Assessing satisfaction with the change management process and work engagement levels of engineers in an electricity supplier

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ABSTRACT

The objective of this research is to study Eskom engineers' satisfaction with the new Engineering Change Management (ECM) process and assess their job satisfaction and work engagement levels in view of the mentioned ECM process. A cross-sectional and quantitative approach is used to obtain necessary data. A self-designed ECM Process Satisfaction Questionnaire, a short form of the Minnesota Satisfaction Questionnaire and the Utrecht Work Engagement Scale are used in the collection of data for this study.

Generally, the engineers are not fully satisfied with the ECM process. Of major concern to the engineers is the way in which both the ECM process is implemented and the ECM process leaders consult and engage with the engineers. In addition, the engineers are satisfied with their employment, a fact that is closely related to their being actively involved in their work. On the downside, engineers are concerned about the limited opportunities for advancement in their current positions.

Regarding work engagement, the engineers are actively employed as is evidenced by their resilience and perseverance in their work, even when problems arise. In terms of the relationship between the study constructs, ECM process satisfaction has a very positive effect on the engineers' work engagement and a slightly less positive one on their job satisfaction.

It is recommended that the study be conducted on the whole population of Eskom engineers who are involved in ECM process. In addition, ECM process control manuals need to be reviewed and assessed in order to improve the implementation of this process. Lastly, an Internal Change Management Strategy needs to be devised to create readiness for change in Eskom's Engineering Departments.

Keywords: engineering change management, job satisfaction, work engagement, Minnesota Job Satisfaction Questionnaire and Utrecht Work Engagement Scale.

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CHAPTER 1 – NATURE AND SCOPE OF THE STUDY

1.1 INTRODUCTION

The work environment is made up of different characteristics of the job such as the way job activities are carried out and completed. These characteristics have significant influence on employee job satisfaction and engagement (Raziq & Maulabakhsh, 2015). In the electricity supplier under study, Engineering Change Management (ECM) process is at the heart of how engineering work is carried out and it is, therefore, deemed to have a bearing on the engagement levels and job satisfaction of the engineers.

Extensive studies have been undertaken to discover how organisations can become more competitive and profitable. Job satisfaction and work engagement are the common factors that successful companies share (Shmailan, 2016). Rothmann and Coetzer (2002) state that job satisfaction among employees is a reflection of organisational effectiveness. This notion is echoed by Saari and Judge (2004) who assert that adequate and optimal operation of an organisation to a certain extent depends on the level of satisfaction of employees and that is why there is a well-known statement, “happy employees are productive employees”. Baldoni (2013) emphasises that improving employee engagement is crucial for improving productivity and creating positive outcomes that are good for both employees and customers. This author also asserts that engaged employees are focused and assertive and have the best interest of their organisations at heart. On the same note, Abraham (2012) asserts that in today’s fiercely competitive environment, having actively engaged employees has become one of the ways in which organisations can retain their personnel. Regarding employee retention, Lumley, Coetzee, Tladinyane and Ferreira (2011) indicate that this century is characterised by the evolution of knowledge workers whose increasing mobility is a result of their endeavours to satisfy their own individual demands and, consequently, organisations are becoming increasingly concerned about the retention of talented employees.

1.2 PROBLEM STATEMENT

This study is meant to assess Eskom's engineers' satisfaction with the new Engineering Change Management (ECM) process and its effect on their job satisfaction and work engagement levels. This ECM process was introduced in 2012 to control execution of engineering changes on existing operating generation assets and to standardise engineering change processes for all Eskom Generation Divisions (Jagjiwan, 2016). However, almost three years after the implementation of this process, the assessment report indicates that there is generally a negative attitude shown towards the ECM process by the engineers and there is considerable non-compliance by some generation sites (Ungerer & Jagjiwan, 2014). This scenario has warranted a research to analyse the ECM impact on the engineers' job satisfaction and work engagement. Full insight into these factors can help Eskom to manage its engineers better to meet its service commitment. Eskom is a critical national economic player and generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity used in Africa (Eskom, 2016). The focus of the study is on Eskom's Generation Division, Centre of Excellence (CoE), Production Engineering Integration Coal (PEIC) offices and other centralised engineering offices which support electricity generation sites.

1.3 PRIMARY OBJECTIVE OF THE STUDY

The primary objective of this study is to determine Eskom engineers' satisfaction with the new Engineering Change Management (ECM) process and assess their job satisfaction and work engagement levels in view of the new ECM process.

1.4 SECONDARY OBJECTIVES OF THE STUDY

In order to address the primary objectives, the following secondary objectives have been identified:

- Conduct an in-depth literature study on the Engineering Change Management process, job satisfaction and work engagement.
- Conduct an empirical assessment and measure Eskom engineers' satisfaction with the ECM process, job satisfaction and work engagement.

- Assess the impact of satisfaction with ECM process on Eskom engineers' job satisfaction and work engagement and determine the relationship between job satisfaction and work engagement.
- Interpret the empirical results and assess their possible implications for Eskom's business.

1.5 SCOPE

This study is conducted in the subject field of organisational behaviour and leadership and change management. The primary focus is on assessing Eskom engineer's satisfaction with the ECM process, together with their job satisfaction and work engagement levels. This assessment is followed by a study of the relationships between the above-mentioned concepts.

Eskom has various divisions but this study is limited to the Generation Division sites (power stations), Centre of Excellences (CoE), Production Engineering Integration Coal (PEIC) and other centralised offices which provide design and system integration support for the mentioned generation sites.

1.6 RESEARCH METHODOLOGY

The study is cross-sectional.The research approach is quantitative and follows a non-experimental research method whereby there is no planned intervention upon the respondents and the data is collected via questionnaire. A non-probability convenience sampling is used. The target sample is Eskom engineers who work at Eskom's power stations, CoE, PEIC and other centralised engineering offices which provide design and system integration support for the mentioned generation sites. The respondents are chosen from different age groups, different races and comprise both females and males.

1.6.1 Literature review

The purpose of the literature review is to study what other researchers have concluded regarding engineering change management, job satisfaction and employee engagement. It provides the background and motivation for the objectives that guide this research project. The literature study includes the utilisation of different sources which include journals, research articles, books, computerised

databases and the Internet. The Ferdinand Postma Library (North West University) and its search engines are used to gather information and source articles that are related to this study.

1.6.2 Measuring instrument

A self-completion questionnaire is used to collect data. The questionnaire initially explains the purpose of the questionnaire, followed by the sections that require demographic and biographic information of the respondent. Confidentiality of the information given and the anonymity of the respondent are emphasised. The next phase of the questionnaire contains the subscales questions that pertain to the ECM process satisfaction, job satisfaction and work engagement. The questions are short and do not have double negatives, in addition, they are tentative and not loaded with the assumption that the respondent has the knowledge or attitude that the researcher is seeking.

The questionnaires were emailed and/or personally handed to the participating Eskom engineers at the generation sites, Coe and PEIC offices and other centralised engineering offices. The response rate was increased by using emails and telephone calls to remind the respondents to answer the questionnaires.

Satisfaction with the Engineering Change Management (ECM) process is measured by a self-designed questionnaire.This questionnaire indicates how satisfied or dissatisfied respondents are with the ECM process by asking them to rate themselves on 10 questions by using a Likert scale of 1 to 5 whereby 1 is “not satisfied” and 5 is “extremely satisfied”.

Statements such as “the way ECM process was introduced”, “how ECM process is implemented” and “the value that ECM process adds to your career” form part of the questionnaire.

Job satisfaction is measured by using **Minnesota Job Satisfaction Questionnaire** (MJSQ) a method which was developed by D.J. Weiss, R.V. Dawis, G.W. England and L.H. Lofquist in 1967. This questionnaire indicates how satisfied or dissatisfied respondents are with their employment by asking them to rate themselves on twenty questions by using a Likert scale of 1 to 5 whereby 1 is “not satisfied” and 5 is “extremely satisfied”. The questionnaire measures three dimensions of job

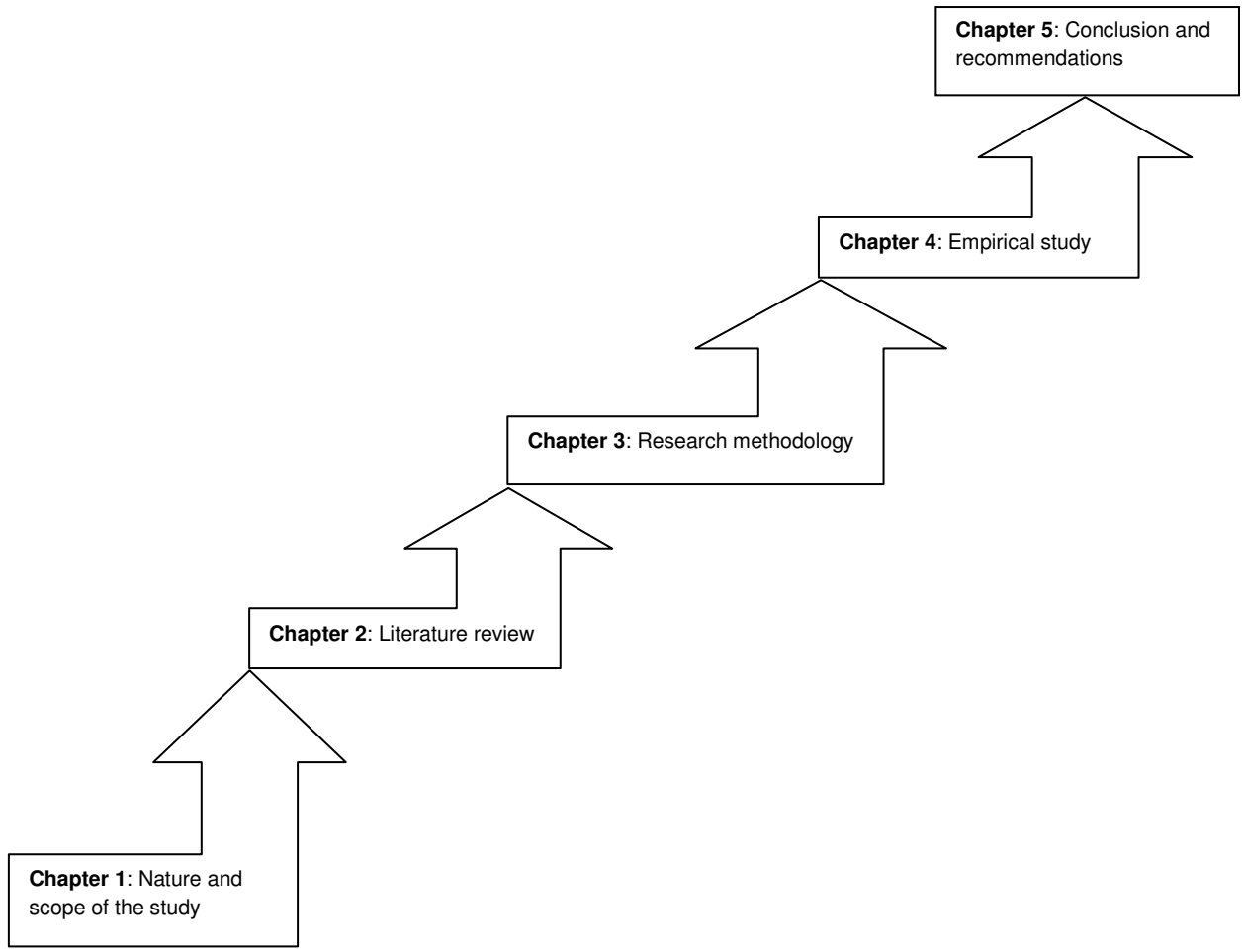
satisfaction (intrinsic, extrinsic and general job satisfactions) by using statements like “the chance to work alone on the job”, “the way my boss handles his workers” and “the way my co-workers get along with each other”.

For the measurement of work engagement, the **Utrecht Work Engagement Scale** (UWES) developed by W.B. Schaufeli, M. Salanova, V. Gonzalez-Roma and A.B. Bakker in 2002 is used. Three subscales of UWES are used, namely, vigour, dedication and absorption. Statements like “I am bursting with energy in my work”, “I find my work full of meaning and purpose” and “I get carried away when I am doing my work” are used. UWES is scored on a seven-point frequency rating scale varying from 0 to 6 whereby 0 is “never” and 6 is “always”.

1.6.3 Statistical analysis

The Statistical Package for the Social Sciences (SPSS) (version 23) is used to carry out statistical analysis. Firstly, descriptive statistics such as means, standard deviations and skewness are used to explore the data. Exploratory factor analysis is used on the study constructs items to ensure that the variables are measuring the aspects of the same underlying dimension. A Cronbach alpha coefficient (α) is used to assess the internal consistency and reliability of the measuring instruments. Spearman correlation coefficients are used to assess the relationship between the study constructs. This is extended to study the relationship between study constructs and ordinal biographic variables. T-test analysis is used to study the relationship between the study constructs and non-ordinal biographic variables like gender and race. “Effect sizes for means” test is used to supplement T-test analysis to draw practical conclusions.

1.7 CHAPTERS' OVERVIEW



Chapter 1: Nature and scope of the study

The discussion in this chapter provides a general introduction, problem statement, objectives of the research and research methodology.

Chapter 2: Literature review

The discussion in this chapter focuses on literature study of aspects of engineering change management, job satisfaction and employee engagement.

Chapter 3: Research methodology

This chapter explains the framework that is used in this research, research instrument, the population sample selection methods and how the research instrument was distributed to the sample. This chapter discusses the techniques used in the analysis of the data captured.

Chapter 4: Empirical study

Chapter 4 outlines the empirical framework used in the study. It presents the results gathered and analysed in accordance with the research methodology and empirical framework. Finally, these results are discussed and elaborated on.

Chapter 5: Conclusion and recommendations

In this chapter, conclusions and recommendations are made based on the discussions conducted in Chapter 4.

1.8 CHAPTER SUMMARY

This chapter introduced the focus of the study by discussing the topic of the mini-dissertation. The discussion on problem statement provided insight into the motivation for conducting the study and the problem the study will attempt to address. The primary and secondary objectives of the study were stated and the scope of the study was outlined. This highlighted subject field of the study and the areas of the organisation that formed part of this research. The research methodology part indicated the reasons for conducting literature review. It also highlighted tools used in the empirical analysis which included measurement instruments and statistical analysis packages used. Lastly, chapters' overview highlighted the main focus of each chapter in the mini-dissertation.

CHAPTER 2 – LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides insight into the theory of engineering change management process, job satisfaction and employee engagement.

2.2 ENGINEERING CHANGE MANAGEMENT (ECM) PROCESS

Engineering Change (EC) can be defined as any change or modification of an object, system, manufacturing process, assembly or part thereof, after the original design has been officially released or after the mentioned elements has been put into production (Gao, Du & Qu, 2008). The EC process requires broad communication and involvement of multidisciplinary teams from within the company. The best possible solution is achieved through active participation of all the teams involved and the final decision on the engineering changes is taken by the cross-functional engineering change committee (Pikosz & Malmqvist, 1998). ISO's technical product documentation standard ISO11442-6 stipulates some primary reasons for the existence of the engineering changes (Pikosz & Malmqvist, 1998). EC happens firstly because of a change which is the result of a modified function or altered production requirements. Secondly, it can occur if there is a change in the technical application of the part or the introduction of a new part. Thirdly, if there is need for replacement or withdrawal of a part and lastly, if there is a need for either correction of errors or update of a document.

The ECM process faces several challenges. Firstly, the best engineering change solutions that cater for the needs of all parties can be achieved through the involvement of cross-functional teams but this is made difficult by the fact that different functions usually have different goals (Pikosz & Malmqvist, 1998). Secondly, the process is lengthy and tedious because of extensive and stringent documentation management which involves searching the archives, updating documents, creating new documents and sending them for approval. Thirdly, the ECM process is sometimes difficult to understand and appreciate. In turn, employees become frustrated and reluctant to use the process and end up avoiding engineering changes or performing them without using a formal process.

2.3 JOB SATISFACTION

Job satisfaction is defined by Yousef (2000) as a measure of employee's positive or negative feeling towards his or her job. Job satisfaction has two different dimensions and these are intrinsic job satisfaction and extrinsic job satisfaction. Intrinsic job satisfaction relates to the way an employee feels about the actual tasks he or she must perform at the workplace, whereas extrinsic job satisfaction relates to the way employees feel about the surrounding work environment that is external to the workplace tasks (Hirschfeld, 2000). Job satisfaction is deemed to be an important attitude because of several factors. Firstly, Judge and Watanabe (1993) posit that job satisfaction is directly linked to the employees' well-being and life satisfaction. Secondly, Hirschfeld (2000) notes that managers believe that job satisfaction is a key attribute that influences employees behaviour and in turn affects organisational effectiveness. The foregoing is supported by Kreitner and Kinicki (1998) who state that most employers acknowledge that the effective functioning of their organisation hinges on both the level of job satisfaction of employees and in their exercising of their full potential.

2.4 PRECONDITIONS OF JOB SATISFACTION

A considerable amount of the research effort aimed at explaining job satisfaction has revolved around the personal and environmental characteristics' paradigm. The conclusion has always been that if the work environment is conducive and satisfies the employees' needs, values and personal characteristics, it is likely that his/her individual job satisfaction will be high (Ellickson, 2002). In general, most studies have pointed two general categories as the determinants of job satisfaction and these are environmental factors and personal characteristics, whereby environmental relates to the work environment and personal relates to individual characteristics. Waqas *et al*. (2014) have studied some key factors that influence job satisfaction and these include participation in decision making, empowerment, reward and recognition and work place environment.

2.4.1 Participation in decision making

Participation in decision making (PDM) has various and distinct forms. PDM can be formal, informal, direct and indirect. Formal participation involves a system of rules

put in place by the organisation whereas informal participation is non-statutory and is driven by the casual interaction between employees. On the other hand, direct PDM involves personal involvement of the organisation's members and indirect PDM is conducted with employee representatives (Cotton, Vollrath, Froggatt, Lengnick-Hall & Jennings, 1988). Irawanto (2015) states that an organisation can benefit from collaboration between managers and employees. It is sometimes thought that this approach can be challenging for employees but, at the same time, it can provide some motivation for the employees (Ladd & Marshall, 2004). Harber, Marriot and Idrus (1991) argue that employee participation is one of the crucial drivers for the successful execution of management strategies and it is significantly influential in determining the degree of job satisfaction.

2.4.2 Empowerment

Due to intense competition, employers now use employee empowerment as a tool to survive (Waqas *et al*., 2014). Siegall and Gardner (2011) highlight that entrepreneurs, managers and researchers in the field of management consider employees as a crucial resource that enable organisations to achieve competitive advantage and they believe that empowerment of employees is central to the success of their organisations. Employee empowerment is defined as giving employees freedom to decide how best they can execute their daily job tasks and includes providing knowledge and authority to employees (Carless, 2004; Hales & Klidas, 1998). Employee empowerment is a broad topic but in its various activities it manifests its importance in the task performance and the job satisfaction that employees achieve (Pelit, Ozturk & Arslanturk, 2011). Aryee and Chen (2006) are some of the authors who have highlighted positive relationship between empowerment and job satisfaction.

2.4.3 Reward and recognition

Reward and recognition programmes serve as management strategic techniques in keeping employees passionate and their self-esteem high (Danish & Usman, 2010). Andrew and Kent (2007) highlight that employee commitment is a function of rewards and recognition and stress that the success of organisations is extremely dependent on how employees are treated and they emphasise that many

organisations have benefitted immensely from their business strategies that dealt with balanced reward and recognition programmes for employees.

Freedman (1978) argued that when effective rewards and recognition are introduced in the organisation, that creates a conducive working environment which motivates employees to perform well in their jobs. Employees regard recognition to be the reflection of their worth and a sense of appreciation from the organisation and this strengthens their morale, which translates to increased productivity for the organisation. Wilson (1994) indicates that effective job reward and recognition can transform employees' jobs into a major satisfaction in their life and this can strengthen the bond between the employees and the organisation. Ali and Ahmed (2009) highlight the importance of rewards and recognition and conclude that there is a significant relationship between reward and recognition and job satisfaction by claiming that any alteration to reward and recognition produces a corresponding change in work motivation and satisfaction.

2.4.4 Work environment

Raziq and Maulabakhsh (2015) point out that many businesses face numerous challenges because they underestimate the importance of the working environment. These authors highlight that work environment comprises two main elements which are work and context. The former element refers to important features of the job, such as the way the job is done, training, control over one's job activities, sense of achievement from work, variety in the job task and its intrinsic value. The latter element refers to physical and social working conditions.

Chandrasekar (2011) cites that human to human interactions and relations play an important role in the employee job satisfaction. In their conceptual model, Raziq and Maulabakhsh (2015) mention that working environment includes variables such as working hours, job safety, job security, relationship among employees, employees' esteem needs and top management influence. These authors concluded that the working environment has a positive effect on job satisfaction of employees and that bad working conditions inhibit employees from performing to their best ability.

2.4.5 Leadership and supervisor

Spector (1997) asserts that supervisor's behaviour has a significant influence on employee job satisfaction. This notion is emphasised more by Robbins (1993) who states that employee satisfaction increases when the supervisor is warm, compassionate, understanding, offers credit for good performance and shows personal interest in employees.

2.5 JOB CHARACTERISTICS MODEL

Kumar, Abbas, Ghumro and Zeeshan (2011) point that employees can excel at their jobs when they have the required ability and are willing to perform their task. These authors state that willingness and motivation to perform their jobs can be created by managers by designing jobs that motivate and satisfy employees at work. With the realisation for the need of an innovative job design for the employees, Hackman and Oldham (1976) devised and presented their job characteristics model. This model comprises five components for job characteristics namely: skill variety, task identity, task significance, autonomy and feedback. Boonzaier, Ficker and Rust (2001) define these characteristics as follows:

Skill variety – a measure of job demand for different activities and employee skills, set and talent required to perform the tasks.

Task identity– an extent to which an employee and can initiate a task and drive it through to completion and witness its complete wholeness.

Task significance – an extent to which the employee's job affects the lives or the work of other people, either within the organisation or outside.

Autonomy – sense of independence, freedom and responsibility when carrying out the task.

Feedback– possibility for the employee to receive clear information from the job about his performance on the work activities that are required by his job.

Chen and Chiu (2009) allude to the notion that job characteristics can affect organisational citizenship behaviour through employees' perceptions such as felt responsibility and perceived task importance. These authors stress that job characteristics that have intrinsically motivating elements foster a feeling of responsibility and increase employees' appreciation of their task significance. They

attest that employees who consider their task to be significant are better placed to understand the importance of their work environment and value their relationship with other employees. The Job Characteristic model devised by Hackman and Oldham (1976) highlights that job characteristics can influence an employee's attitude towards job involvement. Strong core job characteristics strengthen employees' internal motivation and employees who are highly motivated are deemed to be more likely to be actively involved in their jobs because they have a stronger internal drive to dedicate their efforts towards their jobs (Brown, 1996).

2.6 RELATIONSHIP BETWEEN JOB SATISFACTION AND WORK PERFORMANCE

The study of the relationship between job satisfaction and job performance has fascinated researchers for ages (Judge, Bono, Thoresen & Patton, 2001). There is an on-going debate on whether job satisfaction leads to job performance or not. On one hand, social psychologists reason that attitudes influence employee's behaviour. On the other hand, some industrial psychologists argue that employees' attitude toward their jobs is unrelated to their on-job behaviour (Judge *et al*., 2001). Herman (1973) indicates that when situational constraints and demands on behaviour are lower, correlation between job satisfaction and job performance becomes more noticeable. Wright, Cropanzano and Bonnet (2007) scrutinised work by Judge *et al*. (2001) and realised that the results of their various models regarding the relationship between satisfaction and performance showed low correlation and they posit that that psychological wellbeing is one of the variables that moderates the relationship between job satisfaction and job performance. Carmeli and Freund (2004) validate Randall and Cote's (1991) conceptual models that posit that affective, continuance and career commitments are positively related to job performance through job satisfaction as a mediating variable. These authors go a step further and conclude that the best variable for predicting perceived job performance is job satisfaction, since both constructs are "more changeable and fragile variables than several forms of work commitment that were tested".

2.7 RELATIONSHIIP BETWEEN JOB SATISFACTION AND ORGANISATIONAL COMMITMENT

Meyer and Allen (1991) define organisational commitment as an emotional attachment that employees have with their organisation which is underscored by a strong association with the organisation and a drive to help the organisation to achieve its' goals. These authors state that organisational commitment has three dimensions which are affective commitment, continuance commitment and normative commitment. Affective commitment is an emotional attachment to the organisation while continuance commitment is a calculative commitment whereby employees remain with the organisation and are hesitant to move due to the costs and sacrifices that will be associated with the move. On the other hand, normative commitment is driven by a feeling of moral responsibility and an obligation to continue to serve the organisation regardless of the recognition that the organisation will give to the concerned employees. Several authors, including Angle and Perry (1981) and Hunt, Chonko and Wood (1985) assert that a strong positive relationship exists between organisational commitment and favourable work outcomes, such as job satisfaction, performance and adaptability. A study by Kotze and Roodt (2005) empirically confirms a strong correlation between job satisfaction and employee commitment. The empirical results of Lumley *et al*. (2011) reveal a significant relationship between job satisfaction and affective and normative commitment variables.

2.8 RELATIONSHIP BETWEEN AGE AND JOB SATISFACTION

The relationship between age and job satisfaction was found to be positively linear by authors such as Rhodes (1983). However, various studies highlight that the strength of that relationship is small and underscored by correlations ranging between 0.10 and 0.20 as observed by Warr (1994). These authors mention that these parameters varied significantly from one organisation to the other and this led to the conclusion that the age-job relationship is not consistent across different organisations. Studies by Saner and Eyupoglu (2012) show that personal characteristics affect job satisfaction in many complex ways. These authors stress that age and gender are two characteristics whose association with job satisfaction attracts a lot of interest from researchers. A study by Near, Rice and Hunt (1978)

investigating the relationship between age, occupational level and job satisfaction, shows that rank and age are dominant predictors of job satisfaction. In his study of Greek teachers, Koustelious (2001) finds age to be positively linked to job satisfaction. This observation is mirrored in Sessanga and Garret's (2005) study on university academics.

2.9 RELATIONSHIP BETWEEN GENDER AND JOB SATISFACTION

Hersch and Xiao (2015) highlight that, despite challenges such as lower pay and scarce opportunities for promotion and development, women tend to be more satisfied with their jobs than men. An explanation offered by these authors is that, due to perceived bleak career prospects, women tend to have lower expectations in their jobs and hence are more easily satisfied. Another aspect in this argument is that generally women who are not satisfied with their jobs can afford to stay out of the labour market and so the portion which remains in market is likely to be on average more satisfied. Contrary to the afore-mentioned notions, other studies such as the one conducted by Okpara, Squillace and Erondu (2004) on university teachers indicates that females are less satisfied overall with their work than men. This is mainly attributed to both the salary gap whereby females are paid less than men and the unjust promotion practices that favour men over women.

2.10 EDUCATION LEVEL AND JOB SATISFACTION

Gurbuz (2007) in his study identified that there is a positive relationship between education level and job satisfaction. The corresponding correlation factor (r) in this study was 0.302 with significance value below 0.001. However, the mentioned observation cannot be universally applied because other studies have reached different conclusions. Ghazi, Shahzada and Shah (2012), in their study of Pakistani teachers, found that the level of the degree that the respondents hold has no effect on the level of their job satisfaction. The measurement tools in Gurbuz (2007) included items such as job content, work conditions, administration, income, opportunities for development and relationships with co-workers.

2.11 EMPLOYEE ENGAGEMENT

Saks (2006) notes that employee engagement has invoked considerable attention from researchers, many of whom believe that employee engagement influences

employee outcomes, organisational success and financial performance. Employee engagement is defined in various ways by different authors. Baumruk (2004) defines it as "emotional and intellectual commitment to the organisation". On the other hand, Schaufeli *et al*. (2002) define it as "a positive and fulfilling work-related mental state that is underscored by a sense of vigour, dedication and absorption". Vigour is underscored by elevated energy levels, mental strength during the work activity and non-reluctance to apply one's maximum effort regardless of the challenges being faced. Dedication features a sense of enthusiasm, inspiration and pride when tackling work-related activities and challenges. Absorption, is underlined by being fully attentive and so deeply engaged in one's work that time passes quickly and the employee finds it difficult to disengage from his/her task (Schaufeli *et al*., 2002). Khan (1990) highlights that engagement involves exchange of economic and socio-emotional resources. When employees receive these resources, they feel more driven to reciprocate the organisation through their role performance.

2.12 PRECONDITIONS AND ANTECEDENTS OF EMPLOYEE ENGAGEMENT

Saks (2006) highlights that while there is a limited number of research projects undertaken on the predictors of employee engagement, several of them can be matched to the antecedents that have been proposed by Kahn (1990) and the Maslach, Schaufelli and Leiter's 2001 model. The first one is job characteristics, whereby psychological meaningfulness is derived from tasks that provide challenging work, variety, allow the use of diverse skills, individual discretion and the opportunity to make important contributions. Kahn (1990) emphasises that jobs that rate high on core job characteristics provide employees with the drive to become more engaged with their work. The second precondition is rewards and recognition. Kahn (1990) claims that employee engagement varies in relation to the employees' perception of the benefits that emanate from performing their roles effectively. The third precondition is perceived organisational and supervisor support. Saks (2006) highlights that when employees realise that their organisation cares about their well-being and welfare, they are more likely to react positively by fulfilling their organisational duties with greater enthusiasm and commitment. On the same note, Rhoades and Eisenberger (2002) assert that employees interpret their supervisor's attitude towards them as a sign of the organisation's support and hence perceived supervisor support is likely to influence employee engagement. The last

precondition is procedural and distributive justice. Colquitt (2001) interprets distributive justice as "personally-centred perception of a degree of fairness of decision outcomes that affect employees such as pay rise" whereas procedural justice refers to "the perceived degree of fairness of the means and processes used by the organisation to determine the amount and distribution of resources".

Figure 2-1: A model of the antecedents and consequences of employee engagement (Saks, 2006).

2.13 OUTCOMES OF EMPLOYEE ENGAGEMENT

The widespread interest in employee engagement is generated by the notion that engagement generates positive results for the organisation (Saks, 2006). Kahn (1992) posits that engagement can breed favourable individual outcomes, such as high quality of work and enriched experiences in performing work activities. Engagement is associated with employees' good health and positive work affect and Saks (2006) asserts that these positive experiences and feelings are likely to lead to favourable and positive work outcomes. This notion is supported by Schaufeli and Bakker (2004) who assert that engaged employees develop stronger bonds with their organisations and exhibit fewer signs of their intention to quit their organisations. Baldoni (2013) shares the same sentiments with the previous authors when he claims that employee engagement yields positive outcomes for the organisation. He states that the success rate of organisations with highly engaged employees is twice that of organisations whose employees have a lower level of engagement. Baldoni (2013) provides the following simple definition of engagement: "people want to come to work, understand their jobs and know how their work

contributes to the success of the organisation". Harter and Schmidt (2002) assert that engaged employees are more aware and caring about the needs and welfare of their colleagues and the organisation and take full ownership of their work result. Despite all the benefits, however, companies still find it difficult to instill engagement in their employees. Harter and Schmidt (2002) say the reason for this is that many organisations measure either irrelevant parameters, too many variables or do not make the data obtained manageable and understandable to both management and staff. Additionally, these authors indicate that many companies do not incorporate engagement in their overall strategy, nor do they emphasise the importance of engagement or enlighten the managers on what to do with the results and in what sequence.

2.14 AGE, GENDER, QUALIFICATION AND WORK ENGAGEMENT

Schaufeli (2008) observed that there is a weak and minor positive correlation between work engagement and age. Overall, Schaufeli and Bakker (2003) found a low value correlation (r) of 0.14. On the dimensions' level, namely, vigour, dedication and absorption, low correlation values of 0.05, 0.14 and 0.17 respectively were obtained. However, Garg (2014) asserts that the age of the employees is an important aspect of individual differences that affect employee engagement. This assertion leans on a study performed by Milner *et al.* (cited by Jani & Balyan, 2016) which explored employee engagement in five adult age groups. It was found that employee engagement increases with the age of the employee, whereby employees who have reached retirement age exhibit the highest average engagement whereas the young adults displayed the lowest average engagement.

Regarding gender, there are contrary views as to whether male employees or female employees are more engaged with the organisation. A study conducted by Gallup in US (Miller & Adkins, 2006) indicated that women achieve greater fulfillment from their jobs and thus become more engaged than men. However, when a similar study was conducted in an Asian country, gender was found to have no significant effect on employee engagement.

As for qualification level, Swaminathan and Ananth (2009) assert that qualification has no effect on an employee's level of engagement. A graduate employee is

expected to be as equally engaged as an employee with post graduate or professional degree.

2.15 RELATIONSHIP BETWEEN EMPLOYEE ENGAGEMENT AND ORGANISATIONAL PERFORMANCE

Markos and Sridevi (2010) point out that employers are now aware that putting more effort into achieving employee engagement can create a more efficient and productive workforce and that business enhancement programmes cannot be successful without the will and engagement of the employees. Baumruk (2006) highlights that engaged employees exhibit three general behaviours which improve the organisational performance. Firstly, engaged employees become a goodwill ambassador for the organisation, thus motivating co-workers and attracting potential employees to the organisation. Secondly, the employees are resolute about remaining with the organisation and are willing to pass-up opportunities to work somewhere else. Thirdly, they go the 'extra mile' in their efforts to contribute to the success of the organisation.

In general, Markos and Sridevi (2010) highlight that previous studies have shown a positive relationship between employee engagement and organisational performance outcomes, which are employee retention, productivity, profitability, customer loyalty and safety. It is further mentioned that engaged employees increase the chances of their organisation surpassing the industry average in terms of revenue growth.

2.16 RELATIONSHIP BETWEEN JOB SATISFACTION AND EMPLOPLOYEE ENGAGEMENT

Shmailan (2016) elucidates that genuine engagement manifests when employees are enthusiastic about the organisation's strategic initiatives and are committed to its success. In this kind of an environment, this author asserts that there is more job satisfaction and employees are energetic and willing to serve the organisation and to become its goodwill ambassadors. In addition, he indicates that engagement can lead to organisational success and that having satisfied employees who perform well and are engrossed in positions that match their skills, helps to enhance engagement.

Vokic and Hernaus (2015) highlight that extensive studies have been conducted into three key human resources concepts namely job satisfaction, work engagement and employee loyalty. Nevertheless, no clear relationship has been established and broadly accepted by researchers. There is disagreement as to which construct is an antecedent and which one is a consequence. Nonetheless, a scholar such as Abraham (2012) attests to the fact that previous studies showed that job satisfaction and work engagement are positively related constructs. She points out that job satisfaction can be both an antecedent and a consequence of employee engagement. This statement agrees with the notion that causal relationship between job satisfaction and employee engagement is not well articulated. Authors such as Karatepe and Karadas (2015) assert that job satisfaction is a positive outcome of work engagement. That assertion is based on conclusions by Biswas and Bhatnagar (2013) who highlight that engaged employees go through exciting and happy phases at work and as a result become more satisfied with their jobs. The counter argument is derived from the notion that job satisfaction is deemed to be a passive and emotional state while employee engagement is deemed to be an active state as described by Alarcon and Lyons (2011). The foregoing explanations and the fact that work engagement can be fostered through satisfied employees (Abraham, 2012) support the logic that job satisfaction can be either the precursor or the antecedent of employee engagement (Schaufeli & Bakker, 2004).

2.17 CHAPTER SUMMARY

This chapter provided insight into the concept of ECM process by stating its definition, why it is needed and the challenges that are encountered in this process. Thereafter, it covered job satisfaction construct together with its related concepts. This was complemented by the discussion of the research findings on the relationship between biographic variables and job satisfaction. Furthermore, this chapter discussed employee engagement construct together with its related concepts. Similarly, this was complemented by the discussion of the research findings on the relationship between biographic variables and employee engagement. Lastly, the relationship between job satisfaction and employee engagement was discussed.

CHAPTER 3 – RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter provides an overview of the information related to the measurement of ECM process satisfaction, job satisfaction and work engagement. It narrates the research approach and method followed by the researcher. It offers the description of the sample that has been used for this research. It also discusses the reliability of the job satisfaction and engagement measurement methods. It concludes with a discussion of the statistical method used in the research.

3.2 RESEARCH APPROACH

The research approach for this research study is quantitative and follows a non-experimental research method because there is no planned intervention with the respondents and the data is collected via a questionnaire.

3.3 RESEARCH METHOD

The study is cross-sectional. The respondents are chosen from different age groups, different races and comprise females and males. This study is conducted in two phases. The first phase is a literature review which is followed by an empirical study. An in-depth literature study is conducted to investigate and analyse the findings of previous research studies undertaken on the same or closely related topics to the one being researched. The gaps that are identified in the literature studied are also reviewed. The literature review comprises the information sourced from books, journals and the internet. Ferdinand Postma Library (North West University) was consulted and its search engines were used to gather information through resourceful articles related to the study. This approach ensures that scientifically sound information is presented in the literature review. The empirical study phase comprises research design, participants, measuring instruments and statistical analysis.

3.4 SAMPLE DESCRIPTION

The sample of this study comprises engineers who work at Eskom power stations (generation sites), Centre of Excellence (CoE) offices, Production Engineering Integration Coal (PEIC) offices and other centralised engineering offices that directly

deal with Engineering Change Management process in their design and system integration work. The population size is 705. The sample size is 251 people. This sample size is sufficient to satisfy 5% margin of error and 95% confidence level (Abraxas Energy Consulting, 2015). The sample comprises female and male engineers from different races and age groups, all of whom deal with design and engineering changes as one of their functional outputs. The findings of the research will not be generalised to the whole of Eskom because the results reflect ECM process satisfaction, job satisfaction and work engagement levels of engineers who specifically deal with the ECM process when they implement engineering changes.

3.5 SAMPLE METHOD

A non-probability convenience sampling is used in this research study. Shaughnessy and Zechmeister (1997) indicate that convenience sampling involves selecting respondents primarily based on their availability and willingness to respond. This is the preferred sampling technique since it has the practical benefit of being both economical and less time-consuming. The questionnaires were emailed and personally handed to the engineers at the power stations, CoE offices, PEIC offices and other centralised engineering offices. The response rate was increased by using email and telephone calls to remind the respondents to answer the questionnaires. Their email addresses and telephone numbers are available from the company's email system.

3.6 MEASURING INSTRUMENT

For measurement of ECM process satisfaction, a self-designed questionnaire is used. This questionnaire indicates how satisfied or dissatisfied engineers feel about the stated aspects of the ECM process. It asks the respondents to rate themselves on ten questions by using a Likert scale of 1 to 5 whereby 1 is "not satisfied" and 5 is "extremely satisfied". Statements such as "the way ECM process was introduced", "how ECM process is implemented" and "the value that ECM process adds to your career" form part of the questionnaire.

For the measurement of job satisfaction, the researcher used a short form of the **Minnesota Job Satisfaction Questionnaire** (MJSQ) developed by D.J. Weiss, R.V. Dawis, G.W. England and L.H. Lofquist in 1967. This questionnaire indicates how satisfied or dissatisfied respondents are with their jobs by asking them to rate

themselves on twenty questions by using a Likert scale of 1 to 5, whereby 1 is “not satisfied” and 5 is “extremely satisfied”. The questionnaire measures three dimensions of job satisfaction which are intrinsic, extrinsic and general job satisfaction by using statements such as “the chance to work alone on the job”, “the praise I get for doing my job” and “the way my co-workers get along with each other”.

For measurement of work engagement, **Utrecht Work Engagement Scale** (UWES) developed by W.B. Schaufeli, M. Salanova, V. Gonzalez-Roma and A.B. Bakker was employed. Three subscales of UWES are used, namely, Vigour, Dedication and Absorption. Statements such as “I am bursting with energy in my work”, “I find my work full of meaning and purpose” and “I get carried away when I am doing my work” are used. UWES is scored on a seven-point frequency rating scale varying from 0 to 6 whereby 0 is “never” and 6 is “always”.

3.7 RELIABILITY DETAILS

MJSQ has proven to be reliable in a South African context. Buitendach and Rothmann (2009) observed alpha coefficient of 0.86 in their job satisfaction study on employees from selected organisations in South Africa.

UWES has been found to have acceptable reliability coefficients that have been reported both internationally and in South Africa. Storm and Rothmann (2003) obtained alpha coefficients for internal consistency and reliability for three subscales of between 0.78 and 0.89 in a South African context.

3.8 VALIDITY DETAILS

Content validity examines the degree to which measurement instrument incorporates all major elements that are relevant to the construct being measured (Haynes, Richard & Kubany, 1995). The evidence that supports MJSQ validity is derived from literature source; Buitendach and Rothmann (2009) studied job satisfaction of employees at selected organisations in South Africa and recommended that MSQ with two subscales of extrinsic and intrinsic job satisfaction can be used to assess the levels of job satisfaction of employees. As for the UWES validity, Coetzer and Rothmann (2007) did a study on South African insurance company and confirmed that work engagement, as measured by the UWES can be defined as a three-dimensional construct.

Face validity refers to the degree to which respondents understand and judge the items of the measurement instrument to be relevant to the construct and research objectives (Hardesty & Bearden, 2004). The questionnaire was sent to five respondents for review and there were no comments raised. It was thus deemed clear and relevant to the study. The mentioned respondents had a minimum engineering experience of five years and they were active users of ECM process.

3.9 STATISTICAL METHOD

The SPSS (version 23) is used to carry out statistical analysis. Firstly, descriptive statistics such as means, standard deviations and skewness are used to explore the data. Exploratory factor analysis is used on the study constructs items to ensure that the variables are measuring the aspects of the same underlying dimension. Cronbach alpha coefficients (α) are used to assess the internal consistency and reliability of the measuring instruments. Spearman correlation coefficients are used to assess the relationship between the study constructs. This process is extended to study the relationship between study constructs and ordinal biographic variables. T-test analysis is used to study the relationship between the study constructs and non-ordinal biographic variables such as gender and race. An “effect sizes for means” test is used to supplement T-test analysis and to draw practical conclusions.

3.10 CHAPTER SUMMARY

In this chapter, the research approach and method used by the researcher were defined. That was followed by the description of the sample and the sampling method used in the study. Measurement instruments that are used in the research were also discussed and this included references to their reliability and validity. Lastly, statistical analysis method used in the study was discussed.

CHAPTER 4 – EMPIRICAL STUDY

4.1 INTRODUCTION

This chapter presents the statistical analysis of the data obtained from the study. Frequencies and descriptive statistics of the demographic and biographic variables are discussed. This section is followed by an examination of the exploratory factor analysis results. Next is the discussion on results of the study constructs, ECM process satisfaction, job satisfaction and work engagement and the correlations between them. Then the discussion extends to an investigation of the correlation between age, years of experience in a job and years of experience in the current position the study constructs. Lastly, this chapter covers the effects of gender, race, qualification, area of work and level of employment on the mentioned constructs.

4.2 FREQUENCIES AND DESCRIPTIVE STATISTICS OF DEMOGRAPHIC AND BIOGRAPHIC VARIABLES

The total number of the respondents is 251. 81.3% are male and 18.7% are female. Of these participants, 21.5% are aged between 21 and 25 years, while 35.5% are aged between 25 and 35 years, 28.7% are aged between 35 and 45 years, 12% aged between 45 and 55 years and 2.4% are older than 55 years old. In terms of race, 63.7% are Black, 2.4% Coloured, 6.4% Indian and 27.5% White. With respect to level of employment, 0.8% are chief engineers, 1.6% chief technologists, 0.4% engineering managers, 11.2% senior engineers, 9.6% senior technologists, 5.2% senior advisors, 65.3% junior engineers, 4% technologists, 1.6% senior technicians and 1% trainee engineers. Of the participants, 5.6% have a diploma as their highest qualification while 70.1% have a degree and 24.3% have a postgraduate qualification. Respondents who take part in ECM process are represented as follows: 26.3% are from Centre of Excellence (CoE), 71.7% are from the power station, 0.8% are from Production Engineering and Integration Coal (PEIC) office, 0.8% are from centralised engineering and 0.4% from project engineering.

In relation to years of experience, 12% of the participants have 0-3 years, 63.7% have 4-10 years, 10.8% have 11-15 years, 8.0% have 16-20 years and 5.6% have more than 20 years. Of these participants, 37.1% have been in their current position for between 0-3 years while 58.6% have been there for between 4-10 years, 2.8%

have been there for between 11-15 years and1.6% have been there for between16-20 years.

4.3 EXPLORATORY FACTOR ANALYSIS AND RELIABILITY RESULTS

Exploratory factor analyses were carried out to investigate the construct validity of the measuring instruments. This involved conducting principal component analysis on the constructs that form part of the measurement model, namely ECM process satisfaction, job satisfaction (including its intrinsic, extrinsic and general elements) and work engagement (including its vigour, dedication and absorption elements). To complement the foregoing, descriptive statistics (means, standard deviations, skewness and kurtosis) are used to determine and confirm the distribution and pattern of the data. A cut-off point of 2.0 was selected for skewness (Finch & West, 1997) and 4.00 for kurtosis (Field, 2009) to ensure that the data that is used is normally distributed.

On a high level, the following Cronbach's alpha (α) values were obtained:

Table 4-1: Cronbach's alpha (α) values for the ECM process satisfaction, job satisfaction and work engagement

Construct	Cronbach's alpha (α)
ECM process satisfaction	0.92
Job satisfaction	0.83
Work engagement	0.94

Cronbach's alpha (α) is the most common measure of scale reliability and an (α) of 0.7 as a cut-off point is commonly acceptable (Field, 2009). It can be concluded, therefore, that the data concerning ECM process satisfaction, job satisfaction and work engagement of the participating engineers is sufficiently reliable.

4.3.1 ECM process satisfaction

Table 4-2: ECM process satisfaction factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha
0.93	0.00	56.90%	0.92

Table 4-3: ECM process satisfaction component matrix

Component Matrix	
Items	**Component**
	ECM process satisfaction
B9	0.81
B5	0.80
B2	0.79
B3	0.79
B10	0.78
B7	0.78
B4	0.73
B8	0.73
B1	0.70
B6	0.63

Questions B1 to B10 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named ECM process satisfaction. The KMO and Bartlett's test for this factor analysis were 0.93 and 0.000 respectively and these figures indicate that a factor analysis can be conducted. The Percentage variance explained was 56.91%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.92.

4.3.2 Job satisfaction

4.3.2.1 Intrinsic satisfaction

Table 4-4: Intrinsic job satisfaction factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha (α)
0.91	0.00	47.54%	0.90

Table 4-5: Intrinsic job satisfaction component matrix

Component Matrix	
Items	Component
	Intrinsic job satisfaction
C3	0.76
C14	0.76
C11	0.75
C10	0.73
C13	0.73
C2	0.71
C7	0.68
C16	0.68
C1	0.67
C6	0.61
C17	0.60
C15	0.55

Questions C1, C2, C3, C6, C7, C10, C11, C13, C14, C15, C16 and C17 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named intrinsic job satisfaction. The KMO and Bartlett's test for this factor analysis were 0.91 and 0.00 respectively and these figures indicate that a factor analysis can be undertaken. The percentage variance explained is 47.54%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.90.

4.3.2.2 Extrinsic satisfaction

Table 4-6: Extrinsic job satisfaction factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha(α)
0.74	0.00	44.37%	0.74

Table 4-7: Extrinsic job satisfaction component matrix

Component Matrix	
Items	Component
	Extrinsic job satisfaction
C19	0.77
C18	0.72
C5	0.68
C4	0.67
C9	0.65
C8	0.48

Questions C4, C5, C8, C9, C18 and C19 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named extrinsic job satisfaction. The KMO and Bartlett's test for this factor analysis were 0.74 and 0.00 respectively and that indicates that a factor analysis can be undertaken. The percentage variance explained is 44.37%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.74.

4.3.2.3 General satisfaction

Table 4-8: General job satisfaction factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha (α)
0.50	0.00	66.74%	0.50

Table 4- 9: General job satisfaction component matrix

Component Matrix	
Items	Component
	General job satisfaction
C12	0.82
C20	0.82

Questions C12 and C20 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named general job satisfaction. The KMO and Bartlett's test for this factor analysis are 0.50 and 0.00 respectively and this indicates that a factor analysis can be undertaken. The percentage variance explained is 66.74%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.50. Cut-off point for reliability is normally 0.70 but Kline (1999) mentions that Cronbach alpha (α) of 0.50 is not uncommon when dealing with psychological constructs. Cortina (1993) also mentions that the number of items on the measurement scale affects Cronbach's alpha value. Therefore, the obtained result can be accepted for further analysis.

4.3.3 Work engagement

4.3.3.1 Engagement vigour

Table 4-10: Engagement vigour factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha(α)
0.84	0.00	57.02%	0.85

Table 4-11: Engagement vigour component matrix

Component Matrix	
Items	Component
	Engagement vigour
D4	0.83
D8	0.83
D1	0.78
D12	0.70
D15	0.69
D17	0.68

Questions D1, D4, D8, D12, D15 and D17 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named engagement vigour. The KMO and Bartlett's test for this factor analysis are 0.84 and 0.00respectively and this indicates that factor analysis can be undertaken. The percentage variance explained is 57.02%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.85.

4.3.3.2 Engagement dedication

Table 4-12: Engagement dedication factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha(α)
0.87	0.00	67.02%	0.87

Table 4- 13: Engagement dedication component matrix

Component Matrix	
Items	**Component**
	Engagement dedication
D7	0.87
D5	0.86
D10	0.84
D2	0.82
D13	0.69

Questions D2, D5, D7, D10 and D13 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors. One factor was obtained from these questions and was named engagement dedication. The KMO and Bartlett's test for this factor analysis are 0.87 and 0.00respectively and this indicates that a factor analysis can be undertaken. The percentage variance explained is 67.02%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.87.

4.3.3.3 Engagement absorption

Table 4-14: Engagement absorption factor analysis results

KMO	Bartlett's Test (p-value)	% Variance explained	Cronbach's alpha(α)
0.84	0.00	55.43%	0.84

Table 4- 15: Engagement absorption component matrix

Component Matrix	
Items	**Component**
	Engagement absorption
D11	0.86
D3	0.80
D6	0.78
D14	0.77
D9	0.63
D16	0.60

Questions D3, D6, D9, D11, D14 and D16 were analysed using principal component exploratory factor analysis with oblimin rotation to explore the underlying factors.

One factor was obtained from these questions and was named engagement absorption. The KMO and Bartlett's test for this factor analysis are 0.84 and 0.00 respectively and this indicates that a factor analysis can be undertaken. The percentage variance explained is 55.43%. From the component matrix, it is seen that all the questions loaded above 0.3 on one factor, thus one factor was formed. The reliability for these questions is 0.84.

4.4 DESCRIPTIVE STATISTICS ANALYSIS OF ECM PROCESS SATISFACTION

Table 4-16: ECM process satisfaction descriptive statistics

ECM process satisfaction descriptive Statistics								
Items	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	**Statistic**	**Statistic**	**Statistic**	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
B1	1.00	5.00	2.38	1.03	0.39	0.15	-0.46	0.31
B2	1.00	5.00	2.32	0.98	0.27	0.15	-0.81	0.31
B3	1.00	5.00	2.32	0.99	0.43	0.15	-0.44	0.31
B4	1.00	5.00	2.51	1.00	0.35	0.15	-0.27	0.31
B5	1.00	5.00	2.52	1.02	0.25	0.15	-0.60	0.31
B6	1.00	5.00	2.61	1.00	0.10	0.15	-0.65	0.31
B7	1.00	5.00	2.49	1.03	0.26	0.15	-0.60	0.31
B8	1.00	5.00	2.59	1.02	0.19	0.15	-0.38	0.31
B9	1.00	5.00	2.64	1.09	0.11	0.15	-0.78	0.31
B10	1.00	5.00	2.58	0.97	0.20	0.15	-0.52	0.31
ECM	1.00	4.70	2.50	0.76	0.28	0.15	-0.62	0.31

Table 4-16 indicates that the data is normally distributed given the guidelines of 2.00 for skewness (Finch & West, 1997) and 4.00 for kurtosis (Field, 2009). The average score for ECM satisfaction is 2.50 with a standard deviation of 0.76. This scores lies between score of 2 and 3 whereby the former denotes "somewhat satisfied" and the latter denotes "satisfied". Hence, the average score of 2.50 indicates that the engineers are not fully satisfied with the ECM process. Item B9 (**ECM process contribution to Eskom business**) has the highest mean score of 2.64 which suggests that the engineers are almost satisfied with the contribution that ECM process makes to Eskom's business. On the other hand, items B2 (**how ECM process is implemented**) and B3 (**the level of consultation by the ECM process drivers**) have the lowest mean score of 2.32. This reflects that the engineers were least

satisfied with the way ECM process is implemented and the way the process drivers consult and engage with the engineers. Item B1 (**the way ECM process was introduced**) is the next lowest mean score which stands at 2.38 and that highlights that the engineers are not fully satisfied with the way ECM process is introduced.

4.5 DESCRIPTIVE STATISTICS ANALYSIS OF JOB SATISFACTION

Table 4-17: Job satisfaction descriptive statistics

Job satisfaction descriptive statistics								
Items	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
C1	1.00	5.00	3.65	1.03	-0.46	0.15	-0.31	0.31
C2	1.00	5.00	3.40	0.99	-0.25	0.15	0.03	0.31
C3	1.00	5.00	3.31	1.02	-0.30	0.15	-0.17	0.31
C4	1.00	5.00	3.20	0.97	-0.11	0.15	-0.13	0.31
C5	1.00	5.00	3.11	0.96	-0.16	0.15	-0.33	0.31
C6	1.00	5.00	3.14	0.98	0.05	0.15	-0.12	0.31
C7	1.00	5.00	3.18	0.99	-0.25	0.15	-0.17	0.31
C8	1.00	5.00	2.71	1.03	0.01	0.15	-0.61	0.31
C9	1.00	5.00	2.48	0.99	0.42	0.15	-0.20	0.31
C10	1.00	5.00	3.05	1.00	0.05	0.15	-0.32	0.31
C11	1.00	5.00	2.94	1.09	0.04	0.15	-0.62	0.31
C12	1.00	5.00	2.94	0.92	0.03	0.15	-0.39	0.31
C13	1.00	5.00	3.00	0.99	-0.03	0.15	-0.14	0.31
C14	1.00	5.00	3.16	0.92	-0.03	0.15	0.29	0.31
C15	1.00	5.00	3.53	0.91	-0.25	0.15	-0.03	0.31
C16	1.00	5.00	3.29	0.87	-0.01	0.15	0.05	0.31
C17	1.00	5.00	3.02	0.83	-0.17	0.15	0.18	0.31
C18	1.00	5.00	2.55	1.01	0.35	0.15	-0.39	0.31
C19	1.00	5.00	2.68	0.93	0.16	0.15	-0.15	0.31
C20	1.00	5.00	3.43	0.86	-0.11	0.15	-0.31	0.31
Extrinsic	1.00	4.33	2.79	0.65	-0.04	0.15	-0.24	0.31
General	1.00	5.00	3.18	0.73	0.04	0.15	-0.40	0.31
Intrinsic	1.00	4.83	3.22	0.67	-0.22	0.15	0.22	0.31
Job satisfaction	1.00	4.40	3.09	0.61	-0.18	0.15	0.22	0.31

Table 4-17 indicates that the data is normally distributed given the guidelines of 2.00 for skewness (Finch & West, 1997) and 4.00 for kurtosis (Field, 2009). The average job satisfaction score is 3.09 with a standard deviation of 0.61. This indicates that

overall, engineers are satisfied with their jobs. C1 (**being able to keep busy all the time**) the item which is part of intrinsic job satisfaction shows the highest mean score of 3.65. With respect to other items, this shows that the engineers are most satisfied with the fact that they able to keep actively engaged all the time in their jobs. C9 (**the chances of advancement in this job**) item which is part of the extrinsic job satisfaction shows the lowest mean score of 2.48. With respect to other items, this shows that the engineers are least satisfied with the chances or opportunities of advancement in their jobs.

On a factor level, intrinsic job satisfaction is leading by 3.22. It is followed by general job satisfaction with 3.18. The least score is on extrinsic job satisfaction with 2.48. High intrinsic job satisfaction score is attributed to high satisfaction expressed on C1 (**being able to keep busy all the time**), C2 (**the chance to work alone on the job**) and C15 (**the way my job provides for steady employment**). Their respective mean scores are 3.65, 3.40 and 3.53. Low extrinsic job satisfaction score is attributed to low satisfaction expressed on C9 (**the chances of advancement in this job**), C18 (**the way company policies are put into practice**) and C19 (**the praise I get for doing a good job**). Their respective mean scores are 2.48, 2.55 and 2.68.

4.6 DESCRIPTIVE STATISTICS ANALYSIS OF WORK ENGAGEMENT

Table 4-18: Work engagement descriptive statistics

Work engagement descriptive statistics								
Items	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
D1	0.00	6.00	3.50	1.23	-0.39	0.15	0.14	0.31
D2	0.00	6.00	3.58	1.17	-0.31	0.15	0.57	0.31
D3	0.00	6.00	3.98	1.23	-0.64	0.15	0.51	0.31
D4	0.00	6.00	3.56	1.14	-0.10	0.15	0.27	0.31
D5	0.00	6.00	3.78	1.24	-0.46	0.15	0.42	0.31
D6	0.00	6.00	3.35	1.19	-0.41	0.15	0.21	0.31
D7	0.00	6.00	3.48	1.25	-0.43	0.15	0.27	0.31
D8	0.00	6.00	3.40	1.35	-0.38	0.15	-0.04	0.31
D9	0.00	6.00	3.88	1.24	-0.47	0.15	0.32	0.31
D10	0.00	6.00	4.00	1.20	-0.37	0.15	0.43	0.31
D11	0.00	6.00	3.99	1.17	-0.31	0.15	-0.11	0.31
D12	0.00	6.00	3.96	1.13	-0.51	0.15	0.70	0.31
D13	0.00	6.00	3.65	1.25	-0.34	0.15	0.29	0.31
D14	0.00	6.00	3.62	1.15	-0.52	0.15	0.34	0.31
D15	0.00	6.00	3.77	1.03	-0.09	0.15	0.31	0.31
D16	0.00	6.00	3.37	1.28	-0.30	0.15	-0.08	0.31
D17	0.00	6.00	4.20	1.03	-0.47	0.15	0.71	0.31
Vigour	0.83	5.83	3.73	0.87	-0.31	0.15	0.21	0.31
Dedication	0.00	6.00	3.70	1.00	-0.57	0.15	1.10	0.31
Absorption	0.00	5.83	3.70	0.89	-0.63	0.15	0.86	0.31
Work engagement	0.29	5.76	3.71	0.87	-0.60	0.15	0.85	0.31

Table 4-18 indicates that the data is normally distributed given the guidelines of 2.00 for skewness (Finch & West, 1997) and 4.00 for kurtosis (Field, 2009). Average work engagement score is 3.71 with a standard deviation of 0.87. This indicates that overall, the engineers are engaged in their work. D17 (**at my work I always persevere, even when things do not go well**) item, which is one of the engagement vigour elements, shows the highest mean score of 4.20. With respect to other items, this shows that the engineers are most engaged when they need to persevere, even when things do not go well at work. D6 (**when I am working I forget everything**) item, which is part of the absorption dimension of engagement,

has the lowest mean score of 3.35. With respect to other items, this shows that the engineers are least engaged when it comes to attaching themselves and paying attention to their work.

On a factor level, engagement vigour is higher with a mean score of 3.73. It is followed by engagement dedication and absorption which show a tied mean score of 3.70. High "vigour" score is attributed to high engagement expressed on D12 (**I can continue to work for very long periods at a time**), D15 (**at my job, I am very resilient, mentally**) and D17 (**at my work, I always persevere, even when things do not go well**). The respective mean scores of these items are 3.96, 3.77 and 4.20. Dedication and absorption score of 3.70 is not far off from the "vigour" score. Items that boosted dedication is high engagement expressed on D5 (**I am enthusiastic about my job**) and D10 (**I am proud of the work that I do**). The respective mean scores of these items are 3.78 and 4.0. Items that boosted "absorption" is high engagement expressed on D3 (**time flies when I am working**), D9 (**I feel happy when I am working intensely**) and D11 (**I am immersed in my work**). The respective mean scores of these items are 3.98, 3.88 and 3.99.

As highlighted by the foregoing analysis, there is no significant difference between the three elements of work engagement, namely vigour, absorption and dedication.

4.7 CORRELATION RESULTS FOR ECM PROCESS SATISFACTION, JOB SATISFACTION AND WORK ENGAGEMENT

Spearman's rank correlation coefficients are used to determine the correlation between ECM satisfaction, job satisfaction and work engagement. It is used instead of the Pearson correlation test because the Pearson test depends on normal distribution of data. In addition, the Spearman correlation test does not require the relationship between the variables to be linear (Hauke & Kossowski, 2011).

Interpretation of Spearman's rank order correlation coefficient:

$|r| \approx 0.1$ Small effect, no significant correlation

$|r| \approx 0.3$ Medium effect, practical and visible correlation

$|r| \approx 0.5$ Large effect, practically significant correlation

Sign:

r< 0 Negative correlation

r> 0 Positive correlation

Table 4-19: ECM process satisfaction, job satisfaction and work engagement correlation coefficients

ECM satisfaction, job satisfaction and work engagement correlations coefficients									
Construct		ECM	Extrinsic	General	Vigour	Dedication	Absorption	Intrinsic	Job satisfaction
ECM	Correlation Coefficient	-							
Extrinsic	Correlation Coefficient	0,42*	-						
General	Correlation Coefficient	0,29*	0,60*	-					
Vigour	Correlation Coefficient	0,34*	0,52*	0,40*	-				
Dedication	Correlation Coefficient	0,35*	0,49*	0,41*	0,84*	-			
Absorption	Correlation Coefficient	0,24*	0,43*	0,35*	0,83*	0,80*	-		
Intrinsic	Correlation Coefficient	0,41*	0,68*	0,52*	0,57*	0,58*	0,56*	-	
Job satisfaction	Correlation Coefficient	0,43*	0,86*	0,67*	0,59*	0,60*	0,56*	0,95*	-
Work engagement	Correlation Coefficient	0,33*	0,51*	0,41*	0,95*	0,93*	0,93*	0,60*	0,62*

* Correlation is significant at the 0.01 level (2-tailed).

A moderate to strong positive correlation exists between ECM process satisfaction and job satisfaction. A medium to large correlation value of 0.43 for ECM process satisfaction measured against job satisfaction indicates that the participating engineers' satisfaction with the ECM process has a practical and significantly positive effect on their job satisfaction. It can be concluded that an increase in engineers' satisfaction with the ECM process leads to an increase in their job satisfaction.

A moderate to strong positive correlation exists between ECM process satisfaction and the extrinsic factor of job satisfaction. A medium to large correlation value of 0.42 for ECM satisfaction measured against job satisfaction extrinsic factor indicates that engineers' satisfaction with the ECM process has a practical and significantly positive effect on the engineers' extrinsic job satisfaction. A moderate to strong and positive correlation exists between ECM process satisfaction and the intrinsic factor

of job satisfaction. A medium to large correlation value of 0.41 for ECM satisfaction measured against the job satisfaction intrinsic factor indicates that engineers' satisfaction with the ECM process has a practical and significantly positive effect on the engineers' intrinsic job satisfaction. A moderate and positive correlation exists between ECM process satisfaction and the general factor of job satisfaction. A medium correlation value of 0.29 for ECM satisfaction measured against job satisfaction general factor indicates that engineers' satisfaction with the ECM process has a practical and visible and positive effect on the engineers' general job satisfaction.

A moderate and positive correlation exists between ECM process satisfaction and work engagement. A medium correlation value of 0.33 for ECM process satisfaction measured against work engagement indicates that engineers' satisfaction with the ECM process has a visible and positive effect on their work engagement.

A moderate and positive correlation exists between ECM process satisfaction and the dedication elements of work engagement. A medium correlation value of 0.35 for ECM process satisfaction measured against dedication dimension of work engagement indicates that engineers' satisfaction with the ECM process has a visible and positive effect on the engineers' work engagement dedication.

A moderate and positive correlation exists between ECM process satisfaction and the vigour elements of work engagement. A medium correlation value of 0.34 for ECM process satisfaction measured against vigour dimension of work engagement indicates that engineers' satisfaction with the ECM process has a visible and positive effect on the engineers' work engagement vigour elements.

A weak and positive correlation exists between ECM process satisfaction and absorption elements of work engagement. A correlation value of 0.24 for ECM process satisfaction measured against an absorption dimension of work engagement indicates that engineers' satisfaction with the ECM process has a minor effect on work engagement absorption elements.

A strong and positive correlation exists between job satisfaction and work engagement. A high correlation value of 0.62 for job satisfaction measured against work engagement indicates that engineers' job satisfaction has a significant and

positive effect on the engineers' work engagement. It can thus be concluded that engineers who experience high job satisfaction are also highly engaged.

A strong and positive correlation exists between job satisfaction and individual dimensions of work engagement. High correlation values of 0.59, 0.60 and 0.56 for job satisfaction measured against vigour, dedication and absorption elements respectively, indicate that engineers' job satisfaction has a large and significantly positive effect on the previously mentioned three dimensions of work engagement.

On the other hand, strong and positive correlation exists between work engagement and individual elements of job satisfaction. High correlation values of 0.60 and 0.51 for work engagement measured against intrinsic and extrinsic elements of job satisfaction indicate that work engagement has a large and significantly positive effect on the engineers' intrinsic and extrinsic job satisfaction.

4.8 CORRELATIONS BETWEEN ECM SATISFACTION, JOB SATISFACTION AND WORK ENGAGEMENT AND BIOGRAPHIC VARIABLES

The following section discusses correlation between ECM process satisfaction, job satisfaction and work engagement and biographic variables. Only ordinal biographic variables are considered in this section and the Spearman rank test is used.

4.8.1 Correlation between ECM satisfaction and age, years in current position, years of experience and qualification

Table 4-20: Spearman correlation coefficients for ECM process satisfaction versus age, years in current position, years of experience and qualification

Biographic variable	Age (Bio 1)	Years in current position (Bio 5)	Years of experience (Bio 6)	Qualification (Bio 7)
ECM satisfaction	0.05	0.04	0.05	-0.12
p-value	0.41	0.52	0.40	0.07

A very weak and positive correlation exists between age and ECM process satisfaction. The low value of 0.05 for ECM process satisfaction measured against age indicates the relationship between age and ECM satisfaction is not significant. Hence engineers' age has no effect on their satisfaction with the ECM process.

A very weak and positive correlation exists between years spent in current position and ECM process satisfaction. The low value of 0.04 for ECM process satisfaction measured against years in current position indicates that the relationship between years in current position and ECM satisfaction is not significant. Thus, the number of years that the engineers have been in their current position has no influence on their satisfaction with the ECM process.

A very weak and positive correlation exists between years of experience in engineering and ECM process satisfaction. The low value of 0.05 for ECM process satisfaction measured against years of experience in the engineering field indicates that the relationship between years of experience and ECM satisfaction is not significant. Hence, the number of years of experience that the engineers have, has no influence on their satisfaction with the ECM process.

A very weak negative correlation exists between level of qualification and ECM process satisfaction. The low value of -0.12 for ECM process satisfaction measured against level of qualification indicates that the engineers' qualification level has no influence on their satisfaction with the ECM process.

4.8.2 Correlation between job satisfaction and age, years in current position, years of experience and qualification

Table 4-21: Spearman correlation coefficients for job satisfaction versus age, years in current position, years of experience and qualification

Biographic variable	Age (Bio 1)	Years in current position (Bio 5)	Years of experience (Bio 6)	Qualification (Bio 7)
Job satisfaction	0.13	0.06	0.06	-0.22
p-value	0.04	0.34	0.34	0.00

A very weak and positive correlation exists between age and job satisfaction. That is signified by the low coefficient value of 0.13 for job satisfaction measured against age. The low p-value of 0.04 indicates that the observed result is significant and it can therefore be concluded that age has an influence on engineers' job satisfaction.

A very weak and positive correlation exists between years spent in the current position and job satisfaction. The low value of 0.06 for job satisfaction measured against years in current position indicates that the relationship between years in a

current position and job satisfaction is not practically significant. Hence, it can be concluded that number of years that the engineers have been in their current positions has no influence on their job satisfaction.

A very weak and positive correlation exists between years of experience in engineering and job satisfaction. The low value of 0.06 for job satisfaction measured against years in their current position indicates that the relationship between years of experience and job satisfaction is not practically significant. Hence, years of experience have no influence on engineers' job satisfaction.

A weak and negative correlation exists between level of qualification and job satisfaction. That is signified by the low coefficient value of -0.22 for job satisfaction measured against level of qualification. The low p-value of 0.00 indicates that the observed result is significant and it can therefore be concluded that qualification has an effect on the engineers' job satisfaction.

4.8.3 Correlation between work engagement and age, years in current position, years of experience and qualification

Table 4-22: Spearman correlation coefficients for work engagement versus age, years in current position, years of experience and qualification

Biographic variable	Age (Bio 1)	Years in current position (Bio 5)	Years of experience (Bio 6)	Qualification (Bio 7)
Work engagement	0.09	0.10	0.14	-0.24
p-value	0.15	0.13	0.02	0.00

A very weak and positive correlation exists between age and work engagement. The low value of 0.09 for work engagement measured against age indicates that the relationship between engineers' age and work engagement is not practically significant. Hence, it can be concluded that age has no effect on engineers' work engagement.

A very weak and positive correlation exists between years spent in the current position and work engagement. The low value of 0.10 for work engagement measured against years in the current position indicates that the number of years that engineers have spent in their current positions has no influence on their work engagement.

A very weak and positive correlation exists between years of experience and work engagement. That is signified by the low coefficient value of 0.14 for work engagement measured against years of experience. The low p-value of 0.02 indicates that the result is significant and it can therefore be concluded that years of experience has an influence on work engagement.

A weak and negative correlation exists between level of qualification and work engagement. That is signified by the low coefficient value of -0.24 for work engagement measured against qualification level. The low p-value of 0 indicates that the result is significant and it can therefore be concluded that qualification level has an influence on engineers' work engagement.

4.9 T-TEST ANALYSIS FOR ECM PROCESS SATISFACTION, JOB SATISFACTION AND WORK ENGAGEMENT RELATIVE TO BIOGRAPHIC VARIABLES

T-test is a form of parametric test and it assumes that the sampling distribution is normally distributed (Field, 2009). It is used here to check the variation in the participants' ECM process satisfaction, job satisfaction and work engagement mean scores relative to biographic variables. P-value is used to check statistical significance. The use of t-test for a significance test is highly discouraged by Ellis and Steyn (2003) when non-probability sampling is used because of the bias risk. Nevertheless, t-test analysis is useful in this study to conduct exploratory research which can be used in preparation for more rigorous hypothesis testing. This t-test is supplemented by using "effect sizes for means" test which is characterized by:

$d = |\overline{X}_1 \overline{X}_2|/S_{max}$

Whereby $|\overline{X}_1 \overline{X}_2|$is the difference between the mean scores without taking the sign into consideration and S_{max} is the maximum standard deviation between the two means (Ellis & Steyn, 2003). Cohen (1988) provides the following guidelines for the interpretation of the effect sizes:

Small effect: d = 0.2, medium effect: d = 0.5, large effect d = 0.8.

4.9.1 T-test analysis for gender relative to ECM process satisfaction

Table 4-23: T-test analysis results for gender relative to ECM process satisfaction

Gender vs ECM satisfaction				
Gender	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Male	2.48	-0.55	0.59	0.09
Female	2.55			

A critical look at table 4-23 suggests that participants' responses were almost the same irrespective of their gender, with means of 2.48 and 2.55 for males and females respectively. The t-value (-0.55) has a significance (p) value (0.59) which is greater than the alpha (0.05), confirming that the variation between the means is not significant. Therefore, there is no significant difference in ECM process satisfaction in relation to the engineers' gender at 5% level of significance. The low effect size (d) of 0.09 also confirms and indicates that the variation in ECM process satisfaction is not practically significant.

4.9.2 T-test analysis for race relative to ECM process satisfaction

Table 4-24: T-test analysis results for race relative to ECM process satisfaction

Race vs ECM process satisfaction				
Race	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Black	2.51	0.41	0.68	0.05
Other	2.47			

Because of a low number of representatives from some racial groups, namely 'Coloured' and 'Indian', it was decided to group them with 'White race' as "Other" to enable meaningful analysis.

A critical look at table 4-24 suggests that participants' responses were almost the same irrespective of their race, with means of 2.51 and 2.47 for Black and Other racial groups respectively. The t-value (0.41) has a significance (p) value (0.68) which is greater than the alpha (0.05) confirming that the variation between the means is not significant. Therefore, there is no significant difference in ECM process satisfaction in relation to the engineers' race at 5% level of significance. The low effect size (d) of 0.05 also confirms and indicates that the racial variation in ECM process satisfaction is not practically significant.

4.9.3 T-test analysis for level of employment relative to ECM process satisfaction

Table 4- 25: T-test analysis results for level of employment relative to ECM process satisfaction

Level of employment vs ECM satisfaction				
Level	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Senior	2.73	3.16	0.00	0.39
Junior	2.40			

The lower number of representatives from some positions resulted in a decision to categorise them into 'senior' and 'junior' groups only.

A critical look at table 4-25 suggests that participants' responses are noticeably different with means of 2.73 and 2.40 for 'senior' and 'junior' participants respectively. The t-value (3.16) has a significance (p) value (0.00) which is lower than the alpha (0.05) confirming that the variation between the means is significant. Therefore, there is a significant difference in ECM process satisfaction in relation to the engineers' level of employment at 5% level of significance. The difference is practically significant because the effect size (*d*) of 0.39 is close to 0.5 which has a medium effect.

4.9.4 T-test analysis for area of work relative to ECM process satisfaction

Table 4-26: T-test analysis results for area of work relative to ECM process satisfaction

Area of work vs ECM satisfaction				
Area of work	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Power Station	2.43	-2.39	0.02	0.28
CoE/PEIC/other	2.68			

Because of a low number of representatives from some work areas, it was decided to divide participants into two distinctive work areas, namely 'Power Station' and 'CoE/PEIC/Other' for meaningful data analysis.

A critical look at table 4-26 suggests that participants' responses are noticeably different with means of 2.43 and 2.68 for 'Power Station' and 'CoE/PEIC/Other'. The t-value (-2.39) has a significance (p) value (0.02) which is lower than the alpha (0.05) confirming that the variation between the means is significant. Therefore, there is a

significant difference in ECM process satisfaction with regard to the engineers' area of work at 5% level of significance. It can be statistically concluded, therefore, that engineers at the power stations are less satisfied with ECM process than the ones based at CoE, PEIC and other central engineering offices. However, the result is not practically significant because the effect size (*d*) of 0.28 is minimal.

4.9.5 T-test analysis for gender relative to job satisfaction

Table 4-27: T-test analysis results for gender relative to job satisfaction

Gender vs job satisfaction				
Area	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Male	3.13	2.33	0.02	0.37
Female	2.91			

A critical look at table 4-27 suggests that participants' responses were noticeably different with means of 3.13 and 2.91 for males and females respectively. The t-value (2.33) has a significance (p) value (0.02) which is less than the alpha (0.05) confirming that the variation between the means is significant. This means that there is a significant difference in job satisfaction in relation to the engineers' gender at 5% level of significance. It can be concluded with 95% confidence, therefore, that male engineers are more satisfied with their jobs than their female colleagues. The variation is practically significant because the effect size (*d*) of 0.37 is close to 0.5.

4.9.6 T-test analysis for race relative to job satisfaction

Table 4-28: T-test analysis results for race relative to job satisfaction

Race vs job satisfaction				
Race	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Black	2.98	-4.07	0.00	0.49
Other	3.29			

Due to a lower number of representatives from some racial groups, namely 'Coloured'' and 'Indian', it was decided to group them with 'White race' as "Other" to enable meaningful analysis.

A critical look at table 4-28 suggests that participants' responses were noticeably different with means of 2.98 and 3.29 for Blacks and Other racial group respectively. The t-value (-4.07) has a significance (p) value (0.00) which is less than the alpha (0.05) confirming that the variation between the means is significant. This means

that there is a significant difference in job satisfaction in relation to the engineers' race at 5% level of significance. It can be concluded with 95% confidence, therefore, that Black engineers are less satisfied with their jobs than the other racial groups combined. The variation is practically significant because the effect size (*d*) of 0.49 has a medium effect.

4.9.7 T-test analysis for level of employment relative to job satisfaction

Table 4-29: T-test analysis results for level of employment relative to job satisfaction

Level of employment vs job satisfaction				
Level	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Senior	3.19	1.71	0.09	0.22
Junior	3.05			

Due to a lower number of representatives from some positions, it was decided to categorise them into 'senior' and 'junior' groups.

A critical look at table 4-29 suggests that participants' responses are noticeably different with means of 3.19 and 3.05 for 'senior' and 'junior' participants respectively. The t-value (1.71) has a significance (p) value (0.09) which is greater than the alpha (0.05) and this indicates that the variation between the means is not significant. Therefore, it cannot be concluded that there is a significant difference in ECM process satisfaction with regards to the engineers' employment position at 5% level of significance. The effect size (d) of 0.22 confirms that the variation between the means has no practical significance.

4.9.8 T-test analysis for area of work relative to job satisfaction

Table 4-30: T-test analysis results for area of work relative to job satisfaction

Area of work vs job satisfaction				
Area of work	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Power station	3.04	-1.96	0.05	0.25
CoE/PEIC/Other	3.21			

Due to a lower number of representatives from some work areas, it was decided to divide participants into two distinctive work areas namely 'Power Station' and 'CoE/PEIC/Other' for meaningful data analysis.

A critical look at table 4-30 suggests that participants' responses are noticeably different with means of 3.04 and 3.21 for Power Station and CoE/PEIC/Other. The t-value (-1.96) has a significance (p) value (0.05) which is equal to alpha (0.05) and this indicates that the variation between the means is not significant. Therefore, it cannot be concluded that there is a significant difference in job satisfaction with regards to the engineers' area of work at 5% level of significance. The effect size (d) of 0.25 confirms that the variation between the means has no practical significance.

4.9.9 T-test analysis for gender relative work engagement

Table 4-31: T-test analysis results for gender relative to work engagement

Gender vs work engagement				
Gender	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Male	3.78	2.85	0.01	0.45
Female	3.39			

A critical look at table 4-31 suggests that participants' responses were noticeably different with means of 3.78 and 3.39 for males and females respectively. The t-value (2.85) has a significance (p) value (0.01) which is less than the alpha (0.05) confirming that the variation between the means is significant. This means that there is a significant difference in work engagement in relation to the engineers' gender at 5% level of significance. It can be concluded with 95% confidence, therefore, that male engineers feel more engaged with their jobs than their female colleagues. The variation is practically significant because the effect size (*d*) of 0.45 is high.

4.9.10 T-test analysis for race relative to work engagement

Table 4-32: T-test analysis results for race relative to work engagement

Race vs work engagement				
Race	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Black	3.65	-1.48	0.14	0.18
Other	3.82			

Due to a lower number of representatives from some racial groups namely 'Coloured' and 'Indian', it was decided to group them with 'White race' as "Other" to enable meaningful analysis.

A critical look at table 4-32 suggests that participants' responses were noticeably different with means of 3.65 and 3.82 for 'Blacks' and 'Other' racial groups respectively. The t-value (-1.48) has a significance (p) value (0.14) which is greater

than the alpha (0.05) which indicates that the variation between the means is not significant. Therefore, it cannot be concluded that there is a significant difference in job satisfaction in relation to the engineers' race at 5% level of significance. The effect size (d) of 0.18 confirms that the variation between the means has no practical significance.

4.9.11 T-test analysis for level of employment relative to work engagement

Table 4-33: T-test analysis results for level of employment relative to work engagement

Level of employment vs work engagement				
Level	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Senior	3.84	1.53	0.13	0.21
Junior	3.66			

Due to a lower number of representatives from certain positions, it was decided to categorise them into 'senior' and 'junior' groups.

A critical look at table 4-33 suggests that participants' responses are noticeably different with means of 3.84 and 3.66 for 'senior' and 'junior' participants respectively. The t-value (1.53) has a significance (p) value (0.13) which is greater than the alpha (0.05) and this indicates that the variation between the means is not significant. Therefore, it cannot be concluded that there is a significant difference in work engagement in relation to the engineers' employment position at 5% level of significance. The effect size (d) of 0.21 confirms that the variation between the means has no practical significance.

4.9.12 T-test analysis for area of work relative to work engagement

Table 4-34: T-test analysis results for area of work relative to work engagement

Area of work vs work engagement				
Area of work	**Mean**	**T**	**Sig (2-tailed)**	***d* = effect size**
Power station	3.65	-1.77	0.08	0.24
CoE/PEIC/Other	3.86			

Due to a low number of representatives from some work areas, it was decided to divide participants into two distinctive work areas, namely 'Power Station' and 'CoE/PEIC/Other' for meaningful data analysis.

A critical look at table 4-34 suggests that participants' responses are noticeably different with means of 3.65 and 3.86 for Power Station and CoE/PEIC/Other. The

t-value (-1.77) has a significance (p) value (0.08) which is greater than the alpha (0.05) and this indicates that the variation between the means is not significant. Therefore, it cannot be concluded that there is a significant difference in engineers' work engagement level in relation to their area of work at 5% level of significance. The effect size (d) of 0.24 confirms that the variation between the means has no practical significance.

4.10 CHAPTER SUMMARY

The foregoing chapter discussed the results obtained from the statistical analysis of the study. It started by narrating the sample descriptive statistics and this included the discussion on the composition of the respondents in the sample. This was followed by the discussion on constructs' exploratory factor analysis and reliability results. The discussion then moved to the descriptive statistics results of the study constructs which are ECM process satisfaction, job satisfaction and work engagement and the correlations between them. An investigation of the correlation between age, years of experience in a job and years of experience in the current position and the study constructs was conducted. Lastly, this chapter covered the effects of gender, race, qualification, area of work and level of employment on the mentioned constructs.

CHAPTER 5 – CONCLUSION

5.1 INTRODUCTION

The purpose of this research is to study Eskom engineers' satisfaction with the new Engineering Change Management (ECM) process and assess their job satisfaction and work engagement levels in view of this new ECM process.

In terms of the foregoing chapters, chapter 1 introduced the focus of the study and narrated the problem statement. The primary and secondary objectives of the study were defined and the scope of the study was outlined. It also highlighted tools used in the empirical analysis which included measurement instruments and statistical analysis packages used. Chapter 2 provided literature review on study constructs namely ECM process, job satisfaction and work engagement. It proceeded to cover the relationship between the engineers' biographic variables and the mentioned study constructs. This was complemented by the study of the relationship between the constructs themselves. In chapter 3, the research approach and method used by the researcher were defined. That was followed by the description of the sample and the sampling method used in the study. Measurement instruments and statistical analysis method that are used in the research were also discussed. Chapter 4 discussed the results obtained from the empirical analysis of the study. It narrated the sample descriptive statistics which included the discussion of the composition of the respondents in the sample. This was followed by the discussion on constructs' exploratory factor analysis and reliability results. The discussion then moved to the descriptive statistics results of the study constructs and the correlations between them. An investigation of the correlation between age, years of experience in a job and years of experience in the current position and the study constructs was conducted. Lastly, this chapter covered the effects of gender, race, qualification, area of work and level of employment on the mentioned constructs.

In the current chapter, general conclusions are drawn from the discussions in the foregoing chapters. The results of the study are articulated for the benefit of the management of the organisation where this study was conducted. Furthermore, the limitations of the study are discussed and recommendations for future research are made.

5.2 GENERAL CONCLUSIONS

From the study, it is evident that the participating Eskom engineers are not fully satisfied with the ECM process. Of major concern to the engineers is the way the ECM process is implemented as well as the manner in which the ECM process leaders consult and engage with the engineers.

Regarding job satisfaction, the engineers are satisfied with most aspects of their jobs. Most outstanding is intrinsic job satisfaction which is underscored by the highest satisfaction coming from being able to be busy and actively engaged in their jobs. On the downside, engineers have some concern on the availability of opportunities for advancement in their jobs.

Concerning work engagement, the respondents have expressed reasonably high work engagement. This is underscored by their resilience and perseverance in their work even when things do not go well.

In terms of the correlation between the study constructs, it is evident from the results that engineers' satisfaction with ECM process has a positive influence on job satisfaction. Similarly, engineers' satisfaction with ECM process has positive effect on their work engagement. However, this effect is less pronounced than it is on job satisfaction.

On the relationship between ECM process satisfaction and the biographic variables, it is evident from the results that engineers' age, number of years in their current position and years of experience have no effect on their satisfaction with ECM process. Engineers' qualification level also appears to have no effect on ECM process satisfaction either.

Regarding gender, there is no observable difference between male and female engineers' ECM process satisfaction. Similarly, on race, there is no observable difference between Black engineers and other racial groups' satisfaction with ECM process.

Engineers' employment rank results in significant variation in their satisfaction with ECM process. This factor provides insight that 'senior' engineers tend to be more satisfied with the ECM process than 'junior' engineers. Regarding the area of work, engineers from power stations, CoE, PEIC and other centralised engineering offices, do not practically experience different levels of satisfaction on ECM process.

On the relationship between job satisfaction and the biographic variables, it is concluded that engineers' age has some influence on their job satisfaction. This is in line with the results from the study by Warr (1994) which shows positive correlation between age and job satisfaction. The number of years the engineers have spent in their current position and years of experience have no effect on their job satisfaction. Lastly, engineers' qualification level has some negative influence on their job satisfaction. This is in contrast to Gurbuz (2007) who found a positive relationship between education level and job satisfaction. .

Regarding gender, it is concluded that there is a significant difference between male and female engineers' job satisfaction levels. Male engineers tend to be more satisfied with their jobs than their female colleagues. The same conclusion was reached by Okpara, Squillace and Erondu (2004).

Compared with other racial groups, Black engineers tend to experience lower job satisfaction. Engineers' employment rank resulted in no significant variation in their job satisfaction. This provides insight that the engineers' position in the organisation does not influence their job satisfaction. The area of work also proved to have no significant influence on the job satisfaction of engineers from power stations or CoE, PEIC and other centralised engineering offices.

Regarding the relationship between work engagement and the biographic variables, it is concluded that engineers' ages, number of years the engineers have spent in their current position and years of experience have no effect on their work engagement. Regarding the age, Schaufeli (2008) similarly observed a weak relationship between age and work engagement. On the other hand, it is concluded that engineers' qualification level has negative influence on their level of work engagement. This conclusion is in contrast to Swaminathan and Ananth (2009) who asserted that qualification has no effect on an employee's level of engagement.

As for the participating engineers' gender, there is a significant difference between male and female engineers' work engagement and it is concluded that male engineers feel more engaged in their work than their female colleagues do. This is in contrast to the conclusion drawn by Miller and Adkins (2016). On the other hand, it is concluded that race does not have any influence on the respondents' work

engagement. Similarly, engineers' position in the organisation and area of work do not influence their work engagement.

5.3 LIMITATIONS

A non-probability convenience sampling method was used because it was less complicated and an economical option for this study. It would have been interesting to study the whole population of Eskom engineers who are exposed to the ECM process but time was a major limitation. The t-test was used for a significance test but this method is strongly discouraged by Ellis and Steyn (2003) because of the bias risk and their standpoint that the t-test is better suited to random sampling. Nevertheless, t-test analysis was useful in this study as a tool for conducting exploratory research which can be used in preparation for more rigorous hypothesis testing. The t-test was supplemented by "effect sizes for means" test to draw credible and practical conclusions.

It needs to be noted that this study is conducted only on a selected group of Eskom engineers who deal with the ECM process. Therefore, information gathered, results and conclusions drawn cannot be generalised as being applicable to all Eskom personnel who are exposed to the ECM process.

5.4 RECOMMENDATIONS

Another study needs to be conducted to assess the whole population of Eskom engineers who deal with the ECM process. Overall, this report indicates that the ECM process is not well received by the participating engineers. The first major contributing factor to this dissatisfaction is the engineers' unhappiness with the ECM process implementation. This perception warrants the review and assessment of the internal ECM process control manuals and how they can be improved. Secondly, ECM procedures need to be reviewed to enable easier implementation of engineering changes. The participating engineers feel that the level of consultation by ECM process drivers is not fully adequate. This perception calls for a study to investigate ways of developing a proper communication plan and strategy for introducing and implementing new working methods.

In addition to the foregoing, engineers generally feel that the current method for introducing the ECM process is not adequate. This calls for study on how ECM

process drivers can best handle engineers' motivation for change and commitment to organisational change. Furthermore, the study needs to extend ways of creating staff members' readiness for change in Eskom engineering departments, a process that involves motivating engineers to try new work processes and associated technologies. Lastly, the study needs to identify how resistance to change can be overcome. This involves empathy and support for engineers and identification of engineers who have trouble accepting the ECM process, identifying the nature of their resistance and possible ways to overcome it. This procedure can be complemented by identifying ways that engineering members can be directly involved in planning and implementing ECM process changes.

In terms of job satisfaction, the participating engineers feel satisfied with their jobs. However, their extrinsic job satisfaction is noticeably low. A major contributor to this dissatisfaction is that they feel that their job offers limited advancement opportunities. This shortcoming calls for management attention to study how engineers' individual development plan can be structured and supported to create advancement opportunities for them. This remedial action needs to be complemented by reviewing engineers' job descriptions to assess whether their job matches their skills and is sufficiently challenging to keep them satisfied.

Generally, the participating engineers are not happy with the way Eskom's company policies are put into practice and management needs to review this issue. Lastly, these engineers feel that they are not given adequate recognition and praise from their Line Managers. Management needs to ensure that engineers are provided with positive feedback and praise in acknowledgement of good job performance.

Regarding work engagement, all the participating engineers are highly engaged in their jobs. It is of great significance that the engineers feel resilient and believe that they persevere, even when faced with difficult work related problems. This positive and attitudinal behaviour means that management can assign challenging tasks to the engineers and expect positive results.

5.5 CHAPTER SUMMARY

The purpose of this research is to study Eskom engineers' satisfaction with the new Engineering Change Management (ECM) process and assess their job satisfaction and work engagement levels in view of this new ECM process.

General conclusions were drawn from the discussions in the foregoing chapters. The results of the study were articulated to highlight engineers' position on ECM process, job satisfaction and work engagement for the benefit of the management of the organisation where this study was conducted. Positive findings were highlighted and negative findings were elaborated and management remedial actions were recommended. Lastly, the limitations of the study were discussed and recommendations for future research were made.

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APPENDIX A – QUESTIONNAIRE

North-West University
Potchefstroom Campus
Private Bag x6001
Potchefstroom
2520

Date: 16 August 2016

Dear participant,

Re: Assessing satisfaction with the change management process and work engagement levels of engineers in an electricity supplier

I am currently registered for a Master of Business Administration (MBA) degree with North West University School of Business and Governance. As a partial requirement for the completion of this degree, I am required to undertake a research project. The title of the research is "**Assessing satisfaction with the change management process and work engagement levels of engineers in an electricity supplier** ". The objective of the study is to assess engineers' job satisfaction and work engagement levels with respect to the Engineering Change Management process which is used for plant modifications, designs and system integration.
The study entails a survey in a form of a structured questionnaire. Your participation in this study will be much appreciated as it will assist in the completion of the research project. It should take approximately 10 minutes to complete the questionnaire. Your views and contributions to this study will be treated with confidentiality and your anonymity will be assured. The findings of the research will be made available to participants upon request.
Please return the completed questionnaire to Ishmael Makhoa at the e-mail addresses shown below:
ishmaelmakhoa@gmail.com
makhoai@eskom.co.za

The researcher hereby kindly emphasises that the success of this study depends on your participation.
Your co-operation is highly appreciated in advance.

Yours sincerely
Makhoa Ishmael Makhoa
Researcher
Tel: (017) 749 5769
Cell: 079 8866 269
Research Supervisor: Prof. L.T. Jackson

SECTION A – Details of the participant

You are requested to construct a personal code by following the instructions given below. This code will ONLY be known to you, and thus presents no danger of harming your anonymity or the confidentiality of the information given herein. If there would be a follow-up data-gathering, you will be asked the same question, in order for you to reconstruct your code. This code will enable the researcher to study the measured concepts over time, while you still remain anonymous. The code is made up of the following:

	Example	**Your code**
1.Give the first and last letter of the city or town in which you were born	Johannesburg = JG	
2. Give the first and last letter of your mother's maiden name (surname before she got married)	Mnisi = MI	
3. Give the first and last letter of your Father's name	John = JN	

BIOGRAPHICAL INFORMATION:

The following information is needed to enable meaningful data analysis. I appreciate your help in providing this important information.
Mark the applicable block with a cross (X). Complete all questions.

Bio1: Please state your age: ….....years….....months

Bio2	**Gender:**	1. Male	2. Female

Bio3	**Race:**	1. Black	2. White	3. Coloured	4. Indian	5. Other

Bio 4	**Level of Employment:**
1.	Technologist
2.	Engineer
3.	Senior Technologist
4.	Senior Advisor
5.	Senior Engineer
6.	Chief Advisor
7.	Chief Technologist
8.	Chief Engineer
9.	Other

Specify 'Other': ……

Bio5: How long have you been appointed in your current position?

a) 0-3	b) 4-10	c) 11-15	d) 16-20	e) 20 years +

Bio6: How long have you been in an engineering line of work?

a) 0-3	b) 4-10	c) 11-15	d) 16-20	e) 20 years +

Bio7	**Highest Qualification:**	1. Diploma	2. Degree	3. Postgraduate

Bio8	**Area of work:**
1. Power Station	
2. (CoE) Centre of Excellence	
3. PEIC (production engineering integration coal)	
4. Other	

Specify 'Other': …….

SECTION B – Satisfaction with Engineering Change Management (ECM) process

The purpose of this section is to give you a chance to indicatehow satisfied you feel about the stated aspects of the ECM process. Rate your feelings on a scale of 1 to 5 whereby 1= not satisfied, 2=somewhat satisfied, 3=satisfied, 4 = very satisfied and 5 = extremely satisfied.

Items	**ECM aspects**	**Rating scale**				
		1	**2**	**3**	**4**	**5**
B1	The way ECM process was introduced					
B2	How ECM process is implemented					
B3	The level of consultation by the ECM process drivers					
B4	How the decision making is conducted in the ECM process implementation or application					
B5	Provision of ECM process support systems and structures (i.e. guidelines and assistance)					
B6	ECM process training provided					
B7	Relevance and clarity of ECM documents and templates					
B8	The value that ECM process adds to your career					
B9	ECM process contribution to Eskom business					
B10	ECM process's alignment with the business needs					

SECTION C – Job satisfaction

The purpose of this section is to give you a chance to tell **how you feel about your job**, what things you are **satisfied** with and what things you are **not satisfied** with.
Keeping **Engineering Change Management process** in mind, rate how you feel about the aspect of your job described by the statements from C1 to C20 on a scale of 1 to 5 whereby 1= not satisfied, 2=somewhat satisfied, 3=satisfied, 4 = very satisfied and 5 = extremely satisfied

Items	Job satisfaction statement	Rating scale					Dimension
		1	2	3	4	5	
C1	Being able to keep busy all the time						Intrinsic
C2	The chance to work alone on the job						Intrinsic
C3	The chance to do different things from time to time						Intrinsic
C4	The way my boss handles his/her workers.						Extrinsic
C5	The competence of my supervisor in making decisions						Extrinsic
C6	Being able to do things that don't go against my conscience						Intrinsic
C7	The chance to do something that makes use of my abilities						Intrinsic
C8	My pay and the amount of work I do						Extrinsic
C9	The chances for advancement in this job						Extrinsic
C10	The freedom to use my own judgment						Intrinsic
C11	The chance to try my own methods of doing the job						Intrinsic
C12	The working conditions						General
C13	The feeling of accomplishment I get from the job						Intrinsic
C14	The chance to be somebody in my work community						Intrinsic
C15	The way my job provides for steady employment						Intrinsic
C16	The chance to do things for other people (i.e. colleagues)						Intrinsic
C17	The chance to tell people what to do						Intrinsic
C18	The way company policies are put into practice						Extrinsic
C19	The praise I get for doing a good job						Extrinsic
C20	The way my co-workers get along with each other						General

Section D – Work engagement

The purpose of this section is to give you a chance to tell **how engaged you feel** when you perform your job.
Keeping **Engineering Change Management process** in mind, rate how you feel about the aspect of your job described by the statements from D1 to D17 on a scale of 0 to 6 whereby 0 = never, 1= almost never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often, 6 = always.

Items	Engagement statements	Rating scale							Dimension
		0	1	2	3	4	5	6	
D1	At my work, I feel bursting with energy								Vigour
D2	I find the work that I do full of meaning and purpose								Dedication
D3	Time flies when I'm working								Absorption
D4	At my job, I feel strong and vigorous								Vigour
D5	I am enthusiastic about my job								Dedication
D6	When I am working, I forget everything else around me								Absorption
D7	My job inspires me								Dedication
D8	When I get up in the morning, I feel like going to work								Vigour
D9	I feel happy when I am working intensely								Absorption
D10	I am proud of the work that I do								Dedication
D11	I am immersed in my work								Absorption
D12	I can continue working for very long periods at a time								Vigour
D13	To me, my job is challenging								Dedication
D14	I get carried away when I'm working								Absorption
D15	At my job, I am very resilient, mentally								Vigour
D16	It is difficult to detach myself from my job								Absorption
D17	At my work I always persevere, even when things do not go well								Vigour

Thank you very much for your time and effort!