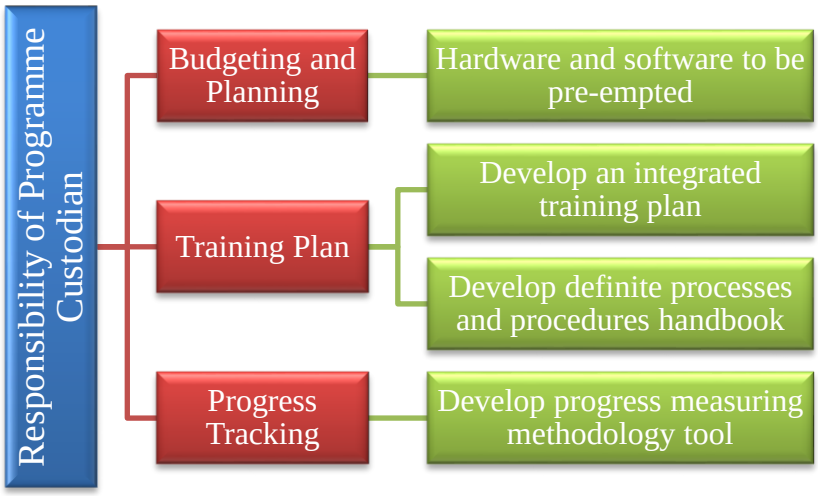

Figure 4.17: Suggested Change Items against Responsibility of Programme Custodian Theme

4.5.6 Knowledge Sharing

The suggested change items pertaining to the 'Knowledge Sharing' theme are detailed below and summarised in Figure 4.18 at the end of the section.

- Network with engineering fraternity and other academic institutes

Knowledge sharing formed the bulk of the discussion which took place during Phase 3. All participants had ideas about how knowledge sharing could take place better than it was currently, thereby adapting to the tough economic situation. The first idea to eliminate the use of external service providers was to network with engineering fraternities and academic institutes. The fraternities suggested are professional bodies, such as the South African Institute of Electrical Engineers (SAIEE) or the South African Institute of Civil Engineers (SAICE).

> "*Network with Engineering fraternities SAIEE, SAICE and other academic institutes of learning, to jointly develop training plans and host guest lectures and workshops*" (P2).

The other bodies that could be approached was academic institutions such as Universities and Technicon's. There is currently partnerships with two universities who offer discipline specific programmes which Transnet employees can attend at a heavily discounted rate. This is because many of the course presenters are actually Transnet employees. P2 expanded:

> "*Like the port and marine engineering at Stellenbosch, the rail at Pretoria. We need more like these. These are just too light*" (P2).

The problem was that not enough partnerships existed as these universities only represented two regions. This could be increased to include all the major universities.

- Host an engineering day

The second idea to eliminate the reliance on external service providers was to host a Transnet engineering day. This would enable companies looking to do business with Transnet to come and showcase their expertise. This would come at only a small cost to the company and would benefit a much larger audience then sending individuals on training.

> "*We call in some industry experts, they come and talk about a particular subject matter in detail such as a paper that we wrote*" (P7).

- Host conferences, symposiums and knowledge sharing sessions

Internal training was a key discussion to combat the decreased training budgets, which resulted in the development of two change items. Both involve the creation of platforms in which internal staff members can share knowledge particularly tacit knowledge. The first, as described by P5, being "in house training by experts" in the form of a conference or symposium open to the wider engineering staff compliment. This could be to discuss general engineering problems and experience or to share knowledge pertaining to your disciplines to staff from other disciplines.

- Focused discipline specific training interventions

The second internal training intervention was to have focused discipline specific knowledge sharing sessions within your own department. This was predominately campaigned for by P1, who had discussed their own experience of discipline specific training as described in Section 3.1.6.

> "*If that's a broad knowledge sharing session then we should also have something like what I was discussing earlier. It's very focused, very interactive, it's quite detailed technical sessions that they teach and then you get homework where you get a problem go and design a solution and then at the next session we sit and compare solutions*" (P1).

- Inter OD secondments or assignments

This followed on from the action of getting Transnet Group involved to identify training opportunities across all the operating divisions as they had full oversight of the entire company's ongoing and potential projects. By ensuring this collaboration the overall training programme would benefit as the entire strength of Transnet as an organisation can be drawn upon.

- Develop a video library

The following four actions detailed the steps or elements that needed to be addressed in order to develop an engineering virtual academy. The first step, which stemmed from P3's idea of searching YouTube for engineering related videos from which to learn, was to develop a video library. This library would be categorized and easily navigable based on discipline specific design and construction.

"*Prepare training material and teaching modules in the focus areas, discipline specific and put it on the virtual academy, so people can on demand download, at their pace watch a video and learn from it*" (P4).

- Prepare an online learning module

The tacit knowledge of individuals may be captured online, in the form of lectures and interviews. It was suggested from this idea that online learning modules could be developed to mirror a classroom environment. Lectures or talks could be viewed, and exercises could be given to complete during that online lecture or to complete for homework. The solutions to those exercises could then be detailed all in an online format, while the learner follows and compares with their own solution.

- Create an engineering help desk

"*This is how the helpdesk can work. You hit a roadblock with something that you need to solve you phone the helpdesk tell them you've got this problem I need to speak to somebody in this discipline that can possibly help me solve this problem. Or they take your written query and direct it to a group of knowledge professionals and then come back to you*" (P2).

P2 has detailed the purpose and functionality of the help desk quite well. The difficulty would come in getting subject matter experts to afford their time to solve problems that may coming from many trainees on a daily basis.

- Create easily accessible online documents and portals

The last of the action items to effect an engineering virtual academy would be to provide online all the relevant documentation pertaining to an engineering career in Transnet. This online portal should be well organised and easy to navigate.

"*What's Transnet all about, what's our engineering policies, where to find things on the network…? Everything. And that's what we should be giving new staff as well. This*

initiative would particularly benefit new trainees who are looking to become familiar with their new environment and settle in as quickly as possible" (P8).

Figure 4.18 presents a summary of the suggested change items relating to the 'Knowledge Sharing' theme.

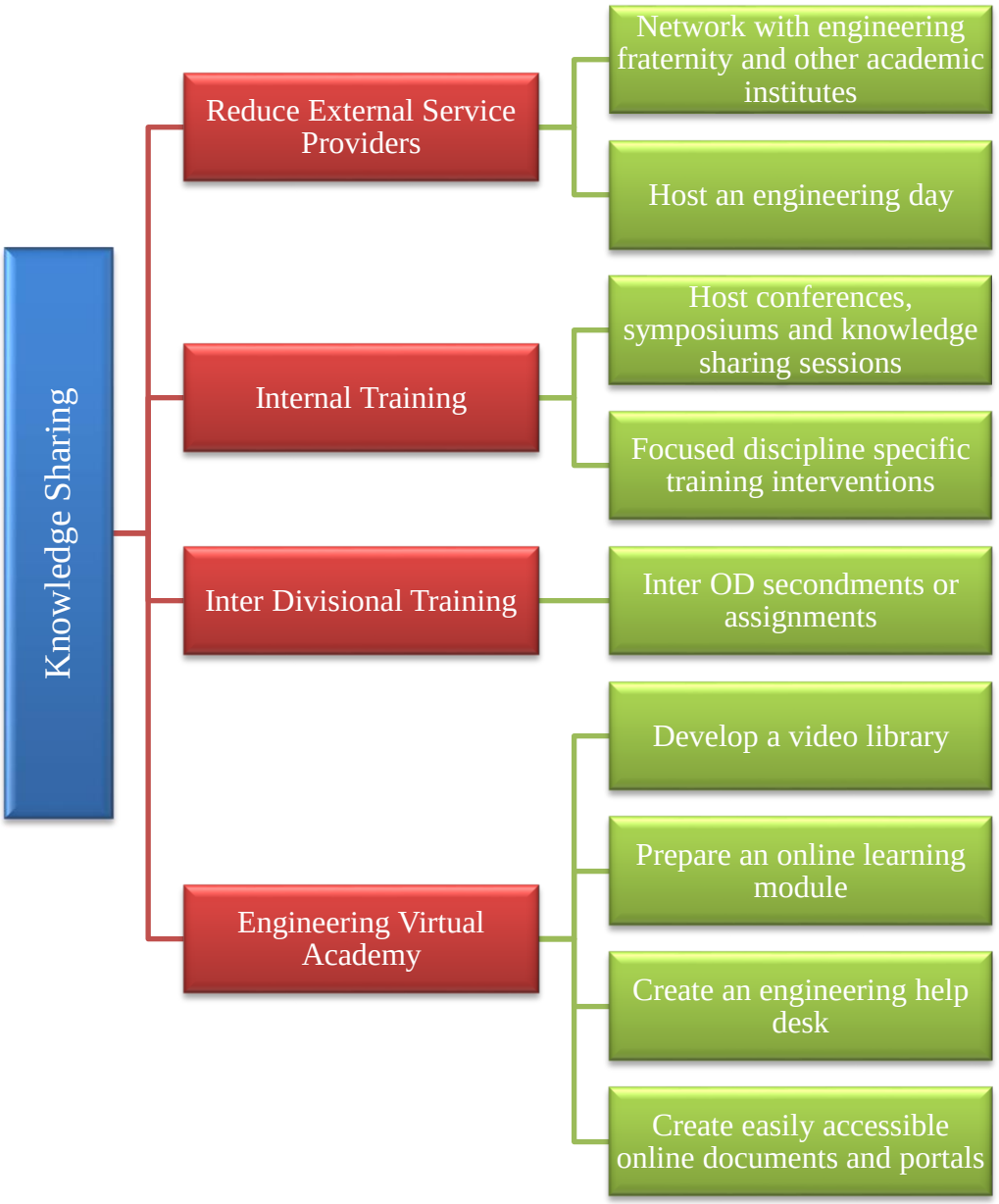

Figure 4.18: Suggested Change Items against Knowledge Sharing Theme

4.6 Conclusion

The focus group session, in conjunction with the literature, has revealed that there are a number of challenges facing the current EIT programme. The current status of the programme was discussed and it was found that the general perception of the programme was that it was failing in its expectations. There was also a lack of alignment between the programme and ECSA's requirements. This was largely due to unrealistic expectations and a lack of understanding by HR in terms of achieving professional registration as an engineer. One of the major shortcomings of the trainees was a lack of practical knowledge as well as unawareness of the functions outside of their own discipline.

The programme structure was criticized for two reason; namely, the length of the programme was not thought to be sufficient and the trainees were not required to book time to projects. The negative aspects of these two items were outlined by the group. The responsibilities of all stakeholders of the programme, including the mentors, mentees, custodians and decision makers, in the form of HR and executives, were comprehensively outlined. The various forms of knowledge sharing were discussed throughout the three phases of the session and this theme in particular manifested into proposed change items during the conceptual model phase. The final phase was that of the proposed change items established by the group, which was constructed in the form of a conceptual model. The change items essentially looked to address all of the deficiencies that were identified and discussed in the previous two phases.

The next chapter will link the objectives with the findings of the study. Conclusions will be drawn, recommendations to address the research problem will be proposed and suggestions for future studies will be presented.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The study has examined Transnet's EIT programme to determine if the programme is successful in achieving its purpose and look at ways that it may be improved. The South African government is looking towards Transnet to grow the economy of the country through its Market Demand Strategy which involves major investment in rail, port and pipeline infrastructure. In order to successfully execute this, the current and future employees of Transnet need to have a high level of competence. For this reason, the EIT programme plays a critical role in adding to a competent workforce. This chapter will present the conclusion to the study by determining if each of the research questions have been addressed.

This Chapter presents the conclusion to the study and the recommendations made based on the findings. The key findings of the study are first outlined and linked to the objectives of the study. This discussion centres on the level of competency of the programme graduates, the structure and training outcomes of the programme as well as the suggested ways in which to improve the programme. The suitability of using a systems thinking based framework for conducting the research is then considered. A conclusion to the study in terms of the objectives of the study is then offered. Recommendations based on the findings of the study are then given. Thereafter the limitations of the study are outlined and acknowledged. The chapter concludes by providing recommendations for areas of future research.

5.2 Key Findings

The presented data and the discussion of Chapter 4 gave a better understanding and insight into the programme, the way that it is perceived, the issues that were encountered as well as possible methods to improve the programme. Each of the objectives that were set for the study were addressed by analyzing the gathered data. The analysed data revealed key information that enabled

conclusions to be drawn in relation to each of the objectives. The following discussion summarises the findings of the study and how it has addressed each of the objectives of the study.

5.2.1 Objective 1: Level of competency of TGC trainees

The group collectively agreed that the graduates of the programme were not competent enough to function with minimal supervision. There was a concession that this did not necessarily apply to every single graduate, but the vast majority. It was agreed that both the programme and the trainees themselves were responsible for this failure. The trainees in their personal capacity did not show enough drive and take enough of an interest in their development. One of the vital areas in which the trainees were found to be lacking was practical, on site knowledge and understanding. They were also found to not be very aware of the functions of other disciplines and departments and how each contributed to projects.

The programme was thought to lack alignment with ECSA in terms of the expected outcomes and the definition of competency. The participants felt that the programme should be a gateway to achieve professional registration and that being deemed competent at the end of the programme should be an indication that this individual is ready to begin the application process. In the context of the outcomes described by ECSA, the group recognised that a professional engineer did not need to demonstrate technical expertise in every aspect of their discipline. Rather, the engineer needed to demonstrate proficiency in all of the eleven outcomes in an area of that discipline. It was felt that Human Resources did not fully understand these requirements and timelines in terms of professional registration. This later prompted the suggestion that the ownership of the programme should move away from Human Resources to engineering.

One of the major influences on the current operations of the programme was found to be the poor economic environment. This effected the training interventions available to the mentors due to companywide budget reductions especially in the case of training. These economic conditions triggered ideas amongst the focus group for how learning can occur without the reliance on external service providers, which led to the development of later subtheme of Knowledge Sharing.

5.2.2 Objective 2: The structure and training outcomes of the programme

There were a number of issues that the participants had with the programme that directly related to how the programme was structured. The expectation of senior staff on the programme graduates is that they operate with a fair degree of independence when carrying out work deliverables. It is therefore necessary for the programme to develop the trainees in such a way that they are able to problem solve and be resourceful when dealing with project issues rather than relying on others to simply give them a solution.

The major criticism of the programme structure was the length of the programme. All participants felt that two years was not enough time to produce competent engineers in line with ECSA's requirements for professional registration. The other major criticism was that trainees were not required to book time to projects which led to a lack of accountability and a sense of laziness amongst the trainees. It was felt that booking time to projects would manifest into more productive outputs in line with the outcomes required by ECSA.

The group also felt that the assessment process, every 6 months, was failing in its purpose to allow progression based on competency due to the fact that mentors and supervisors were passing the trainees for fear of being seen as the bad guy. This was doing more of a disservice to the trainees and causing more harm to their development. Another factor not benefiting the trainees was the unfavourable ratio of mentor to mentee. It was made clear that there was a large amount of trainees when compared to the amount of senior staff capable of mentoring them, which reduced the amount of attention each trainee was likely to receive. This was further strained by the fact that all mentors were also heavily involved in business operations.

The custodian of the programme, as suggested earlier, needs to move away from Human Resources to engineering. The custodian needs to be strong in terms of planning and execution when it comes to items such as introductions, transitions and budgeting. The two tools that the custodian urgently needed to attend to was the training plan and a progress tracking tool. It was suggested that the two could benefit each other and that the training plan could serve as the basis from which a tool to measure progress could be constructed. A more generic template needs to be developed for the

training plan, based on ECSA's requirements for professional registration and the experience of seasoned engineers and managers.

Knowledge sharing was a major topic that emerged as a result of the acknowledgment that the current economic environment was poor. The participants discussed an over reliance on external service providers and how this should not be the case. Many methods of sharing knowledge were discussed including the creation of platforms in which experienced staff could relay stories and recount project problems and solutions. It was also suggested that there needs to be more of a collaboration between the different operating divisions in order to maximize on training opportunities across the company's operations. Finally, there was a strong agreement amongst the group that the training interventions utilised needed to go more digital, and that all the modern technology available should be utilised to improve the sharing of knowledge.

5.2.3 Objective 3: Ways in which to improve the TGC graduate programme

The final phase of the focus group session directly addressed the third objective of the study, which was to look at actions that could be implemented in order to improve the programme. These items looked at ways in which to rectify the issues discussed in the previous two phases, which were broken down into the following themes; competency, programme structure, responsibility of mentors and mentees, responsibility of decision makers, responsibility of programme custodian and knowledge sharing. Figure 5.1 gives a summary of the proposed action items suggested to address these six themes.

Figure 5.1: Summary of Suggested Action Items

Source: Own Construct

5.3 Systems Thinking as a Theoretical Framework Revisited

The approach of the study was a systems methodology approach with a particular focus on using soft systems methodology to gather data. This approach encourages a cyclic learning process. This approach is often used in situations where the problem is not clearly defined and a better understanding is required. The EIT programme is a complex system with a large number of interacting variables including social, managerial and organisational processes. The problems which exist are not well defined and are subject to opinion. It is also something that will not be able to be fixed in one attempt. Rather a process of trial and error needs to occur that slowly looks to improve the programme based on what change efforts are influencing the programme in a positive way.

The approach was also successful in facilitating conversation, the sharing of ideas and stimulating debate. This enables different viewpoints to be heard and considered, and deductions made regarding what changes are the most desirable. This was one of the benefits of the study; changes were proposed and agreed upon as a collective. Finally, the cyclic approach and simplicity of the methodology makes the study ideally set up to be repeated in order to gradually improve the programme over time and changing environments.

The nature of a soft systems approach is that it generally gives a limited perspective on why problem situations occur. It tends to focus on changes that can be implemented without recognizing first what the underlying reasons are for necessitating change in the first place. The methodology assumes that consensus is easily obtained and neglects the role of conflicts of interest, making it seem as if they can be easily dealt with.

The soft systems approach also ignores the power dynamics, in the sense that some people may have been reluctant to speak in front of a perceived more powerful person in the company. The ultimate argument is that the world is full of conflicts of interest, coercion and contradiction and a soft systems methodology fails to address this directly, therefore, it is unclear whether the approach will be able to bring about significant change even with a number of iterations.

5.4 Recommendations

The recommendations made are based predominately on the change measures or action items that were established by the focus group and as a response to Objective 3. There were a total of 31 change measures suggested. It will obviously not be feasible to implement all of these changes at once. It is therefore recommended that a phased approach is adopted by prioritizing the most critical change requirements as well as the most easily attainable changes first. In other words if it is felt that the most critical thing is for the programme length to increase, then that process in order to motivate and approve that change, should commence immediately. At the same time, action items such as encouraging EIT's to take ownership and developing an integrated training plan template do not necessarily require approvals at the highest level and can thus also commence with immediate effect. It is also recommended that a committee be tasked to oversee the change measure implementation and that, within that committee, a dedicated champion is assigned to each theme or category of change. For example, knowledge sharing is a large theme with a number of change items; therefore, a dedicated resource with the correct expertise should be assigned to spearhead this category of change.

5.5 Limitations of the Study

The research was limited to a South African context, focusing on Transnet as an Organisation and TGC as a business unit, confining the results to the engineering profession and the project execution sector. The findings of the study may have an association to other training programmes outside of engineering, however, these findings cannot be liberally applied to any programme in a general sense. The study also focused on engineers working in a design and construction space, in the employ of Transnet Capital Projects.

The sample group of the study was chosen specifically to meet the goals of the study, hence, their responses and opinions are not representative of a larger generalized public such as the South African population or the larger engineering fraternity. It is specific to the context of Transnet Group Capital. The outcomes again should, for that reason, not be assumed for a broader general

view. The quality of the research is also dependent on the proficiency of the researcher, as well as the researcher's ability to omit researcher bias from the results, using the methods detailed in Chapter 3.

A further limitation of the study is that only senior engineers and managers were interviewed given their expertise and knowledge of the profession. This may give a skewed or one sided view, and may not represent the views of lower level employees or of the trainees themselves. Finally, given the constrained time and limitation in terms of resources, the depth of the study and its findings may only represent a small actuality and further research may be required to gain a more in depth understanding.

5.6 Recommendations for further study

There are two opportunities for further research that was identified by the researcher. The first would be to re-conduct the study after the suggested change measures have been implemented. As mentioned the cyclic nature of a soft systems approach enables one to do this using the same methodology, in order to see if there has been an improvement. Linked to this would be to include in the study the perspective of the trainees themselves. Given the population of trainees in the organisation, a quantitative approach may be considered more suitable to get the view of the entire trainee population.

The second opportunity for further research is the utilization of hard systems approaches such as causal loop diagrams by means of specialised software. As mentioned, the underlying reasons for the cause of the experienced problems, and the leverage points in the system are not given due attention using a soft systems approach. It would therefore be prudent to conduct a study of this nature now that a clearer understanding has been attained.

5.7 Conclusion

Transnet has a social responsibility to deliver on its operating strategy by executing projects on time, within budget and of a good quality. In order to achieve this, the company needs to have within its ranks a highly competent workforce who possess the necessary skills. The topic for the study was chosen with the ultimate goal of improving the EIT programme at Transnet such that it produces competent engineers who are able to deliver on national infrastructure projects. This was seen as an indirect means to assist in developing the economy of South Africa. The researcher therefore looked at how the current programme was perceived, how it compared to the requirements of professional bodies, how it was structured and how it can possibly be improved.

The presented data and discussion in Chapter 4 effectively described the poor perception of the programme amongst staff of a senior technical and managerial level. It was made clear that the programme was not functioning as it should and consequently requires corrective action. One cause for this was suggested to be a lack of alignment with ECSA. The structural issues affecting the programme were clearly defined and these assertions manifested into ideas for corrective actions or changes that could be made to improve the programme. The responsibilities of all stakeholders of the programme were outlined in a sense of what has been happening and what needs to be happening. A major portion of the discussion centred on knowledge sharing, how it can benefit the trainees, and how it can benefit the company in terms of cost reductions. Finally, 31 possible change measures and actions to be taken were identified.

The primary research objectives of the study have been successfully satisfied and the findings of the study can have a meaningful outcome if implemented. The implications and benefits of the study have been outlined and the limitations have been listed and accepted in no uncertain terms. The limitations of the study did not prevent the findings and corresponding outcomes from achieving the objectives. The study has been successful in revealing a deeper understanding of the Engineer in Training programme at Transnet and its deficiencies as well as the means to begin to address the identified problems. This will in turn have a positive effect on the quality of trainees being produced, thereby the quality of work being done by the company and ultimately the economic strength of the country. The study has thus been valid and useful, giving a number of

recommendations for the improvement of the programme. Recommendations for further study have also been suggested and it is thought that if these studies are taken further, significant advancement of the programme can be achieved.

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ANNEXURE A: Gatekeepers Letter

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TRANSNET

ANNEXURE C: MEMORANDUM

www.transnet.net

To: Mr. Oupa Radise, General Manager: Human Resources, Transnet Capital Projects

From: Ashneil Premraj, Engineer: Marine, Transnet Capital Projects

Date: 04 March 2016

SUBJECT: **REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT TRANSNET CAPITAL PROJECTS**

PURPOSE

1. The purpose of this memorandum is to seek approval for conducting research at Transnet Capital Projects in the fulfillment of the degree MCom Leadership.

BACKGROUND

2. Ashneil Premraj is currently employed in the engineering department in the capacity of marine engineer. In attempting to further his own personal growth and development, Ashneil has embarked on an MCom Leadership programme. He is currently completing his final year of this programme at the University of KwaZulu-Natal and, as part of the programme, a dissertation research project must be undertaken.

3. The proposed research, entitled: "An Evaluation of Transnet Capital Projects' Graduate Programme: A Sytems Approach", is planned.

4. Ashneil is a graduate of the Engineer in Training Programme. It is a programme that he is therefore very familiar with and holds a personal interest in. The basis for the research will be to evaluate the programme using Sytems theories and thinking. This will be done in order to determine if it is achieving its intended outcomes, thereby, looking for ways in which to improve the programme. In this way we can ensure that the programme is serving both the trainees as well as the company.

MOTIVATION

5. The responsibility of Transnet Capital Projects is immense for South Africa in the context of developing infrastructure, raising the economy, creating employment and ultimately improving the lives of South African citizens. This same level of responsibility is thereby shouldered by the employees of Transnet, especially those who are in critical positions such as engineers, managers and executives. It is, therefore, highly important to ensure that employees who occupy these roles presently and in the future have a solid experiential foundation and are competent enough to purposefully complete their jobs.

6. The study will benefit graduates entering the program and those currently in the program through the evaluation of the activities and outcomes of the program. The greater engineering staff of TCP will benefit in the long run as the caliber of young engineers coming through the program will be of a higher level.

7. It is therefore motivated on the basis of the abovementioned reasons that permission be granted to undertake this research at Transnet Capital Projects.

FINANCIAL AND BUDGET IMPLICATIONS

8. There is no financial or budgetary cost considerations required for this study.

ETHICAL USE OF INFORMATION

9. Transnet Capital project's participation in this study is very critical. They may, however, choose not to participate or withdraw from the study at any time without consequence.

10. The results of the study will be used for academic purposes only. All findings will be made available to the company if requested to utilize as deemed necessary.

11. All findings will be strictly confidential if so requested and will only be viewed by the University staff who will grade the study.

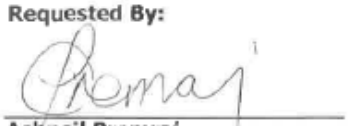
12. Please contact my supervisor, Dr. Shamim Bodhanya, on Bodhanyas1@ukzn.ac.za if you have any questions or comments regarding the study.

RECOMMENDATION

13. In light of the above, it is therefore recommended that Mr. Oupa Radise, General Manager: Human Resources, Transnet Capital Projects approves the request for the

research study entitled: "Root cause analysis of Project Gate Review Failures when evaluated against a Project Lifecycle Process Methodology" to be undertaken at Transnet Capital Projects. Please sign below to indicate your willingness to participate in the study.

Requested By:



Ashneil Premraj
Engineer: Marine, TCP
Date: 2016/03/04

APPROVAL SECTION:

I, Oupa Radise, General Manager: Human Resources, Transnet Capital Projects herewith grant authority and my permission for the above mentioned study to be conducted on Transnet Capital Projects.

Approved by:

Oupa Radise
General Manager: HR, TCP
Date: 13/4/2016

ANNEXURE B: Ethical Clearance Form

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

02 August 2016

Mr Ashneil Premraj (208504258)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Premraj,

Protocol reference number: HSS/0926/016M
Project title: An evaluation of Transnet's Engineer in Training Programme: A systems thinking approach

Full Approval – Expedited Application

In response to your application received on 22 June 2016, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL.**

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

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

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Dr Shenuka Singh (Chair)

/ms

Cc Supervisor: Dr Paul Edmund Green
Cc Academic Leader Research: Dr Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj / Ms Eileen Mohamed

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
Website: www.ukzn.ac.za

ANNEXURE C: Informed Consent for Focus Group Participation

UNIVERSITY OF KWAZULU-NATAL

GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

MCom Leadership Research Dissertation

Researcher	:	Ashneil Premraj	(076 589 2586)
Supervisor	:	Prof. Paul Green	(031 260 8690)
Research Office	:	Ms P Ximba	(031 260 3587)

Dear Respondent,

I, Ashneil Premraj, a Master of Commerce student at the Graduate School of Business and Leadership of the University of KwaZulu-Natal, invite you to participate in a research study as part of my dissertation project. The research project is entitled "An Evaluation of Transnet's Engineer in Training Programme: A Systems Thinking Approach". The aim of the study is to identify how the graduate programme currently offered by TGC can be improved. This will be done by benchmarking the activities and outcomes of the programme against ECSA's requirements for a professional engineer.

The aim will be achieved by the establishing the following objectives for the study:

- To determine the level of competency of TGC trainees and programme graduates benchmarked against ECSA competency standards.
- To evaluate the structure and training outcomes of the programme.
- To recommend ways in which to improve the TGC graduate programme.

The basis for the research will be to evaluate the programme using Systems theories and thinking. This will be done in order to determine if it is achieving its intended outcomes, thereby, looking for ways in which to improve the programme. In this way we can ensure that the programme is serving both the trainees as well as the company.

Your participation in this project is voluntary. The results of the study will be used for academic purposes only. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns regarding the study or about participation in the study, you may contact me or my supervisor at the numbers listed above.

The study will take place in the form of a focus group meeting which will take approximately 2 to 4 hours. I ask that you allow me your time and input in order to achieve the objectives of this study as we look to improve our organisation.

Yours Sincerely,

_____ _____

Ashneil Premraj Date

This page is to be retained by participant

UNIVERSITY OF KWAZULU-NATAL

GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP

MCom Leadership Research Dissertation

Researcher	:	Ashneil Premraj	(076 589 2586)
Supervisor	:	Prof. Paul Green	(031 260 8690)
Research Office	:	Ms P Ximba	(031 260 3587)

CONSENT

I…… (Full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I hereby consent ☐ / do not consent ☐ to have this interview recorded
(Please x)

…… ……

Signature of Participant **Date**

ANNEXURE D: Focus Group Schedule

Part A

Hi my name is Ashneil and as previously discussed with you I am doing a study on Transnet's Engineer in Training Programme for my dissertation as part of my MCom, through the University of KwaZulu-Natal. Thank you all for agreeing to avail yourselves for this focus group session. The results of this study will be treated in strict confidence and should they be published will be published in aggregate form only.

Part B

The first phase in attempting to stimulate thinking and establish perceptions related to the Engineer in T2raining programme will be to conduct an exercise known as developing a rich picture. A rich picture is a sketch that depicts key aspects of a situation such as the structure, physical characteristics, processes, relationships and issues. I ask that everyone now take one of the markers provided and come up to the whiteboard/flipchart, and draw any thing that you feel is representative of the EIT programme.

** Allow time for completion of Rich Picture*

The rich picture will now be analysed and discussed in order to determine root definitions. Discussion will be encouraged using the prompts listed in Part C.

Part C

The next phase will involve a group discussion.

The following prompts will be used to encourage discussion in a direction that will assist in achieving the objectives of the study.

Objective 1: To determine the level of competency of TGC trainees and programme graduates benchmarked against ECSA competency standards.

Prompt: How do you perceive the graduate programme at Transnet?

Prompt: Do you feel that the programme is achieving its intended outcome?

Prompt: What level do you expect the trainees to be operating at on completion of the programme?

Prompt: How does the current programme outcomes compare to ECSA's competency standards for aspiring professional engineers?

Prompt: What do you feel the calibre of trainees exiting the programme is currently?

Objective 2: To evaluate the structure and training outcomes of the programme.

Prompt: What are some of the challenges experienced with the programme and the trainees?

Prompt: Does the structure compliment the desired outcome, including the length, method of assessment?

Prompt: Does leadership affect the success of the programme and how is the leadership performing with the Transnet programme.

Prompt: How is the current programme structured and assessed?

Prompt: What is the intention of the programme and what are the levels expected of graduates of the programme?

Objective 3: To recommend ways in which to improve the TGC graduate programme.

Prompt: What are some of the key elements of the programme that need to be given the highest priority of attention?

Prompt: What are some of the techniques that can be implemented by Transnet in order to improve the programme in your opinion?

Prompt: What are some of the techniques that can be implemented by mentors and supervisors in order to improve the programme in your opinion?

Prompt: What are some of the techniques that can be implemented by the trainees in order to improve the programme in your opinion?

Prompt: Do you think that the programme benefits the business overall given the current strategy of the organisation now and in the future?

Thank you for the time you have taken to be part of the study. Do you perhaps have any questions?

ANNEXURE E: Turn It In Report

Dissertation Final

ORIGINALITY REPORT

%0	%0	%0	%0
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

1%

★ Submitted to Colorado Technical University Online

Student Paper

EXCLUDE QUOTES	ON	EXCLUDE MATCHES	< 1%
EXCLUDE BIBLIOGRAPHY	ON		