The predictive validity of learning potential and English language proficiency for work performance of candidate engineers

by

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DECLARATION

I, Adelaide Mphokane, student number 41867114, hereby declare that the dissertation entitled, "The predictive validity of learning potential and English language proficiency for work performance of candidate engineers" is my own work and has not been presented at any other institution in and out of South Africa for the same qualification. All the sources have been completely acknowledged, quoted and referenced.

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ACKNOWLEDGEMENT

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SUMMARY

The predictive validity of learning potential and English language proficiency for work performance of candidate engineers

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The aim of this research was (1) to provide empirical data of learning potential and English language proficiency for work performance; (2) to establish whether race and gender influence work performance; (3) to evaluate practical utility and to propose recommendations for selection purposes. The Learning Potential Computerised Adaptive Test and the English Literacy Skills Assessment were used as measuring instruments to measure learning potential and English language proficiency respectively. Work performance data were obtained from the normal performance data system of the company where the research was conducted. ANOVA results showed differences between race and gender groupings. A regression analysis confirmed the predictive validity of learning potential and English language proficiency on work performance. The Spearman rho correlation coefficient ($p < 0.05$) showed a significant positive correlation between the investigated variables.

Key words:

Learning potential; cognitive ability; intelligence testing; static assessments; dynamic assessments; English language proficiency; work performance; predictive validity, candidate engineers

CHAPTER 1: SCIENTIFIC ORIENTATION OF THE RESEARCH

The purpose of this research was to investigate the predictive validity of learning potential and English language proficiency for work performance of candidate engineers. This chapter focuses on the background to and motivation for the study. The problem statement of the study and the aims of the research are also identified. To contextualise the study, the paradigm perspective is defined and discussed and the research design and methodology explained. The chapter ends with an indication of the layout of the subsequent chapters in this dissertation.

1.1 BACKGROUND TO AND MOTIVATION FOR THE STUDY

Engineering is regarded as the most vital field of study in the industrial developing world because it stimulates economic growth (Du Toit & Roodt, 2008; Manpower, 2007). While Woolard, Kneebone and Lee (2003) revealed that there is a shortage in demand and supply of skilled engineers, Farr and Brazil (2009) indicated that global competition, outsourcing, poaching, migration, career mobility across international borders and so forth, intensify demand and supply. This indicates the importance of engineers as a scarce and critical resource towards the implementation of either organisational or government projects.

In the research by Woolard et al. (2003), it was found that the huge shortage of engineers is eminently prevalent in Third-World economies and South Africa is no exception to this challenge. As indicated by Lawless (2005), the ratio of registered engineers by South African population is ranked lowest compared to other developed and developing African countries such as Namibia, Tanzania, Zimbabwe and Swaziland. However, Lawless (2005) notes that the definition of an engineer differs from country to country, and this difference could impact on the comprehension of actual worldwide engineering statistics.

According to Woolard et al. (2003), the shortage of engineers in South Africa is prominent across all engineering disciplines and especially amongst formerly disadvantaged groups. A study by Statistics SA (2000-2004) reported a deep decline, from 0.62% to 0.51% respectively, in the field of engineering, technologists and technicians. Subsequent to the Statistics SA report, the Department of Labour (DoL) (2006) accentuated that some of the engineering and technical professions, namely mechanical, process engineers, chemical, nuclear engineers and so forth, are classified as critical and scarce skills. These skills are essential in the development of engineering projects such as energy generation, construction, technology or the day-to-day running of engineering and other organisations. Hence, as indicated by Khumalo and Mmope (2007), the shortage of engineers,

technologists and technicians not only poses a threat to the economic growth of South Africa but also to the wider engineering industry.

As indicated by Woolard et al. (2003), in 2001, South Africa had an overall of 29 824 engineers with an annual projected growth of 3.4% to meet the skills demand. Lawless (2005) indicated that in 2004 South Africa had a decreased number of engineers of 26 119. However, these statistics do not provide figures for various engineer categories. Lawless (2005) demonstrated that the ratio of registered engineers in South Africa declined to 1:3 166 people compared to 1:2 000 in 1972. As indicated by the Engineering Council of South Africa (ECSA) in its 2012 report the ratio of engineers in South Africa was 1:3 100 people compared to 1:2 000 in Germany and 1:310 equally in Japan, the UK and the USA (ECSA, 2012). This decline could imply that South Africa is increasingly lagging behind in the development and training of engineers required to drive economic growth. In order to be recognised globally, South Africa needs to produce ten times more engineers (ECSA, 2012).

More alarmingly, Du Toit and Roodt (2009) indicated that there was an apparent decline of women engineers from 16.21% in 1996 to 10.51% in 2005. This is supported by the ECSA (2011) database, which demonstrates the gender discrepancy of registered engineers as well as candidate engineers. Out of the 14 000 registered professional engineers, females made up 3% (ECSA, 2011). Moreover, out of the current 6 594 candidate engineers registered on the ECSA database, only 1 236 are females and 5 358 males. This does not represent the current female population as reported in Stats SA (2011) which indicated that over 51% (i.e. 26 071 721 million) of the population are female and approximately 49% (i.e. 24 515 036 million) are males (Statistics South Africa, 2011). However, it should be noted that since registration with ECSA is not compulsory, the numbers may provide a good indication of the current situation, but they may not be a true reflection of how many engineers are present in South Africa.

As highlighted in the ECSA (2012) annual report, out of 34 000 registered professional engineers, 14 000 were professional engineers with a degree from a recognised university. Out of the 14 000, professional engineers blacks constituted less than 12% (ECSA, 2012). However, based on the overall persons registered with ECSA in 2012 , the number of black (black African, Chinese, coloured and Indian) on ECSA's database increased from 10 704 or 30.8% in 2011 to 13 543 or 35% in 2012. Of this, the number of registered candidate engineers increased to 16.6% from 5 652 in 2011 to 6 594 in 2012.

The above statistics indicate that the demographic spread for the total registered persons on the ECSA's database are not representative of the 2012 South African population statistics,

with 3 669 white, 1 895 black, 993 Indian and 137 coloured engineers. The Statistics South Africa (2011) surveys showed that Africans are in the majority and constitute just more than 79% of the total South African population, white and coloured are at 9% while the Indian/Asian population is at 12%. South Africa's apartheid legacy might very well be the attributing factor towards the race and gender imbalances in the engineering field.

In post-apartheid South Africa, the Employment Equity Act (EEA) of 1998 was implemented as a system of national strategy, to redress past imbalances. Section 8 in the EEA (1998) stipulates that "psychological testing and other similar assessments are prohibited unless the test or assessment being used (a) has been scientifically shown to be valid and reliable, (b) can be applied fairly to all employees, and (c) is not biased against any employee or group" (Republic of South Africa, n.d.). The Act is important for promoting equality and attempts to eliminate unfair discrimination during the employment process. According to Theron (2009), valid and reliable psychological assessments can be useful to predict employees who can perform, succeed in their jobs and contribute towards organisational success. Therefore previously disadvantaged people could as well be afforded training opportunities to enter the engineering field alleviating the South African shortage of engineers, transforming the workforce and resulting in high-performing employees and organisations (Theron, 2009).

In conclusion, in the field of industrial psychology, particularly in South Africa, it is paramount to continuously provide facts supporting the use of psychological assessments and whether such tests predict work performance. In this study, it was imperative to draw on existing scientific knowledge to provide empirical evidence about the use of learning potential and language proficiency as measured respectively by the Learning Potential Computerised Adaptive Test (LPCAT) and the English Literacy Skills Assessment (ELSA) to predict the work performance of candidate engineers. As indicated by Robertson and Smith (2001), psychometric assessments are more reliable and provide a better predictive value for job performance than other methods. It is important to investigate whether individuals who have been identified as having the potential to learn could successfully transfer such learning to the work environment resulting in better performance.

1.2 PROBLEM STATEMENT

On the basis of the above background and motivation for this study, it is essential to provide evidence on the use of psychological assessments to predict work performance. The meta-analysis reported by Schmidt and Hunter (1998) suggests that cognitive assessment provides a better predictive validity compared to other methods of assessment. Schmidt and Hunter (1998) found that compared to the other 18 methods commonly used for selection

procedures, general cognitive ability has a high validity of 0.51 in predicting job performance. Several studies demonstrated that cognitive assessments predict job performance (Hunter, 1983, 1986; Hunter & Hunter, 1984; Hunter, Schmidt, Rauschenberger & Jayne, 2000; Jensen, 1986; Ree & Earles, 1992; Schmidt & Hunter, 1998). In addition, studies found that learning potential and language proficiency predict work performance (Nzama, De Beer & Visser, 2008; Schoeman, De Beer & Visser, 2008; Taylor, 1994). It is therefore expected that learning potential and English language proficiency can be successfully used to predict candidate engineers' work performance.

Sternberg and Grigorenko (2002) assert that it is vital to use learning potential because it allows individuals to improve their latent abilities provided that guidance and feedback are offered. As indicated in research, learning potential is measured through the use of dynamic assessment (De Beer, 2000a, 2000b, 2000c; Guthke, 1993; Feuerstein, 1979; Sternberg & Grigorenko 2002; Vygotsky, 1978), and dynamic testing is a type of cognitive assessment that measures learning potential. It is based on a test-train-retest method to establish an individual's current and future learning potential and test takers receive feedback during testing (De Beer, 2000a, 2000b, 2000c; Feuerstein, 1979; Sternberg & Grigorenko, 2002; Vygotsky, 1978). Hence, in the current study, dynamic testing was used to determine the learning potential of candidate engineers.

As mentioned earlier, language is recognised as a factor that contributes towards work performance (Hill & Van Zyl, 2002). According to Webb (2002), South Africa recognises 11 official languages, but the medium of instruction in most organisations is English. In addition, Webb (2002) indicated that both the Afrikaans-speaking and African-language-speaking people often experience a problem with English language because their performance is frequently lower than their counterparts in English-based assessments. Hough and Horne (1994) found that 90% of South African workers transfer to an English language environment every day – hence the word "transferee". In addition, Hill and Van Zyl (2002) found that 40% of engineers mostly used Afrikaans and indigenous African languages in order to be effective.

A transferee is referred to as a person who, in order to make a living, has to transfer daily from his/her natural language environment (and culture) to a different language environment (and culture) and is assumed/expected to cope like a mother-tongue user (Hough & Horne, 1994). Hence the majority of the transferee workers do not cope well with the daily demand of the application of English, which results in a high rate of functionally illiterate employees (Hough & Horne, 1994). For this reason, Hough and Horne (1994) contend that non-English mother-tongue users are likely to perform at lower level than English mother-tongue users.

A study by Schoeman et al. (2008), found that people who use English as a second language often experience some learning and training difficulties, which usually escalate to work performance. Correspondingly, Hill and Van Zyl (2002) found that the use of African languages in the workplace has an influence on productivity, because employees understand better when instructions are in their own languages. Furthermore, Hill and Van Zyl (2002) reported that English language is essential in the engineering workplace to understand technical jargon which is difficult to translate into other languages.

As indicated in Sonnentag and Frese (2002) and Viswesvaran and Ones (2000), work performance is a key concept in work and industrial and organisational psychology. Guion (1998) maintains that it is critical to continuously measure work performance to identify dimensions that contribute to success, revise and increase the initial set performance bar and remain globally competitive in order to achieve organisational goals. It is therefore important to conceptualise what predicts work performance of candidate engineers based on the many findings reported in the literature (Avolio, Waldman & McDaniel, 1990; Borman & Motowidlo, 1997; Campbell, 1990; McDaniel, Schmidt & Hunter, 1988; Motowidlo & Schmit, 1999).

This research focuses on establishing whether candidate engineers in transition from university to the workplace perform as predicted during the selection process. Research investigating the predictive validity of psychological assessments has been focused mainly on the general prediction of psychological assessments for work performance. As indicated in research (Anastasi & Urbina, 1997; Borman & Motowidlo, 1997; Hunter & Hunter, 1984; Robertson & Smith, 2001; Schmidt & Hunter; 1998), various tools such as work samples, cognitive assessments, biodata and integrity tests are useful for selection as well as predicting work performance.

Currently, the organisation in which the study was conducted thrives on the skills and talents of engineers and considers its high performance culture as a driver of organisational success. The challenge is that the organisation has not conducted any scientific study to validate the employment of the psychological assessment utilised to predict work performance of engineers. This study will therefore provide evidence and internal validation whether the tools used for the selection of engineers predict work performance and are aligned to the high performance culture of the organisation. Accurate prediction will ensure that suitable candidate engineers are selected for the organisation, consequently contributing towards its high performance culture. High performing candidate engineers will contribute towards the many global and local expansion projects initiated by the organisation.

Beyond accurate recruitment and the selection process of candidate engineers, this will ensure that performing employees are rewarded on the basis of their unique individual contributions both at the team and organisational level, hence entrenching the desired high performance culture. In this organisation, promotion of candidate engineers depends on individual performance on the training programme and is linked to salary increases.

The following research questions were formulated to examine whether assessment tools used in the selection process predict work performance of candidate engineers:

- Is learning potential a significant predictor of work performance?

- Is English language proficiency a significant predictor of work performance?

- Is the combination of learning potential and English language proficiency effective in predicting work performance?

- Are there any differences with regard to race and gender, in terms of learning potential, English language proficiency and work performance?

1.3 AIMS

Pertinent to the above problem statement and the research questions the aims were formulated as follows:

1.3.1 General aim

The general aim of this study was to determine whether learning potential and English proficiency measured respectively by the LPCAT and the ELSA can effectively/accurately predict the work performance of candidate engineers using their final work performance merit rating as a criterion measure.

1.3.2 Specific theoretical aims

The specific theoretical aims of this study were as follows:

- To theoretically conceptualise learning potential, English language proficiency and work performance and explore how the learning potential and English language proficiency concepts can be measured using psychological tests

- To conceptualise the theoretical relationship between learning potential and English language proficiency in predicting work performance

1.3.3 Specific empirical aims

The specific empirical aims of the study were as follows:

- To assess the empirical predictive validity of learning potential and English language proficiency as predictors of work performance of candidate engineers

- To evaluate the relationship between learning potential and English language proficiency as predictors of work performance of candidate engineers

- To establish whether there are differences in terms of race and gender the learning potential, English language proficiency and work performance of candidate engineers

- To provide practical utility and propose recommendations for selection purposes

1.4 PARADIGM PERSPECTIVE OF THE RESEARCH

For the purposes of this research, a paradigm was used to signify a covert or overt view of reality that serves as the fundamental framework for research (Kuhn, 1970). The paradigm perspective refers to the intellectual climate or variety of meta-theoretical values, beliefs and assumptions underlying the theories and models that inform the context of this study (Mouton & Marais, 1996). A paradigm is therefore a lens through which the researcher practically gains knowledge of the principles of reality (Guba & Lincoln, 1994; Kuhn, 1970; Terre Blanche, Durrheim & Painter, 2006).

Paradigms can be characterised by ontology (the nature of the reality to be studied and what can be known about it), epistemology (the nature of the relationship between the researcher and the studied subjects and how we come to know that reality) and methodology (how the researcher may practically study what they believe can be known) (Mouton & Marais, 1996). For this study, the ontology is guided by the positivist view, wherein the assumptions are of an objective researcher and predictive reality; and the epistemology and the methodology are quantitative (Mouton & Marais, 1996). A positivist approach seeks to explain and predict the realities of the world by objectively measuring the relationships between phenomena (Terre Blanche et al., 2006). Therefore the study seeks to explain the predictive validity of learning potential and English language proficiency for the work performance of candidate engineers.

The empirical study was guided by the functionalist paradigmatic point of view. Based on societal affairs, the functionalist paradigm seeks to gain understanding and preserving of order and stability in society (Babbie, 2001; Kouvas, 2007). According to the functionalist

perspective, the variables to be studied form part of the larger system and are hence required in performing a necessary function within the system (Babbie, 2001; Terre Blanche et al., 2006). The following are some of the basic assumptions of the functionalists: (1) certain orders really exist in societies; (2) universally, science determines what can be sufficiently observed; (3) scientific theories provide objective and empirical evidence; (4) scientists employ external rules and regulations to create and structure the orders within the social world; and (5) scientists provide explanations of social matters (Babbie, 2001; Kouvas, 2007).

These above-mentioned assumptions guided this study in order to empirically provide evidence of the role of cognition and language for the work performance of candidate engineers. Because learning potential and English language proficiency are scientifically measurable and quantifiable, statistical results could be utilised to understand if these constructs could predict work performance. Therefore this study contributes to the theoretical ideologies and provides practical solutions to the realities of the use of psychological assessments in the real workplace to predict work performance.

The intellectual climate is a variety of meta-theoretical values held by those practising in a particular field at a given time (Mouton & Marais, 1996). This is important to ensure continuous growth in the discipline. The study was conducted in the industrial and organisational psychology discipline, with specific reference to psychometric assessments and personnel psychology.

Industrial and organisational psychology (IOP) is defined as a systematic and applied field of psychology concerned with the study of human behaviour in the workplace (Aamodt, 2010; Cascio & Aguinis, 2005). In general, IOP benefits organisations because it enables them to continuously improve organisational processes such as recruitment and selection, talent retention, organisational design, performance management, facilitation of employee career development, and enhances employee productivity and overall organisational performance. This study contributes towards the selection of candidate engineers and the evaluation of their work performance.

Psychometric assessments (psychological testing) refer to the quantified standardised measures of a sample of behaviour in which the application of the measuring instruments is uniform (i.e. is administration and scoring) (Anastasi & Urbina, 1997). According to Schreuder and Coetzee (2010), ongoing consideration should be given to the role of psychometrics in IOP, and how validity indications are interpreted and used in terms of new predictor criteria for work performance and career success. In this study the LPCAT was

used to measure the learning potential of candidate engineers (De Beer, 2000a; 2000b; 2000c; 2005; 2006). ELSA is not classified as a psychometric tool, it measures the aspects of individual language proficiency (Hough & Horne, 1994).

Personnel psychology is a sub-discipline of industrial psychology that refers to the application of theories in order to understand individual behavioural differences through work performance and the measurement thereof (Aamodt, 2010). It encompasses the human resource management vital to achieving organisational goals such as attraction, selection, development and retention of talent (Cascio & Aguinus, 2005). Through these processes the diversity of employees can be easily identified, predicted and managed to increase individual and organisation performance. This study also focused on race and gender to evaluate whether differences exist with regard to learning potential, English language proficiency and work performance and to provide the practical utility for the future selection of candidate engineers.

1.5 CONCEPTUAL DESCRIPTION

The key concepts used in the study are briefly defined below.

- De Beer (2006, p. 10) defines learning potential "as *a combination of the pre-test performance and the magnitude of the difference between the post-test and the pre-test scores".*

- Hough and Horne (1994) refer to language proficiency as the ability to apply functional literacy rather than the theoretical understanding of a language.

- Viswesvaran and Ones (2000) refer to work performance as an act of fulfilment for the requirements of a given job to accomplish organisational goals including the manner in which the job is carried out, work efficiency or achievement and sense of duty.

- Candidate engineers refer to registration of persons who meet the academic requirements for registration in the Professional Categories referred to above and who are undergoing professional development (preferably) under a Commitment and Undertaking (ECSA, 2012).

- Anastasi and Urbina (1997) refer to reliability as the extent to which the measuring instrument consistently measures the same construct in repeated settings. The Cronbach alpha coefficients (α) employed in psychological assessment of above the 0.70 guidelines are acceptable (Nunally & Bernstein, 1994).

- Anastasi and Urbina (1997) define validity as the extent to which an instrument measures what it purports to measure.

- Predictive validity refers to a form of validity focused on whether the assessment procedure can predict how groups may differ and whether there is a relationship between test scores and later performance (Schmidt & Hunter, 1998).

1.6 RESEARCH DESIGN

The purpose of the research was to predict, describe, compare and correlate data in relation to the specified variables. This is discussed in detail in subsequent chapters of this dissertation.

The research adopted a nonexperimental research design, an ex post facto, to focus on candidate engineers undergoing on-the-job training and aimed to evaluate the predictive validity of the LPCAT and ELSA instruments utilised during the selection process. As indicated in Goodwin (2010), an ex post facto is a research design in which the participants with similar background are selected on the basis of past occurrences of different conditions and then compared to the dependent variable. This method was chosen because the research participants had undergone similar selection procedures in different years and had been exposed to different on-the-job training at different business units in the same organisation. Also ex post facto design is ideal when two or more of the variables in the study cannot be manipulated by the researcher, as it was in this study with gender and race variables (Terre Blanche et al., 2006).

For the research, a quantitative approach was used to collect and analyse data, and hence the results can be replicated and generalised for a wider population (Terre Blanche et al., 2006). The quantitative method assumes that behaviour is predictable and as such can be measured (Mouton, 2001; Mouton & Marais, 1996; Schoeman et al., 2008). Non-probability, convenience sampling was used because the participants were easily accessible to the researcher (Terre Blanche et al., 2006). The sample consisted of candidate engineers employed by the organisation where the research was conducted.

The research followed a descriptive approach to obtain information on the relationship between learning potential, English language proficiency and work performance. It aims to describe the relationship between the variables rather than assuming a causal effect. That is, a descriptive approach is followed to provide the relationship of the constructs measured and its predictive validity on work performance (Terre Blanche et al., 2006). The literature review explores the relationship between the variables and its impact on work performance.

Independent or predictor variables refer to what the researcher is investigating (Terre Blanche et al., 2006). In this study, the independent variables were learning potential and English language proficiency. The dependent or criterion variable refers to the variable being tested that is dependent on the independent variable (Terre Blanche et al., 2006). In this study, the dependent variable was work performance. Moderator variables are defined as those variables that interfere and have an influence on the dependent variable (Terre Blanche et al., 2006). The moderator variables considered in this study were race and gender.

The unit of analysis is defined as the objects or things that are investigated in order to determine whether such objects or things can be generalised to further explain the differences between them (Babbie & Mouton, 2009; Terre Blanche et al., 2006). The unit of analysis for the general aim (to determine whether the learning potential and English proficiency can effectively/accurately predict the work performance of candidate engineers) was the group. The unit of analysis for the specific aims was the sub-groups of the biographical variables (race and gender) relative to their scores of learning potential, English language proficiency and work performance.

The internal validity and reliability of the study were considered through the use of reliable and valid psychological instruments, that are, the LPCAT (De Beer, 2000a; 2000b; 2000c) and the ELSA (Hough & Horne, 1994), which are reported to provide acceptable results for different populations. External validity was not accomplished, bearing in mind the nonprobability convenience sampling method and the small sample size, which was not representative of the population of candidate engineers in other settings. The results were generalised only to the population of the candidate engineers currently investigated in a petrochemical organisation. Relevant literature was reviewed to exclude plausible rival hypotheses. The research design and procedures were selected to ensure that the findings could be generalised (Terre Blanche et al., 2006).

1.7 RESEARCH METHOD

The study comprised of two phases, namely the literature review and the empirical study. The literature review investigated and theoretically conceptualised learning potential and English language proficiency as measuring constructs. The literature review provided information on work performance as an evaluation measure. The literature explained the relationship between learning potential and English language proficiency and its effects on work performance. The hypotheses were formulated on the basis of previous studies relating to the constructs. The empirical study focused on the research procedure, selection of

research participants, measuring battery and the application of data analysis. The results, limitations and recommendations for future research were discussed in an article format (chapter 3).

1.7.1 Participants

The population comprised one-hundred-and-forty-eight (148) candidate engineers assessed between 2005 and 2006 placed in a petrochemical organisation situated in South Africa where the organisation operates. The sample was limited to candidate engineers currently undergoing specific formal training to become professional engineers. A nonprobability convenience sampling method was chosen characterised by permanent candidate engineers. The researcher excluded a great proportion of candidate engineers in the organisation who were not part of the bursary selection process. The researcher was aware that the exclusion of other candidate engineers would influence the external validity and generalisability of the results. Hence the results were not inferred to the entire candidate engineer population in the organisation since the sample was not representative nor was it randomly selected.

Both the learning potential and English language proficiency and work performance data were accessed from the central Talent Management and Global Learning Department. The results obtained from this study should be useful to determine future selection challenges and to improve the training programme for candidate engineers. The total sample consisted of whites (n = 56), blacks (n = 14), Indians (n = 22) and coloureds (n = 2). The sample consisted of males (n = 67) and females (n = 27).

1.7.2 Measuring instruments

The LPCAT and ELSA were used to measure learning potential and English language proficiency respectively. The organisation's annual merit rating system was used to measure work performance. The reliability and validity of the instruments were considered to be satisfactory and will be discussed in chapter 3.

1.7.3 Data collection

The researcher used available learning potential and English language proficiency data obtained between 2005 and 2006 in the annual bursary selection process for candidate engineers. The data included the learning potential and English language proficiency results of the potential engineers. An annual formal performance review cycle (July ending June) utilised by the organisation was used to collect work performance data. The June review

provided the final merit rating linked to the salary increases, incentives and promotion of employees. In this study, the final review for the first year of placement for each candidate engineer was used (i.e. placements from 2006 – 2011). The reason for the time lapse between 2005/2006 and 2012 could be various ranging from students not finishing their minimum 4 year degree on time as is expected. Some students had extended study years due to the need to develop their English language proficiency as per the recommendation made during the selection process. After completion of the degree the participants are placed in a company formal training programme for a minimum of 18-24 months before a formal performance appraisal is conducted.

1.7.4 Statistical analysis

The research analysis was carried out in two phases through the use of the Statistical Product and Service Solution (IBM SPSS, 2011). In phase 1, the descriptive statistics focused on the means and standard deviations for independent and dependent variables to describe the results in terms of their minimum and maximum scores (Vogt, 1993). The Spearman rho correlation coefficient was computed to determine the correlational between the independent and the dependent variables. The size of the coefficient only provides an indication as to the strength and direction of the relationship; so is not interpreted as a predictive relationship (Babbie & Mouton, 2009; Vogt, 1993). The level of statistical significance was set at $p < 0.05$.

In phase 2, the inferential statistics analyses were performed. Regression analysis was done to indicate the extent to which learning potential and English language proficiency predict work performance. Multiple regression analysis was computed between the learning potential, English language proficiency and the work performance to interpret the practical differences between genders. A stepwise regression was selected to sequentially add each variable (i.e. one at a time based on the strength of their squared semi-partial correlations (R^2)). At each step, each variable was added on the basis of greatest improvement in R^2 or removed if R^2 was not significant (Babbie & Mouton, 2009; Vogt, 1993). An independent sample t-test set at value ($p < 0.05$) was performed to establish whether gender differences exist with regard to learning potential and English language proficiency. Analysis of variance (ANOVA) was performed to evaluate whether racial differences exist between learning potential and English language proficiency and work performance (Babbie & Mouton, 2009; Vogt, 1993). This analysis provided information on the differences between the race groups with regard to their learning potential and English language proficiency.

The post hoc test was computed to test which pairwise group differences were significant. The Scheffè test is a method that can be generally applied to all comparisons of means after an ANOVA (Cohen, 2008; Glass & Stanley, 1984). Hence in this study, the Scheffè post hoc comparison and test of means was performed mainly to explore and interpret the results that differ from one another. The Kruskal-Wallis test is used to compare more than two sets of scores from different groups (Cohen, 2008). In this research the Kruskal-Wallis test was used to determine differences between gender groups with regard to the nonparametric data (the ELSA and work performance). The detailed empirical study is discussed in chapter 3.

1.7.5 Research hypotheses

The hypotheses stated below were empirically tested based on the 95% confidence level.

$H1_1$: The learning potential scores correlate significantly and positively with the work performance of candidate engineers.

$H2_1$: The English language proficiency scores correlate statistically significantly and positively with the work performance of candidate engineers.

$H3_1$: There is a statistically significant difference between the gender groups with regard to learning potential.

$H4_1$: There is a statistically significant difference between the race groups with regard to learning potential.

$H5_1$: There is a statistically significant difference between the gender groups with regard to English language proficiency.

$H6_1$: There is a statistically significant difference between the race groups with regard to English language proficiency.

$H7_1$: There is a statistically significant difference between the race groups with regard to work performance.

1.7.6 Results

The results are reported and presented in chapter 3. The descriptive analysis is reported to provide an overview of the data collected. A detailed statistical interpretation to infer the results as well as the statistical significance of the studied sample is reported. Chapter 4 concludes the study by drawing conclusions, discussing the limitations of the present study and making recommendations for future research.

1.8 ETHICAL CONSIDERATIONS

Participants' informed consent was obtained prior to completion of the assessments. The consent form stated that all assessment results would be kept strictly confidential, used for decision making, not released to any third party without the individual's written consent and within the parameters of confidentiality used by the organisation for research purposes. The relevant authorities were approached to obtain permission for gaining access to all candidates' stored data. This included the corporate graduate officers who provided a list of all candidate engineers, global learning to access performance merit ratings and talent management for psychological assessment results. Ethical clearance was also obtained from the academic institution where the researcher studied.

1.9 CHAPTER LAYOUT

In Chapter 1 the research topic providing the background to and motivation for the study, the research problems and aims was introduced. Information on the design, method and paradigmatic stance is also presented.

In Chapter 2 a literature review and the theory of learning potential with reference to intelligence, and cognitive and dynamic assessments was discussed. This is followed by the discussion of English language proficiency such as the importance of literacy in the work environment and the challenges impacting on the assessment of language. Lastly, the literature review focuses on the model, definition and measurement of work performance. The process and purpose as well as the challenges of performance management are discussed.

The research article focuses on the method of research design and methodology, data collection, data analysis and the instruments used. This includes the research objectives, hypothesis testing and integration of the research findings.

Chapter 4 concludes the research, discusses the limitations observed in the study and proposes recommendations for future research based on the empirical results.

1.10 CHAPTER SUMMARY

This chapter provided an introduction to the study, the background to and motivation for the study and the problem statement. The aims and the value of the study were explained. The chapter introduced the constructs or variables of this study. The paradigm view relevant to this study was discussed. The research design and methodology were explicated.

CHAPTER 2: LEARNING POTENTIAL, ENGLISH LANGUAGE PROFICIENCY AND WORK PERFORMANCE

2.1 INTRODUCTION

This chapter provides a discussion of the literature review of the three variables of the study, namely learning potential, English proficiency and work performance. The chapter begins with a historical overview of psychological assessments and the legal requirements in the South African context. The definition and development of intelligence testing described by different theorists is discussed followed by a distinction between static and dynamic assessment. A critical analysis of the development of cognitive assessment and its application in the work context is also discussed. The section concludes with an analysis of dynamic assessments and learning potential in the South African work environment.

This is followed by a discussion of English language proficiency with the focus on existing and various language proficiency measures, the importance of language and the challenges posed by the use of language in different settings. The emphasis is on understanding the theory and development of language, usage and measurement, and the implications for work performance.

Lastly, the chapter focuses on the model, definition and measurement of work performance. The challenges of performance management are also discussed. Finally, a conclusion integrates and summarises the three constructs relative to the research topic.

2.2 HISTORICAL DEVELOPMENT OF PSYCHOLOGICAL ASSESSMENT

The study of the history of psychological assessment is important to understand the development phases and their contribution to modern psychological practices (Foxcroft & Roodt, 2005; 2009). Psychological assessment has its origins in ancient times, especially for selection purposes. For example, the Bible, Judges: chapter 7, records how Gideon selected his soldiers by observing who of them maintained alertness while drinking water (Foxcroft & Roodt, 2005; 2009). A civil service system was instituted by the Chinese emperor, in 2200 B.C., to determine whether officials were fit to perform their governmental duties (Foxcroft & Roodt, 2005; 2009). In more modern times, the British and French civil services developed their civil service examination procedures (Aiken, 1988).

The need to assess human attributes has been explored in fields ranging from astrology, physiognomy, humorology, phrenology, chirology and graphology (Foxcroft & Roodt, 2005; 2009). Although, these historic origins cannot be scientifically established, Foxcroft and Roodt (2005; 2009) argue that they contributed towards the development of scientific

measures of assessments. Unlike in ancient times, rapid technological advancement, legal requirements and scientific evidence are increasingly used in the field of psychological assessments to systematically differentiate people's abilities, personality and behavioural characteristics.

2.2.1 A brief overview of psychometric assessments in South Africa

During the apartheid period in South Africa, psychological tests were used to justify established views that Africans were inherently inferior to whites (Claassen, 1997). African abilities were assessed against Western norms on tests developed for application in Western cultural contexts (Claassen, 1997; Foxcroft & Roodt, 2009). Although it can be mentioned that tests are currently not used to prove the inferiority of non-whites, they are still very much assessed against Western norms (Claassen, 1997). That is, some of the tests used in South Africa were originally developed in other countries and adapted for the South African population (Claassen, 1997). This is problematic given that South Africa is a multicultural society growing rapidly in terms of a change in educational systems and political and socioeconomic status (Foxcroft & Roodt, 2009).

The argument that tests should always take consideration of the cultural background of the person fails to consider that in South Africa there is a present shift of many African groups from rural to urban areas (Claassen, 1997). Hence cultural differences are no longer quite as serious a matter as they used to be. Alongside sociocultural factors, technological advancement is continuously changing the field of psychological testing (Feature Online Psychometrics, 2001; Gregory, 2007). Computer-based and internet-based tests are swiftly catching on and also relevant, because they provide efficiency and precision in the milieu of testing. However, it is important to note that computer illiteracy may increase the anxiety level on the part of the test taker as well as threaten the authenticity and security of testing (De Beer, 2006; Foxcroft & Roodt, 2005). Some of the computer-based tests developed in South Africa include the LPCAT (De Beer, 2006) and the Cognitive Process Profile (CPP) (Prinsloo, 2001).

2.2.2 South African legal requirements and implications

Research shows that the application of psychological assessments in the workplace has been received with scepticism, because it overlooks issues of bias, fairness and discrimination evident in the South African context (Claassen, 1997; Saunders, 2002; Theron, 2007). The employment of psychological assessments is therefore guided by the Constitution of the Republic of South Africa (1996) (The Bill of Rights section 7(1) and governed by the Professional Board for Psychology under the Health Professions Council of

South Africa (HPCSA), and the Health Professions Act 56 of 1974). These frameworks are invaluable for ensuring the protection of the public from professional malpractice (De Villiers, 1994; Foxcroft & Roodt, 2005).

In addition, section (8) of the EEA (1998) stipulates that psychological testing and other similar assessments are prohibited unless the test or assessment being used has been (a) scientifically shown to be valid and reliable; (b) can be applied fairly to all individuals or groups; (c) is not biased against any individual or group. The amended clause (d) (EEA, 2012) states that only psychometric tests certified by the HPCSA may be used. The latter, if done appropriately, could increase credibility, reputation and confidence in the use of psychological assessments in South Africa. However, capacity to carry out the changes in the HPCSA could be a major challenge with the approval and certification of tests and impact on the process of test development (Society for Industrial and Organisational Psychology of South Africa, 2011).

Further, the EEA of 1998 proposes that tests should be certified as EEA compliant. However, declaring a test as EEA certified may lead to misuse because results may possibly be interpreted unfairly (Foxcroft & Roodt, 2005). To avoid this requires additional effort with regard to minimising bias within subgroups during test development and consideration of other sociocultural and economic factors. In addition to section (8) of the EEA (1998), (Republic of South Africa, n.d), and sections 15 and 20 (3) emphasise equal representation of suitably qualified people from the designated groups and that such suitably qualified people must have the capacity to acquire, within reasonable time, the ability to learn and to do the job (Lopez, Roodt & Mauer, 2001; Mauer, 2000a; 2000b).

The implication of these changes encourages users and developers of psychological tests to be more vigilant about the application and development of tests in order to maintain test fairness, reduce bias and legally protect test takers against any form of discrimination. Such discrimination and bias are often observed with intelligence and cognitive assessments.

2.3 LEARNING POTENTIAL

2.3.1 The development of learning potential assessments

The popularisation of dynamic assessment evolved around the theory of Lev Vygotsky (1978) who developed the term "zone of proximal development" (ZPD). Vygotsky (1978) criticised the behaviourist, constructionist and the gestalt approaches which assume that learning follows development. Vygotsky (1978) believed in the ZPD and argued that learning comes first and then develops through significant others such as parents, teachers and so

on, and then independently. Vygotsky (1978) assumed that the difference between actual and potential development is determined by independent problem solving and through supervision or collaboration with others, respectively.

According to Vygotsky (1978), the ZPD refers to the difference between the lower and the upper range of the tasks an individual completes. The lower limit encompasses the level reached by the individual while working independently (Vygotsky, 1978). The upper limit refers to the potential the individual reaches with assistance or supervision from competent others (Campione, Brown, Ferrara & Bryant, 1984; Fabio, 2005; Sternberg & Grigorenko, 2002).

According to Zaretskii (2009), Vygotsky is commended for his focus on the sociocultural factors that affect cognitive development. However, Miller (2002) argues that the theory is generic rather than specific. Hence further studies should rather focus on the identification of specific processes that take place during the interaction between the learner and the environment. Miller (2002) contends that Vygotsky placed too much emphasis on the role of language and emotional factors of human development towards cognitive development. Although the approach focuses on the cognitive development of children and students, it provides fewer details on how the various ages or developmental levels of children influence learning. Thus the various aspects that constrain or enable learning are unknown (Miller, 2002).

Subsequently, Reuven Feuerstein (1979; 1980) developed the terms, structural cognitive modifiability (SCM) and mediated learning experience (MLE) (Murphy & Maree, 2006). According to Feuerstein (1979), the co-contributor to dynamic assessment, people have the capacity to grow, adapt and learn, mediated by their experiences and interaction with the environment. He assumed that biological and sociocultural factors have an influence on cognitive functioning and therefore the human-environment interaction facilitate learning. He argues that a lack in MLE results in less modifiability, that is, directly influences factors such as educational and socioeconomic status. He refers to the cognitive differences influenced by the environment and the sociocultural factors as the "distal" and the MLE as the "proximal" (Feuerstein, 1980).

Feuerstein (1979) developed the dynamic tool, the Learning Potential Assessment Device, also referred to as the Learning Propensity Assessment Device (LPAD) to assess cognitive functioning. The LPAD infers that cognition is not static – hence measurement is done at three levels, firstly the manifestation functioning, exploration of conditions under which manifest functions may be improved and modifiability through mediation (Feuerstein, 1979).

The LPAD focuses on unlocking the future potential by identifying well-developed and underdeveloped cognitive functioning rather than current cognitive functioning (Feuerstein, 1979).

Several studies (De Beer, 2000a; 2000b; 2000c; 2005; 2006; Elliot, 2003; Embretson, 2000; Hamers & Resing, 1993; Lidz & Elliot, 2000; Murphy & Maree, 2006; Sternberg & Grigorenko, 2002) indicate that dynamic assessment is structured into three stages known as test-train-test. The test-train-test assessment measures what the individual has already achieved, subsequently tested again on the learning acquired after an opportunity to learn has been provided (De Beer, 2006; Embretson, 2000; Jooste, 2004; Sternberg & Grigorenko, 2002). Hence even disadvantaged groups are afforded an opportunity to be assessed fairly, because training is provided.

Similar studies that support the dynamic notion include Budoff's (1968; 1974; 1987a; 1987b) test-train-test assessment, Campione and Brown's (1987) and Campione et al.'s (1984) graduated prompting assessment, and Guthke's (1993) learning ability test concept. However, Lauchlan and Elliott (2001) state that research in dynamic assessment is still in its early stages – hence the need for further investigation of this concept to enhance the scientific evidence.

In South Africa, the need to measure individual's learning potential either in institutions of learning or in organisations for placement and selection is increasingly regarded as appropriate rather than basing it on what the person has achieved. De Beer (2006) found that an improvement in the educational, cultural and socioeconomic status of previously-disadvantaged groups has resulted in increased performance on the measurement of learning potential. This implies that changes in the confounding factors largely influence the overall cognitive capability both in current and future learning potential. The Learning Ability Battery (LAB) (Taylor, 1994) the Ability Processing of Information and Learning Potential Battery (APIL) (Taylor, 1999), the Transfer Automatisation, Memory and Understanding Learning Potential Battery (TRAM) (Taylor, 1999) and the LP-CAT (De Beer, 2000a; 2000b; 2000c), are some of the South African dynamic assessments (Murphy & Maree, 2006).

Dynamic assessment, as highlighted by Jitendra and Kameenui (1993) and Murphy and Maree (2006), is often criticised because of issues related to validity (construct fuzziness and instrument inadequacy), reliability (procedural spuriousness and instructional aloofness) and universally costly research practices (labour intensiveness). As suggested in research (Bendixen, 2000; Jitendra & Kameenui, 1993; Murphy & Davidshofer, 2005), dynamic assessments employ different models that result in vague definitions and application of

standards. This means that dynamic assessments lack specific instruments designed for dynamic testing, and thus affect validity, reliability and comparability of individuals' scores.

However, Feuerstein (1979), Murphy (2002) and Valsiner and Voss (1996) contend that because learning potential is continuous, reliability is inappropriate in dynamic assessment. To improve the concerns on reliability, De Beer (2000a; 2000b; 2000c) and Hambleton and Slater (1997) asserted that the item response theory (IRT) could be applied when developing dynamic assessment tools. As opposed to the test-level, De Beer (2004) maintains that the focus of IRT is on the theory of the item considering the difficulty level of each item in order to achieve the optimal level of performance. While Taylor (1994) maintains that the IRT could possibly address test bias, Elliot (2003) contends that dynamic testing is often targeted for disadvantaged the low performer group, thus restraining the applicability at various group levels.

Furthermore, Haywood and Brown (1990), Jitendra and Kameenui (1993) and Murphy (2002) argue that the application of dynamic assessment is costly, time consuming and requires some level of expertise. However, this argument is perhaps the case in individual assessment rather than in group testing. De Beer (2000a; 2000b; 2000c) maintains that dynamic assessment is cost effective and efficient especially in group settings.

Overall, dynamic assessment assumes that learning potential remains intact until an opportunity is provided to improve the current ability in order to function at an optimal level (De Beer, 2006; Embretson, 2000; Murphy & Maree, 2006; Van Eeden & De Beer, 2009). As indicated in research (De Beer, 2006; Jooste 2004; Van Eeden & De Beer, 2009) dynamic assessment augments the static assessment because the current and future level of performance is also measured. Dynamic assessment thus only emphasises the second phase which indicates the difference between the pre-test and post-test described as learning potential (Bendixen, 2000; De Beer, 2000a; 2000b; 2000c; 2005; 2006; Stenberg & Grigorenko, 2002; Swanson & Lussier, 2001). Learning potential as defined by De Beer (2006, p. 10) for the LPCAT refers to "a combination of the pre-test performance and the magnitude of the difference between the post-test and the pre-test scores".

In summary, Haywood and Tzuriel (2002) and Lidz (1991) and Murphy (2008) argue that research in the field of dynamic assessment is limited only to the theorists and test developers of dynamic assessments. This inhibits further investigations on the psychometric properties of dynamic assessments. Elliot (2003) emphasises that more research should be conducted to test whether dynamic assessment does provide a prediction of future performance. Furthermore, prediction is often too generic and lacks specificity for academic

prediction. According to Murphy (2002), overcoming these challenges requires proper standardisation of administration and scoring.

2.3.2 Cognitive assessments in the workplace

Cognitive assessment, as reported in research by De Beer (2006), Guion (1998), Hunter and Hunter (1984), Nzama et al. (2008), Outtz (2002), Prinsloo (2001) and Schmidt and Hunter (1998), is regarded as a measure of general ability, and hence is popularly used to predict work performance, measure potential to learn and make decisions for selection and placement of suitable candidates. Several studies (Gutenberg, Arvey, Osbur & Jeanneret, 1983; Hunter, 1986; Levine, Spector, Menon, Narayanan & Cannon-Bowers, 1996) reveal that in more complex jobs, general cognitive ability was found to be a general predictor of work performance. As reported in (Schmidt & Hunter, 1998) cognitive ability has been correlated highly with job performance ($r =.51$), other general predictors have somewhat lower correlations (e.g., integrity tests, $r = .41$; conscientiousness tests, $r = .31$; biographical data measures, $r =.35$; and reference checks, $r =.26$), although equivalent prediction might be obtained using specific predictors (e.g., work samples, $r = .54$)

As mentioned by Robertson and Smith (2001), the value-add and validity of cognitive assessments in predicting work performance have been scientifically proven and widely accepted. However, other studies (Hartigan & Wigdor, 1989; Hunter, 1986; Hunter & Hunter, 1984; Schmidt & Hunter, 1998) found that the validity of cognitive assessments varies across jobs. Likewise, Outtz (2002) points out that cognitive assessment yields racial differences that are three to five times larger than other predictors such as biodata, personality inventories and structured interviews as valid predictors of job performance.

Although research (De Beer, 2006; Muller & Scheepers, 2003; Prinsloo, 2001) has provided scientific evidence that cognition predicts work performance, it is imperative to note that in making decisions, a battery of assessments and other situational factors are needed to provide a holistic picture of the person being considered.

2.3.3 Learning potential conclusion

The measurement of intelligence or learning potential is entrenched by debates on the theories that provide evidence to accurately facilitate effective, fair, reliable, valid and unbiased testing. While, Jitendra and Kameenui (1993) emphasise that the psychometric properties of dynamic assessment are a major concern to the followers of static assessments, Murphy (2002) reports that it is impossible to maintain standardisation when dynamic assessment is used over static assessment.

As pointed out in Lipson (1992) and Sternberg and Grigorenko (2002), static and dynamic assessment methods are absolutely different in terms of how intelligence, cognition or learning potential is measured. Meanwhile, Murphy (2002) indicates that static and dynamic assessments provide a balanced view of measuring learning potential, and instead of being in opposition, they are thus invaluable when combined. Therefore the challenge is to select the best approach in order to serve the purpose of the assessment in question while keeping abreast of new developments.

2.4 LANGUAGE PROFICIENCY

2.4.1 Definition of language proficiency

Language proficiency is defined as linguistic competence (Chomsky, 1965), basic interpersonal communicative skills (BICS), cognitive academic language proficiency (CALP) (Cummins, 2000) and communicative competence (Hymes, 1972). According to Cummins (2000), BICS involves the process of engagement in casual conversation, while CALP embraces the multifaceted components in reading and writing expository text. Cummins (2000) therefore suggests that people with underdeveloped CALP would find it difficult to cope with academic prospects especially evident among second-language users. These have been interpreted to mean that a solid foundation of mother-tongue language is important to best prepare people to comprehend English.

2.4.2 English language proficiency and literacy in South Africa

As indicated in Butler and van Dyk (2004) and Webb (2002), the use of English is shifting mainly from being a European language to being a domestic, global language of choice and widely used as a medium of instruction. According to Smet (2006), language in South Africa is not only used as a means of communication but associated with cultural, emotional, historical, social and political power. Meanwhile, Webb (2002) finds that one quarter of the world's population uses English as an additional language. Therefore English is necessary to communicate effectively and to survive at the global level.

The advent of English as an official language in South Africa was partly due to the fulfilment of the political ambitions of the colonists (Ngcobo, 2009). For example, Ngcobo (2009), Van Rooy and Van Rooy (2005) and Wissing (2002) emphasise that language was used to promote racial segregations among different ethnic groups. According to Hibbert (2011) and Kamwangamalu (2002), the English language is thus seen as a sign of power, prestige and mobility. Yet, Nel and Muller (2010) and Webb, Lafon and Pare (2010) and Weideman and Van Rensburg (2002) argue that it is for this reason that the English language for Africans is inadequately developed and may be regarded as a second or even a third language.

In South Africa, language proficiency is defined on the basis of the language most spoken at home or mother tongue rather than on the proficiency level (Stats SA, 2001; 2011). As illustrated in South African national surveys, the most spoken languages in 2001 and 2011 were isiZulu (23.8% and 22.7%) followed by isiXhosa (17.6% and 16.0%), Afrikaans (13.3% and 13.5%) respectively. In 2011, Sepedi, Setswana and Sesotho were spoken by 24.7% of the population, which was greater than in the 2001 statistics. IsiNdebele, XiTsonga, TshiVenda and SiSwati were spoken by less than 5% of the population (Stats SA, 2001; 2011). Although English is regarded as one of the 11 official languages commonly used in business, politics and media, it is frequently spoken by 8.2% and 9.6% (in 2001 and 2011) respectively (Stats SA, 2001; 2011). This means that English is not used by the majority of the South African population on an everyday basis.

By contrast, Posel and Zeller (2011) provide an indication of how South Africans assess their language proficiency based on the language usually spoken at home rather than what language they speak most often at home. Posel and Zeller (2011) found that individuals typically report considerably higher ability in their home language than in English. However, these findings do not report on the level of language proficiency a person has achieved. While these results are invaluable for understanding the reading and writing levels of South Africans, they should be interpreted with caution because they are based on self-assessments and individuals are likely to overestimate their ability and as a result perceived literacy level are influenced (Coetzee-Van Rooy, 2011; Posel & Zeller, 2011).

2.4.3 English language proficiency in the South African workplace

In the period 1910 to 1994, racial segregation occurred in all aspects of life, whereby white people had political and economic control of South Africa's work environment (Claassen, 1997; Foxcroft & Roodt, 2009). According to Kamwangamalu (2002), during these periods, African languages were marginalised and jobs were reserved according to racial groups particularly in favour of whites. However, this discrimination resulted in a high rate of functionally illiterate employees and marginalisation of other languages (Hough & Horne, 1994). Hence people who use English as a second language often experience learning and training difficulties which usually escalate to work performance (Hough & Horne, 1994; Schoeman et al., 2008).

Hill and Van Zyl (2002) contend that in the engineering and mining industry, the discrimination has resulted in marginalisation of African languages in favour of the Afrikaans language. According to Hill and Van Zyl (2002), it is assumed that the use of Afrikaans is associated with cooperation by newcomers towards technical staff. The use of English in the

engineering field is not just regarded as a medium of instruction to be adhered to, but it is also essential to understand technical jargon, which is often difficult to translate into other languages. For example, the majority of the engineers choose English over other languages, especially when applying technical jargon in work-related conversations (Hill & Van Zyl, 2002).

In the mining industry, an additional language to Afrikaans called "*Fanakalo*" which incorporated isiZulu also emerged to promote effective communication and to get the job done between white and black employees (Mining Qualifications Authority, 2000). Similarly, Hill and Van Zyl (2002) emphasise that African languages are used by the majority of employees and management. The latter is also associated with increased productivity, improved employee cooperation, shared communication between employees and other stakeholders and understanding of discontentment, thus minimising communication breakdown, other related social issues and so on.

In addition, Hill and Van Zyl (2002) maintain that management use young black engineers to translate English documents and liaise with employees who are less proficient in English and to translate cultures and ways of working. In this study, especially at the mining site, black engineers are used as a resource to translate documents from English into African languages and to communicate with a vast number of illiterate employees.

However, Hill and Van Zyl (2002) state that in practice, most organisations view English as a medium of instruction for policy purposes only. This view hampers the development of employee's English proficiency because most employees revert back to their mother-tongue languages. As indicated by Smet (2006), this could create challenges, because some people may not participate or engage fully and feel excluded. Furthermore, Smet (2006) claims that in some instances, Africans still compromise in the presence of Afrikaans-speaking people, and this could thus result in discontented employees if they perceive that their language is neglected.

However, Hill and Van Zyl (2002) conclude that English is increasingly accepted as a global and dominant language to interact with the rest of the world and to break through into the world market. According to Greywenstein, Horne and Kapp (1992), South African engineers are also attracted to international assignments and proficiency in English thus becomes a prerequisite for helping bring intercultural understanding. In addition, the advent of information technology also perpetuates how language is acquired, because computer programs are written in English. The advantage of this is that, technology enhances the

need to up-skill English language proficiency, resulting in improved literacy levels (Greywenstein et al., 1992).

According to Hough and Horne (2001), a transferee is thus referred to as a person who in order to make a living, has to transfer daily from his/her natural language environment/culture, to a different language environment/culture and is still expected to cope like a mother-tongue user. Hough and Horne (1994) therefore argue that the majority of transferee workers do not cope with the daily demand of the application of English language, and employers find it invaluable to upskill their workforce to enhance their communication and interaction skills, thus increasing productivity and high performance.

2.4.4 Assessing English language proficiency

The traditional assessment of language proficiency focuses on grammar, spelling and reading comprehension, and vocabulary. Primarily, Teachers of English to Speakers of Other Languages (1997) assumes that English proficiency is important in three areas, namely the ability to communicate in social situations, for academic purposes to acquire knowledge and to measure scholastic success and is noteworthy on the social and cultural level of the audience.

According to Foxcroft (2004), the quality of education in rural areas is not always on the same standards as in urban areas and this is attributed to factors such as class overcrowding, poorly trained teachers, lack of resources and multilingualism in class. Webb (2002) thus contends that assessments aimed at assessing language proficiency must consider sociocultural aspects that may impact on the reliability and validity of results. In addition, Webb (2002) indicates that both Afrikaans- and African-speaking people often experience a problem with English language proficiency tests.

A study by Weideman and Van Rensburg (2002) found that out of 1 000 students who wrote the ELSA, a quarter have language proficiency levels below Grade 10. Likewise, Horne (2001) demonstrates that first-year trainee teachers achieve language proficiency levels equivalent to Grade 8 and higher. Secondly, Afrikaans and African students performed below Grade 10 level on the ELSA. The study also indicated a decline in functional literacy of school leavers applying for admission to technikons and students registered in professional fields such as articled clerks (CAs) (Horne, 2001).

Hence English language difficulty is not limited only to non-mother-tongue and undergraduate students, but also first language speakers of Afrikaans as well as professionals. This implies that a need for remedial actions to improve the South African

English proficiency level should be extended to wider racial groups as well as within educated people (Horne, 2001).

2.4.5 English language proficiency conclusion

It is clear that English language proficiency is a complex concept and a by-product of socioeconomic, educational background and political history. In South Africa, the low level of English language proficiency is attributed to past inequalities between black and white populations and colonisation. However, there is a growing need to learn the English language in order to fit into the rapidly changing environment and for economic viability.

Although all 11 languages are recognised as official in South Africa, both English and Afrikaans dominate the workplace and institutions of learning. In most situations, English is preferred over African languages, because it is globally recognised as a medium of communication, business conduct, and it is the language of power when seeking employment as well as adaptation into urban areas (Chaka, 1997; Heugh, 2010; Kunene, 2009). It is believed that Africans view English language over their mother tongue as a tool to advantageously participate in the international community (Beukes, 2009; Chaka, 1997). This preference, as indicated in literature (Beukes, 2009; Chaka, 1997), contradicts the drive towards a multilingual nation advocated by the South African government whereby citizens are expected to apply all 11 official languages. It should be noted though that it may be practically impossible to be proficient in all 11 official languages

2.5 WORK PERFORMANCE

2.5.1 Definition of work performance

The *Oxford English dictionary* (2007, pp. 641 & 408) defines "work as an activity involving mental or physical effort, as a means of earning money, a task to be done, and performance as to carry out a task or complete an action" respectively. Therefore work performance can be described as a relation of the task and how people carry out and complete the task. Sonnentag and Frese (2002) maintain that individuals who perform and accomplish tasks experience a sense of satisfaction, feeling of mastery and pride compared to their counterparts. Accurate predictions of who will perform the job best can benefit both the individual and the organisation to accomplish goals.

Campbell, McCloy, Oppler and Sager (1993) suggest that organisations employ people not only to perform certain work, but also to perform well, and such performance can be clearly measured. Hence work performance as indicated by Avolio et al. (1990), Borman and Motowidlo (1997), Campbell (1990), Motowidlo and Borman (1997), Motowidlo and Schmidt

(1999) and McDaniel et al. (1988) is multidimensional (i.e. task and contextual performance) and dynamic (i.e. individual variation based on transition and maintenance phase facilitated by learning). It is thus critical to analyse job competencies in order to predict employees' ability necessary to perform the core tasks as well as identify those who demonstrate the potential to learn and maintain job knowledge.

According to Campbell (1990), task performance refers to an individual's proficiency required to perform the core of the job (direct task) and specific task (indirect task such as managing others, etc.). Meanwhile contextual performance refers to factors that indirectly contribute to the core of the job but are a means to pursuing the goals of the job (i.e. behaviour such as conscientiousness, accuracy, spontaneity, initiative, innovation, etc.) (Borman & Motowidlo, 1997; Campbell, 1990; Motowidlo & Borman, 1997; Motowidlo & Schmidt, 1999). Thus task performance relates to a person's ability to do the job, whereas contextual performance includes aspects of personality and motivation.

Work performance as suggested by Avolio et al. (1990) consists of the transition and maintenance phase. During the transition phase, cognitive ability is necessary to perform novel tasks and becomes less relevant during the maintenance phase. Some of the dispositional aspects such as interest, motivation and so forth increase during the maintenance phase, whereby knowledge and skills required to perform the job are learnt and become automatic. Avolio et al. (1990) therefore suggests that individual performance constantly changes from controlled processing (cognitive ability) to the acquisition of knowledge manifested through learning. Sonnentag and Frese (2002) maintain that both multidimensional and dynamic aspects contribute towards overall work performance. Consequently, the evaluation of work performance is likely to pose challenges, because it varies across jobs and depends on skills and individual capabilities and attributes.

According to Griffin, Neal and Parker (2007), work performance is classified into three levels of work, that is, individual, team and organisational levels, characterised by factors such as proficiency (core tasks), proactivity (self-starting behaviour to direct effectiveness) and adaptability (adapting or coping with rapid changes in work roles or the environment). This description suggests that in more stable environments, proficiency becomes a better predictor, while during uncertainty; proactivity and adaptability predict the future effectiveness of the individual, team or organisation's contributions (Griffin et al., 2007).

In this study, work performance was predicted on the basis of both the multidimensional (direct task only) and dynamic concept (transition phase - the cognitive abilities) rather than the contextual and maintenance aspects or the proactivity and adaptability factors.

According to Borman and Motowidlo (1997), cognitive abilities tend to predict task performance, while personality and other related factors tend to predict contextual performance. The focus of this study is therefore on cognitive abilities rather than personality and environmental factors.

2.5.2 Process and purpose of performance evaluation and management

According to Armstrong (2009), performance management is a systematic process for improving individual, team and organisational performance to facilitate organisational strategy. Likewise, Nel, Van Dyk, Haasbroek, Sono and Werner (2005) argue that performance management is becoming increasingly important to distinguish top performers from underperformers. However, Chen and Fu (2008) and Nel et al. (2005), state that performance management is usually linked to allocations of rewards and benefits, such as salary increases and bonuses, which connect employees and the organisation. For this reason, Chen and Fu (2008) and Pongatichat and Johnston (2008) maintain that if alignment is evident between the individual and the organisation, performance management systems could enhance employee engagement, morale, stability, quality results and success.

In essence, performance management is twofold, namely the contribution at the individual and the organisational level (Armstrong, 2009; Bennet & Minty, 1999, Nel et al., 2005). At the individual level, performance management is not only important to identify how people perform relative to the job requirements, but also applies to how they perform. The process assists individuals to identify their development needs and encourages continuous improvement (Armstrong, 2009; Cascio & Aguinis, 2005). The process of performance management thus requires intense focus on defining job responsibilities combined with an ongoing dialogue rather than on mere completion of forms and rating scales.

As suggested in the literature, Armstrong (2009), Bennet and Minty (1999), Cascio and Aguinis (2005) contend that performance management is also useful as an administrative tool to manage careers and talent, inform succession planning, gather data for research purposes, diagnose and identify training needs and inform recognition and reward strategies. Putu, Mimba, Helden and Tillema (2007) and Sheng and Trimi (2008) found that performance measurement is invaluable in directing an organisation's operational agenda and instilling the learning behaviour increasingly required in the global market. It also supports the recognition and reward strategy for individual performance.

For this research, performance management was used as an administrative tool to manage talent in order to provide relevant learning opportunities and to acknowledge candidate engineers' contribution to high-performing culture. In turn, high-performing individuals are

rewarded and promoted to the next level. In the same way, individuals receive feedback on their learning progress and management identify their strengths and development needs to close performance gaps. Hence performance management, as indicated by Armstrong (2009), is not a once or twice a year process but a continuous one.

Thus, to ensure efficiency, performance evaluation requires precise judgement which can either be relative or absolute (Armstrong, 2009; Gomez-Mejia, Balkin & Cardy, 2001). Firstly, Armstrong (2009) and Cascio and Aguinis (2005) state that relative judgement refers to the manner in which one's performance is compared to that of others doing the same job to identify individual differences. However, Gomez-Mejia et al. (2001) maintain that a relative judgement is flawed because the intensity of individual differences whether great or small is not defined. As a result, it cannot be stated how well or badly employees perform on a given task.

Secondly, as indicated by Armstrong (2009) and Cascio and Aguinis (2005), absolute judgement refers to a process in which one's performance is rated based solely on specific performance standards or dimensions. This method is useful for minimising inconsistent ratings. Nonetheless, Gomez-Mejia et al. (2001) emphasise that the difficulty with this method is that all employees receive the same evaluation because of the rater's reluctance to differentiate between employees.

Armstrong (2009) and Cascio and Aguinis (2005) suggest that the success of performance evaluation largely depends on the decisions of the evaluator and the method, such as direct line manager, peers and subordinate, 360° feedback or team appraisal or the techniques used and chosen to measure actual performance. Hence evaluation of work performance, as indicated by Armstrong (2009), should be seen as a continuous, flexible planning process that focuses on the future growth of the individual and the organisation, instead of conforming to the system.

2.5.3 Performance rating techniques

According to Aguinis (2009), performance rating techniques are explained in two forms, namely relative and absolute ratings. As suggested in the literature (Cascio & Aguinis, 2005), relative rating techniques encompass three factors, namely forced/peer, forced distribution and the paired combination ranking system. A forced/peer ranking system is utilised to compare and rank employee performance from best to worst by assigning numbers (Cascio & Aguinis, 2005; Sprenkle, 2002). While it may be effective to determine strong over weak performers, it overlooks an employee's progress in mastering certain jobs

or critical skills and may be viewed as a cause of poor employee morale (Cascio & Aguinis, 2005).

The forced distribution system compares employees on the basis of predetermined performance distribution criteria such as exceeds, meets or does not meet expectations often linked to remuneration (Sprenkle, 2002). According to Cascio and Aguinis (2005), if done appropriately, this system may encourage employees to perform as expected or even beyond what is expected, respectively, because it is associated with rewards. However, employees who do not meet expectations criteria may be disregarded for salary increases, resulting in dissatisfaction (Armstrong, 2009). Lastly, the paired combination system compares each employee with every other employee in a selected group and the position of each employee; based on the number of times the individual was judged to be better than the others. This could be time-consuming when applied to a large group of employees (Armstrong, 2009).

Overall, Cascio and Aguinis (2005) indicate that the above three aspects of relative rating techniques enable individuals to receive feedback on their actual performance. However, the techniques accentuate individual performance and neglect team or organisational performance, which could result in a detrimental competition between employees. Furthermore, to some degree, if the technique is applied inconsistently it could attract legal action by discontented employees (Kline & Sulsky (2009).

An absolute rating technique comprises the essay method, critical incident, forced choice, graphic scales, behaviourally-anchored rating scales (BARS) and management by objectives (MBO) as discussed below (Aguinis, 2009; Cascio & Aguinis, 2005; Kline & Sulsky, 2009).

- *The essay method.* The evaluator writes a report in the form of an essay to describe the strengths and weaknesses of the employee. This technique is time consuming and dependent on the writing skills of the evaluator. The efficiency of the essay method is acceptable only if the report is written in a comprehensive manner (Cascio & Aguinis, 2005).

- *Critical incident.* This method involves the continuous recording of good and bad incidents on the actual job that describe success or failure. This method can be influenced by the period in which the incidents are recorded. In case the incidents are not recorded frequently, the recent recording can be used to finalise performance. In addition, the final performance may exclude incidents that may have been forgotten

or omitted during the time of recording. The method appears to be time-consuming (Cascio & Aguinis, 2005).

- *Forced choice.* The evaluator rates employee on a list of paired job-related competencies. Although it seems to be an objective technique, paired descriptions may not necessarily provide a full description of the employee's performance (Cascio & Aguinis, 2005).

- *Graphic rating scales.* The evaluator indicates the degree of the point on the continuum that describes the employee's performance relative to the specific job. The advantage of this technique is that it is standardised, applied consistently and easier to understand, and it is time-effective. Evaluators are trained to avoid rater errors – hence the highest quality of employees rated as exceptional may be identified to drive the organisational goal, while appropriate development is offered to poor performers (Armstrong, 2009; Cascio & Aguinis, 2005). This technique is criticised because it is distributional in nature and could attract legal complaints if used to discriminate between employees and to conclude employment contracts. In addition, because it is not scientifically proven, it threatens the validity of the ranking (Cascio & Aguinis, 2005).

- *Behaviourally-anchored rating scales (BARS).* This is a complex and expensive technique that requires time and a high level of supervisor involvement. It is job specific and combines the graphic rating scales with critical incidents. Unlike the graphic rating scale, this method could be used if a case of discrimination and bias is a concern (Cascio & Aguinis, 2005; Kline & Sulsky, 2009).

- *Management by objectives (MBO).* This method is typically employed in a team or departmental setting to establish goals to be achieved by individuals. The focus is on output rather than on how performance should be managed. The advantage of the MBO is that it involves the participation of the manager and subordinates (Cascio & Aguinis, 2005).

2.5.4 Challenges of performance evaluation

Sprenkle (2002) indicates that the manner by means of which performance evaluation is conducted contributes to the satisfaction and dissatisfaction of employees. According to Sprenkle (2002), the percentage of those who are satisfied with the process is often less than those who are dissatisfied. Sprenkle (2002) found that issues relating to dissatisfaction include but are not limited to manager's training, unrealistic targets, no consequences for not

conducting performance reviews and inconsistent ratings amongst evaluators and so on. The following factors summarise some of the challenges to be considered during performance evaluation:

- *Rating errors – human factor influence.* Managers could consciously overrate employees who deliberately work extra hard because of the associated rewards such as increases, promotions, career progression and so forth (Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

- *Unclear standards.* Inconsistency is manifested in the unclear definition of standards used between evaluators. For example, categories such as exceptional, good, fair and average are sometimes interpreted differently by evaluators (Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

- *Halo effect.* This occurs when there is bias with regard to how the evaluator rates the employee on one description over the others. For example, the positive halo effect occurs if the employee effectively meets the required goals in one area resulting in an overall satisfactory rating in other areas that are not achieved. Similarly, the negative halo effect may occur if the employee fails to achieve the goals in one area thus influencing the overall rating (Armstrong, 2009; Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

- *Central tendency.* This occurs when the middle point is adopted by the evaluator owing to the intricacy of distinguishing between higher or lower performers, even though a clear difference in performance is evident. It also occurs if the evaluator is unfamiliar with the employee's work, lacks management ability, or fears for rating too leniently or too strictly (Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

- *Leniency or strictness.* Leniency occurs when the evaluator rates employees higher, even if the required output was not satisfactorily achieved. It occurs when inexperienced evaluators appraise employee performance higher because they feel it is the easiest route to follow. Strictness occurs when the evaluator believes that no one achieved the required standards. This approach yields a distorted picture of real performance – hence employee development may be influenced (Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

- *Recency and bias.* If performance evaluation is not conducted frequently, recent occurrences could influence the evaluator's perception of overall performance (Cascio & Aguinis, 2005). Similarly, if there is no clear job analysis, conducting an

effective performance evaluation could be consciously or unconsciously biased and influenced by factors such as age, gender, race, status of the employee and immeasurable goals (Cascio & Aguinis, 2005; Murphy & Cleveland, 1995).

Whether the above challenges are due to human errors, the use of inappropriate standards and instruments or application of incorrect processes, practices, rating techniques is important when deciding on suitable models that assist in attaining organisational objectives and continuously improving the efficiency of performance evaluation systems (Cascio & Aguinis, 2005; Kline & Sulsky, 2009).

2.5.5 Models of work performance

Organisations embrace various job performance models to measure and manage work performance. Depending on the needs of every organisation, some job performance models can be a buffer that enhances employee morale, satisfaction, development, motivation, engagement etc. However, some models, though attractive in theory, if not pertinent to the organisation can be damaging to overall organisational success. Some of the well-researched work performance models employed in the work environment (not exclusive) are the Sink and Tuttle work performance model, Kaplan and Norton scorecard model of performance management, Medori and Steeple work performance model, Neely performance prism and Cross and Lynch performance pyramid of work performance (for detailed descriptions see Tangen, 2004).

The organisation in which the research was conducted adopted the Cross and Lynch (1992) performance pyramid of work performance, also known as the SMART model. This model is commended by Ghalayani (1997) as cited in Tangen (2004), because it integrates both the operational and the strategic goal of performance across the organisation with a focus on both internal and external factors. It is a top-down model measuring performance from the bottom (i.e. operations, departments and work centres, business operating systems, business units) translating into the overall vision of the organisation. However, the SMART model according to Tangen (2004) places less emphasis on the mechanism to identify performance indicators and continuous improvement.

2.6 INTEGRATION OF LEARNING POTENTIAL AND ENGLISH LANGUAGE PROFICIENCY AND WORK PERFORMANCE

Understanding constructs that predict work performance is vital to understand how people will perform in the job and how training and development could be designed for each employee to effectively contribute to the success of the organisation. Literature has shown that there are many factors that contribute to work performance such as cognitive and

personality constructs (Avolio et al., 1990; Borman & Motowidlo, 1997; Campbell, 1990; Outtz 2002; Prinsloo, 2001, Sonnentag & Frese, 2002; Viswersvaran & Ones, 2000).

Cognitive ability was found to be amongst the most reliable and valid predictor of work performance (Cooper & Robertson, 1995; De Beer, 2006, 2010; Hunter & Hunter's, 1984; Schmidt & Hunter, 1998). A study conducted by Schoeman et al. (2008) revealed that learning potential and English language proficiency tests can be used successfully to predict work performance. Other studies that yielded similar results of learning potential predicting work performance include technical employees in a precious metal refinery (Gilmore, 2008) and cadet pilots (Mnguni, 2011).

Demographic changes in the workforce especially in multicultural countries present challenges where proficiency in English language is a basic requirement to carry out the job (Greywenstein, Horne & Kapp, 1992; Hill & Van Zyl, 2002). Lohman (2005, p.113) suggests that *"non-verbal tests should be considered in conjunction with verbal and quantitative abilities and achievements if the candidates are not adequately proficient in English".* Mol, Born, Willemsen and Van Der Molen (2005) found that cultural sensitivity and language relate to expatriate job performance. Hence, caution is necessary when using the ELSA assessment in a multicultural context such as South Africa.

2.7 CHAPTER SUMMARY

This chapter presented a general overview of the practices of psychological assessment. Globally and through the decades, the journey of psychological assessments endured much criticism. There seems to be more abundant opportunities than ever for the thoughtful improvement and practices of psychological assessment to identify human capabilities.

The history of psychological assessment, intelligence and cognitive assessments was discussed. The comparison of static and dynamic assessments was also highlighted. Psychological tests can be misused or deceiving regarding a particular culture, depending on their application or administration.

South Africa is a country associated with complex cultural historical inequalities but still has a strong need to identify individuals with the ability to learn and perform well in the workplace. Any form of assessment should therefore focus on the potential to acquire and further develop rather than what is currently achieved. In addition, assessments should not be the only criteria by which people's abilities are measured and predictions made. It is strongly advised that the necessary precautions be taken to ensure that different cultural and language groups are taken into consideration during test administration and interpretation.

It can be argued that the use of psychological assessment in a multicultural environment is extremely challenging, but presents opportunities for further improvement. However, the recognition of South Africa's 11 official languages causes further complications in test administration, interpretation and comparison of individual test scores.

In conclusion, the core focus of every organisational success is to remain globally competitive and achieve excellence, meet customer expectations and be profitable. Hence it is important to determine factors that influence individual and overall organisational performance in order to predict better during recruitment and selection processes. In the long term, better prediction results in better talent attraction and retention of critical and scarce skills that drive a high performance culture.

CHAPTER 3: [1]RESEARCH ARTICLE

The predictive validity of learning potential and English language proficiency for work performance of candidate engineers

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Abstract

Orientation: It is important to continuously provide scientific evidence to support the use of psychological assessments particularly in South Africa. If used for selection purposes; then determining whether such assessments predict work performance becomes equally important. Previous studies have shown that learning potential and English language proficiency predict work performance. However, the applicability of such conclusions in various environments is important. The context of the study was within the engineering discipline and the interest is whether the candidate engineers who have been identified as having high learning potential and English language proficiency could successfully transfer such attributes into the work environment resulting in better performance.

Research purpose: The objective of the study was to determine whether learning potential and English language proficiency (as measured by the Learning Potential Computerised Adaptive Test and the English Literacy Skills Assessment) accurately predict work performance. The secondary objective was to establish whether biographical variables (race and gender) influence the performance of candidate engineers in South Africa.

Motivation for the study: The focus of the study was on determining the predictive validity of learning potential and English language proficiency for work performance. This study could assist in building confidence and trust in test results to appropriately predict the suitability of candidate engineers that are selected into the organisation consequently contributing towards the high performance culture.

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[1] **Note: This article is written on the basis of the *South African Journal of Industrial Psychology* guidelines.**

Research design, approach and method: A non-experimental, ex post facto design was used. The research was descriptive and quantitatively based on a convenience sample (n = 94) of candidate engineers in a petrochemical organisation. The Statistics Product and Service Solution (SPSS) was utilised to analyse the data.

Main findings and results: A regression analysis confirmed the predictive validity of learning potential and English language proficiency on work performance. The Spearman rho correlation coefficient ($p < 0.05$) showed a significant positive correlation between the investigated variables. Furthermore, the differences between race and gender groupings with regards to the variables were investigated; the ANOVA results indicated significant differences.

Practical implications: The study calls for awareness of the benefits of learning potential and English language proficiency for predicting work performance.

Contribution/value-add: This research provides a scientific framework to understand the benefit of psychological assessments to predict work performance within the candidate engineer work context.

Key words:

Learning potential; cognitive ability; intelligence testing; static assessments; dynamic assessments; English language proficiency; work performance; predictive validity, candidate engineers

KEY FOCUS OF THE STUDY

Engineers are critical in any developing country and a shortage of their skills adds to the challenges for economic and organisation growth (Woolard, Kneebone & Lee, 2003). Therefore organisations need to ensure that young engineers in transition from university to the work place are industrious and effective (Hill & Van Zyl, 2002). This also means the pool of qualified engineers needs to be extended, thus placing focus towards the selection process of these young engineers. Entailed in the selection process are the instruments used for assessment. In South Africa it is critical to provide evidence that any method used for employee selection does not discriminate against any employee, and that it is fair, reliable and valid as stipulated by the Employment Equity Act Section 8 of 1998. Determining the predictive validity of learning potential and English language proficiency is aligned to that requirement.

Similarly, it is imperative to measure work performance to identify strengths and developmental areas in order to identify gaps and to engage in continuous training and development (Armstrong, 2009). Such practices enhance mutual benefits for both the organisation and the individual in the sense that a person-environment fit, person-career fit and overall organisational performance are achieved (Nel, Van Dyk, Haasbroek, Schult, Sono, & Werner, 2005).

Various studies conducted on work performance provide different results on what tools predict work performance. Nzama, De Beer and Visser (2008); Schoeman, De Beer and Visser (2008) and Taylor (1994) establish that cognitive assessments predict work performance. A meta-analysis of Schmidt and Hunter (1998) shows that cognitive ability yields the best predictive value for work performance. Furthermore, Schmidt and Hunter (1998) reveal that a combination of methods such as cognitive ability and integrity; cognitive ability and structured interviews; and cognitive ability and work sample predict work performance.

BACKGROUND TO THE STUDY

The success of any organisation depends on the productivity of employees and the process in which such productivity is predicted, managed and measured. In 2001, South Africa had 29 824 engineers with an annual projected growth of 3.4% in order to meet skills demands (Woolard et al., 2003). However, Du Toit and Roodt (2008) reported a decline between 2000 and 2004 in terms of engineers, technologists and technicians from 0.62 to 0.51% respectively. This somehow confirms the earlier study of Woolard et al. (2003), where they argue that there is a huge shortage of engineers in Third World economies, and South Africa is no exception to this challenge. These shortages are prominent across all engineering disciplines among formerly disadvantaged groups (Woolard et al., 2003). These skills challenges have detrimental effects on the implementation of organisational and government projects to fuel economic growth. According to Du Toit and Roodt (2008), the latter has exposed an acute shortage of technical skills making skilled people highly marketable and mobile. Hence, these changes and declines influence the way in which organisations perform and how they keep their employees.

Connor and Shaw (2008) indicate that over the past decades there has been an increase in the number of graduates entering the workplace via graduate schemes. However, Du Toit and Roodt (2009) acknowledge that there is a decline in enrolments and graduation of engineering students at universities, in particular evident with women engineers from 16.21% in 1996 to 10.51% in 2005. According to Du Toit and Roodt (2009), despite the

tremendous training programmes accessible through South African government and organisational initiatives in elevating the engineers' pool, the shortage of engineers in South Africa seems to be rapidly growing. Meanwhile organisations are engaged in in-house training and development in order to enhance both individual and organisational performance through structured training programmes (Woolard et al., 2003).

In the field of industrial psychology and in alignment with the legislation, it is paramount to continuously provide facts supporting the use of psychological assessments for selection purposes to predict work performance. In this study, it was imperative to draw on existing scientific knowledge to provide empirical evidence of the reliability and validity of learning potential and English language proficiency to predict work performance of candidate engineers. This means investigating whether individuals who have been identified as having the potential to learn could successfully transfer such learning into the work environment resulting in better performance.

LEARNING POTENTIAL

According to De Beer (2006, p. 10), learning potential refers to the "overall cognitive capacity and includes both present and projected future performance". Literature indicates that it is crucial to use assessments that measure candidates' potential to learn rather than what they have achieved because it affords opportunities to identify those factors that goes undetected with traditional measures (De Beer, 2000a; 2000b; 2000c; Guthke, 1993; Sternberg & Grigorenko, 2002). South Africa, like the rest of the world, has embraced the use of assessments that measure learning potential rather than latent ability (De Beer, 2000a; 2000b; 2000c; Lopez, Roodt & Mauer, 2001). Some examples of the tools developed in South Africa include the conventional paper format (APIL-B, TRAM 1 and 2) (Lopez et al., 2001), the computer adaptive (LPCAT) (De Beer, 2000a; 2000b; 2000c) and Cognitive Process Profile (CPP) (Prinsloo, 2001). In this study, the LPCAT is utilised as a selection tool to measure learning potential in order to predict work performance of prospective engineers. For the LPCAT, De Beer (2006, p. 10) defines learning potential as "a combination of the pre-test performance and the magnitude of the difference between the post-test and the pre-test scores".

De Beer (2006) reveals that the use of learning potential assessments in South Africa could potentially address the issue of equality and fairness associated with sociocultural and educational background, because it affords individuals with an opportunity to learn. This supports the study conducted by Claassen (1997) that cultural and social barriers are, to a great extent, restricting factors in individual learning. As indicated in Caffrey, Fuchs and

Fuchs (2008), De Beer (2006), Foxcroft and Roodt (2005), Murphy and Maree (2006) and Sternberg and Grigorenko (2002), some of the restricting factors and barriers to learning are associated with educational and sociocultural differences.

ENGLISH LANGUAGE PROFICIENCY

Hill and Van Zyl (2002) argue that English is increasingly accepted as a global and dominant language to interact in the world market. According to Greywenstein, Horne and Kapp (1992), because South African engineers are also attracted to international assignments, proficiency in English becomes a prerequisite to help bring intercultural understanding. In addition, Hill and Van Zyl (2002) maintain that in the workplace, management use young black engineers to translate English documents and liaise with employees who are less proficient in English and to translate learning and verbal or nonverbal communication. Therefore, Jukes and Grigorenko (2010) maintain that a high level of cognitive thinking and language capability is required in order to execute job tasks.

Although English is widely regarded as an official business language, in South Africa it is one of the eleven official languages where you would find that the majority of the workforce utilises the other languages to conduct business (Hill & Van Zyl, 2002; Webb, 2002). As a legacy of apartheid, language is a barrier in the business world because there is a gap in terms of the use of English as a business language, especially for non-mother-tongue users resulting in functional illiteracy (Hough & Horne, 1994).

Functional illiteracy is defined by Hough and Horne (1994) as the inability to use literacy and numeracy skills to cope with the demands of daily living and the workplace. This would entail speaking, writing, reading and listening in English which would enable employees to read training manuals and policies; and also to comprehend instructions (Hough & Horne, 1994). Consequentially an underdevelopment of language skills could be detrimental to employees in effectively performing their tasks.

According to Hough and Horne (1994) and Horne (2001), the predicament faced by organisations is that employees do not understand instruction or training given in English because their English is too weak – hence the need to upgrade employees' English literacy levels first in order to achieve success in the workplace. According to [2]Chan, Schmitt, Jennings and Sheppard (1999), most of the immigrant employees and second English

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[2] Authors indicated that development of reliable and valid measure of English Language proficiency in the organisation is surpassed by those in the educational setting. (Research conducted in the academic field also revealed that English language proficiency predicts future performance (De Beer, 2010; Logie, 2010).

language users are not proficient in the basic usage of English and thus affect work performance.

The lingua franca of commerce and industry in South Africa is English. Meanwhile, Thwala (2008) indicated that in the mining industry *fanakalo* dominates other languages. It follows that a poor command of English and/or critical deficiencies in basic skills makes it impossible for transferees to take written instruction, let alone upgrade their skills. According to Hough and Horne (1994), a transferee is a person who in order to make a daily living has to transfer daily from his/her natural language environment (and culture) to a different language environment and culture) and is assumed/expected to cope like a mother-tongue user. Therefore, the only way to successfully equip employees with skills to think and speak in English is an integrated approach whereby listening, speaking, reading and writing is exposed in every contact session.

According to Thwala (2008), there are high levels of English language proficiency amongst the workforce. Thwala (2008) indicated that despite the introduction of Adult Basic Education and Training (ABET) over 20 years ago, there is very little evidence that this training is making an impact on these matters. Thwala (2008) estimated that this number continues to hover around 30% of the workforce and that the required scale and scope of the teaching intervention is massive. Therefore, Thwala (2008) argued that without the necessary time to intervene meaningfully, making English one of the languages of work remain just an unachievable desire with no little possibility of ever being achieved.

WORK PERFORMANCE

Campbell, McCloy, Oppler and Sager (1993) suggest that organisations employ people not only to perform certain work but perform well, and such performance can and should be clearly measured. Work performance can be described as a linkage of the task and the way people perform and complete the task. Sonnentag and Frese (2002) maintain that individuals who perform and accomplish tasks experience a sense of satisfaction and feeling of mastery and pride compared to their counterparts. Studies show that work performance is defined as a complex construct that varies across jobs (Avolio, Waldman & McDaniel, 1990; Borman & Motowidlo, 1997; Campbell, 1990; McDaniel, Schmidt & Hunter, 1988; Motowidlo, Borman & Schmidt, 1997; Motowidlo & Schmidt, 1999). This means that different skills, knowledge and personal attributes are required to perform a certain type of work. It therefore becomes critically important to utilise some form of scientific and reliable measure to predict which individuals demonstrate the potential to succeed on the job.

Sprenkle (2002) indicates that job complexity poses challenges in terms of the way employees' job tasks are defined and evaluated. In addition, if the latter are conducted inappropriately it could contribute to satisfaction or dissatisfaction of employees and overall good or poor performance of the organisation. Hence by accurately predicting who will perform best, the job can benefit both the individual and the organisation in accomplishing goals.

INTERGRATION OF LEARNING POTENTIAL, ENGLISH LANGUAGE PROFICIENCY AND WORK PERFORMANCE

According to Hunter (1986), there is a relationship between general cognitive ability, job knowledge, and job performance because these constructs predict individuals who will in future perform better than others. Schmidt and Hunter (1998) maintain that organisations use general mental ability tests to identify individuals who will have the potential to perform well on the job, and learn and acquire knowledge from work-related training programmes. While Hunter (1986) argues that cognitive ability predicts learning and work performance in any type of work, he points out that such prediction is observed between complex and simple jobs. According to Hunter and Hunter's (1984), meta-analysis study, general cognitive ability yielded a predictive validity of $r = 0.54$ for a training success criterion and $r = 0.45$ for a job proficiency criterion across all jobs. Cooper and Robertson (1995) thus contend that general mental ability provides practical information during selection procedures. In this study, work performance ratings of candidate engineers were used as an indicator of potential to succeed in the job.

This is the case in a petrochemical organisation where there was a need to predict future work performance through learning potential and English language proficiency scores obtained during the bursary scheme selection phase as a precursor to undergoing the candidate engineering training programme. The study therefore investigated whether the use of learning potential and English language proficiency effectively/accurately predict the work performance of candidate engineers. As indicated in Ritson (1999, p. 35), "If there is any doubt regarding the ability of a test to provide an accurate idea of an applicant's future performance in the job, then the test itself should be analysed for suitability of purpose". This study was thus in line with the provisions of the EEA of 1998 to provide evidence that only valid psychometric tools should be used.

A study conducted by Schoeman et al. (2008) revealed that learning potential and English language proficiency tests can be used successfully to predict work performance. This study was conducted in the same organisation where the current study was done, but the target group was production employees as opposed to the candidate engineers of the current

study. Other studies that yielded similar results of learning potential predicting work performance include technical employees in a precious metal refinery (Gilmore, 2008) and cadet pilots (Mnguni, 2011).

Although previous studies pertaining to the current research found that learning potential and English language proficiency accurately predict work performance (Schoeman et al., 2008), it cannot be generally concluded that these results are applicable in the engineering field. Muller and Scheepers (2003) contend that the validity of cognitive assessment varies across studies, and as such, organisations should strive to investigate its efficiency to confirm that it suits the organisation's needs.

The meta-analysis reported by Schmidt and Hunter (1998) found that compared to the other 18 methods commonly used for selection procedures, general cognitive ability has high validity of 0.51 in predicting job performance. Moreover, although research commends the contribution of static assessments in measuring learning ability (De Beer, 2000a; 2000b; 2000c; 2005; 2006; Embretson, 2000; Haywood & Tzuriel, 2002). Sternberg and Grigorenko (2002) contend that it would be beneficial to predict performance based on an individual's learning potential which can be evaluated using dynamic methods of assessment. Sternberg and Grigorenko (2002) assert that it is vital to use learning potential because it allows individuals to improve their latent abilities provided that guidance and feedback are offered.

A study by Schoeman et al. (2008), found that people who use English as a second language often experience some learning and training difficulties which usually escalate to work performance. Hill and Van Zyl (2002) reported that the use of African languages in the workplace has an influence on productivity because employees understand better when instructions are in their own languages. Furthermore, Hill and Van Zyl (2002) report that English language is essential in the engineering workplace to understand technical jargon which is difficult to translate into other languages.

RESEARCH OBJECTIVES

The primary objective of this study was to determine whether the learning potential measured by the LPCAT and English language proficiency as measured by the ELSA can effectively/accurately predict work performance. The secondary objective was to establish whether biographical variables (race and gender) influence the performance of candidate engineers in South Africa.

It is imperative for organisations to understand the relationship between the learning potential, English language proficiency and work performance of their employees. Such

understanding will enhance the practical utility of psychological assessments to predict work performance. In South Africa, this relationship becomes important during the selection process of employees, whereby other factors that are likely to influence performance are considered, as outlined in the EEA of 1998. Although research shows that the constructs are important in other areas of work, it is still unclear on whether this relationship is influential in predicting engineers' work performance.

HYPOTHESES

$H1_1$: The learning potential scores correlate significantly and positively with work performance of candidate engineers.

$H2_1$: The English language proficiency scores correlate statistically significantly and positively with work performance of candidate engineers.

$H3_1$: There is a statistically significant difference between the gender groups with regard to learning potential.

$H4_1$: There is a statistically significant difference between the race groups with regard to learning potential.

$H5_1$: There is a statistically significant difference between the gender groups with regard to English language proficiency.

$H6_1$: There is a statistically significant difference between the race groups with regard to English language proficiency.

$H7_1$: There is a statistically significant difference between the gender groups with regard to work performance.

THE POTENTIAL VALUE ADDED BY THE STUDY

Since the inception of the use of psychological assessments in the world of work, test developers have been on par developing measuring tools in a quest to identify factors that effectively and accurately predict work performance with the aim of determining potential and to achieve person-job fit (Anastasi & Urbina, 1997). This is particularly necessary in the light of cost optimisation and the consequences of inappropriate placement of individuals in the wrong jobs, or broadly selecting candidates for training programmes which in turn could result in a less productive and ineffective workforce. The current study contributes in understanding the relationship between learning potential and English language proficiency in order to predict work performance of future engineers. In addition, the findings will also

allow future researchers to further explore the benefit of using learning potential and English language proficiency in selection of engineers in the South African context taking into account different race and gender groups. This will assist the organisation to focus on targeted selection and thus save on recruiting costs.

RESEARCH DESIGN

A research design serves as foundation for research. Terre Blanche, Durrheim and Painter (2006) define research design as a framework that guides the flow of research from the beginning to end, allowing the researcher to pursue the planned tasks.

RESEARCH APPROACH

A nonexperimental design and specifically an ex post facto study were adopted to conduct this research. As indicated in Goodwin (2010), an ex post facto is a research design in which participants with similar background are selected on the basis of past occurrences and different conditions and then compared to the dependent variable. This method was chosen because the research participants had undergone similar selection procedures in different years and had been exposed to different on-the-job training at different business units in the same organisation. Also ex post facto design is ideal when two or more of the variables in the study cannot be manipulated by the researcher, as it was in this study with gender and race variables (Terre Blanche et al., 2006).

The quantitative methods used in the study (correlation, regression, etc.) assume that behaviour is predictable and as such can be measured (Schoeman et al., 2008). Mouton and Marais (1996) indicate that a quantitative study follows a systematic approach and is feasible with large populations. A quantitative method can be replicated and generalised to other situations (Terre Blanche et al., 2006).

RESEARCH METHOD

This section provides an explanation of the research participants, measuring instruments, research procedures and statistical analyses used in this study.

RESEARCH PARTICIPANTS

The population on which the empirical study was based was one-hundred-and-forty-eight (148) candidate engineers from a South African petrochemical organisation situated in various regions, business units and exhaustive of all engineering disciplines in the organisation. This included mining, factory and manufacturing business units. These participants were initially selected between 2005 and 2006 through the group bursary

scheme provided by the organisation to further their university studies. At the time of assessments, the initial cut-off criteria for selection included applicants who had grade 11 and 12 with subjects in English, Mathematics and Science. The rationale for the selection of participants was that they had an engineering degree and at the time were undergoing on-the-job training to qualify as professional engineers. Participation in the training is compulsory and involves panel reviews which certify the candidate engineers as fully competent. On completion of the training the successful candidate engineers enjoy promotions and registration with ECSA as professional engineers.

A nonprobability convenience sampling method was chosen because the research participants were easily accessible to the researcher. In this case, the researcher excluded a great proportion of candidate engineers in the organisation who were not part of the bursary selection process. The researcher was aware that the exclusion of other candidate engineers would influence the external validity and generalisability of the results.

A total number of 18 (n = 18) from a total population of 148 participants were excluded from the final analysis of which 17 (n = 17) participants had missing raw scores on the ELSA test and one participant (n = 1) had no merit rating assigned for work performance. The sample as shown in table 1 below consisted of 94 (n = 94) participants. The race representation of the total sample included white (n = 56), black (n = 14), Indian (n = 22) and coloured (n=2). The sample consisted of males (n = 67) and females (n = 27) and was thus not representative of the South African population. According to national statistics, just over 51% of the population is female and less than 50% male (Statistics South Africa, 2011). This sample depicts the realistic male-dominated nature of the engineering field. Although ECSA (2011) reported a 16.6% increase in registration of candidate engineers from 5 652 in 2011 to 6 594 in 2012, out of the 6 594, only 1 236 were females and 5 358 were males. See table on the next page.

Table 1

Sample distribution

		Frequency	Per cent	Valid per cent	Cumulative per cent
Valid	African	14	14.9	14.9	14.9
	Indian	22	23.4	23.4	40.4
	White	56	59.6	59.6	100.0
	Total	92	100.0	100.0	

As noted in the ECSA (2012) annual report, the number of black (black African, coloured, Indian and Chinese) persons registered on ECSA's database increased by 26.5%, from 10 704 or 30.8% in 2011 to 13 543 or 35% of total registrations in 2012. Of this, the number of candidate engineers registered on ECSA's database was as follows: whites (3 669), blacks (1 895), Indians (993) and coloureds (137). The results were therefore not inferred to the entire engineering population in the organisation since the sample was not representative of all candidate engineers.

MEASURING INSTRUMENTS

Learning Potential Computerised Adaptive Test (LPCAT)

The LPCAT was used to measure learning potential as a predictor of work performance. The LPCAT is a cost-effective psychometric tool developed in South Africa, intended to measure an individual's current and future learning potential (De Beer, 2000a; 2000b; 2000c). Language and educational background have no influence on the individual's performance reducing the issues of perceived unfairness (De Beer, 2000a; 2000b). The LPCAT is a computerised adaptive tool, using the dynamic method and Item Response Theory (IRT) (De Beer, 2000a; 2000b; 2005). The LPCAT precisely provides different items' performance based on the test-retest method providing opportunities to improve performance during testing (De Beer, 2000a; 2000b). It can be used for different people with different literacy levels and languages and can be administered to an individual or a large group (De Beer, 2006).

The LPCAT can be administered using two formats, namely for people with an understanding of English and Afrikaans equivalent to grade 6 and the "no language" format for people with lower than grade 6 educational levels or limited English proficiency (De Beer, 2000a; 2000b; 2000c). Although there is no time limit, the LPCAT takes approximately 45 minutes to an hour to administer. Results are readily available at the end of the test (De Beer, 2000a; 2000b; 2000c).

The LPCAT provides four scores, namely a pre-test (current performance level), post-test (potential level of performance), difference score (undeveloped potential between the pre-test and post-test scores) and a (combination of the three scores) referred to as the composite score (De Beer, 2000b). The LPCAT results are described in T-score format (mean of 50 and standard deviation of 10 and ranges between score of 20 and 80) (De Beer, 2010). Percentile ranks are also provided with a range of (1-100) representing the percentage of individuals who obtained a score below the average. A stanine is also reported with a mean of 5 and a standard deviation of 1.96. Those who obtained a score at or below that score are equated to the educational and NQF levels. The LPCAT coefficient alpha reliability values range between 0.926 and 0.978 (De Beer, 2005). In addition, the reliabilities per racial grouping of Africans, coloureds and whites are reported to be above 0.9 (De Beer, 2000b).

For the present study, the post-test and the composite scores were given due consideration to allow the interpretation of other factors that could have influenced the projected future (optimal potential) level of performance evident in the LPCAT results. However, for comparison purposes, the composite score was used to rank individual scores from high to low level potential scores using both the educational and the NQF levels for interpretation. The pre-test scores were not considered because they measure the current ability level the person has already achieved.

English Literacy Skills Assessment (ELSA)

The ELSA Intermediate was used to measure English language proficiency as a predictor of work performance. The [3] ELSA is a standardised measuring instrument used in the educational institution, corporate environment and in commerce and industry in Southern Africa (Hough & Horne, 1989, 1994; Horne, 2001). It was designed and developed locally for Southern African needs (Hough & Horne, 1989, 1994; Horne, 2001) to predict trainability outcomes where English is a language of learning. The ELSA equates the functional skills

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[3] Non-peer reviewed findings and recent case studies are obtainable from E-mail: zerelde@kaleidoprax.co.za I Website: www.kaleidoprax.co.za.

level of a person to those of an English mother-tongue user (EMT). It also provides the level of strength and weaknesses in an English language training environment and prescribes remedial treatment and how to improve proficiency.

Benchmarked against South African norms, the ELSA literacy level equates to three years of formal schooling, functional literacy is equivalent to eight years of formal schooling and academic literacy is equal to ten years of formal schooling, EMT implied (Hough & Horne, 1989, 1994; Horne, 2001). The ELSA Intermediate quantifies English competency input levels and trainability levels of employees who have to communicate, cope and function effectively in an English language environment such as reading manuals, policies, etc. and/or undergo training that utilises English tests such as books, study guides, etc., with English as the language of learning (Hough & Horne, 1989, 1994; Horne, 2001).

Based on a national representative population group of 684, the predictive validity of ELSA is reported to be 84% and the reliability is 0.67 (Hough & Horne, 1994). As indicated by Hough and Horne (1994) and Horne (2001), the ELSA is considered to be a culture-fair assessment that steers clear of meta-language, colloquialisms, idiomatic expressions and dialectic usage. It is a paper and pencil group assessment (Hough & Horne, 1994; Horne, 2001). The ELSA comprises seven subtests, and overall results are reported in terms of the level of numeracy and literacy skills an individual has achieved.

Work performance data

An objective format of gathering work performance was used (i.e. the organisation's annual formal performance review was used to collect participant's work performance data to provide an indication of their work performance merit rating). These merit ratings are linked to salary increases and promotions.

The organisation follows both a relative and absolute rating performance evaluation technique, in particular a forced distribution system and the graphic rating scales discussed earlier. The graphic rating scale ranges from extremely not demonstrated behaviour or extremely demonstrated behaviour. In this organisation, the adopted methods of performance evaluation involve the direct line manager, self-appraisal and 360° feedback. The organisation employs a 360° evaluation method and set standard key result areas (KRAs) for all levels based on organisational and team charter objectives and organisational core values. The 360° focuses on standard KRAs identified by the organisation and the organisational core values, namely stakeholder focus, integrity, excellence in all we do, accountability, safety and people.

An employee contracts for full performance based on the five KRAs as described in the performance standards. To be considered a full performer, an individual should achieve the required outputs in each of the five key standard performance areas, namely operational, financial and technical results, leadership and growth results, management results, customer and relationship results, innovation and improvement results. A four-point rating scale as indicated in table 2 below is used to evaluate employees' final work performance merit ratings.

Table 2

Participating organisation's merit rating scale

Nonperformer (X)	Developer (D)	Full performer (F)	Exceptional performer (E)
Does not meet all the agreed KRAs	Meets some of the agreed KRAs	Meets all the agreed KRAs	Exceeds expectations on the agreed KRAs

RESEARCH PROCEDURE

The learning potential and English language proficiency predictor scores were conveniently collected between 2005 and 2006 for the purposes of the bursary scheme to select potential bursary holders by registered psychologists and psychometrists employed at the participating organisation. Both the computer and the paper-and-pencil methods were used to administer the group tests (the LPCAT and ELSA). The criterion data were collected in 2012, representing the first year of the candidate's engineers work performance. In addition, the relevant authorities at the participating organisation concerned were approached to obtain permission for gaining access to all the candidate engineers' merit ratings data. These data included a list of all candidate engineers in the participating organisation.

Ethically, the researcher obtained clearance from the Department of Industrial and Organisational Psychology at the university and the company to conduct the research. Participants' informed consent regarding the purpose of the assessments and confidentiality were signed during completion of the assessments, which granted permission for their results to be utilised for research purposes. The research participants' assessment results

were kept securely in the talent assessment department. The privacy of the participants was maintained by not revealing their names in this study.

STATISTICAL ANALYSIS

IBM SPSS (version 20) (2011) was utilised to analyse quantitative data for the empirical study by performing statistical data analysis. Prior to beginning the analysis, the raw data were cleaned by means of double-checking English language proficiency, work performance, race and gender and assigning categorical codes to the nonparametric data to make sense for regression analysis. The coding for nonparametric data was checked and no errors were found (Cohen, 2008).The dependent variable is ordinal variable with three point scale, therefore no parametric test such ANOVA or t-test could be used. One doesn't need to test for normal distribution. Even if the test were done the results will not be normally distributed. For correlations nonparametric were used because there was a mixture of continuous and ordinal variable (work performance). Based on the tests for normality (Kolmogorov-Smirnov and Shapiro-Wilk tests), which were interpreted at a $p > 0.01$ significance level, it was decided to continue with parametric statistics (Cohen, 2008). The tests for normality (Kolmogorov-Smimov and Shapiro-Wilk tests, English literacy level mean 5,978 and SD 1.47, English numeracy level mean 2.810 and SD 0.39 and work performance mean 1.283 and SD 0.50 indicated that the data were normally distributed.

Descriptive statistics and correlations were used to determine the magnitude of scores and the relationship between variables. Descriptive statistics consisted of analysis of the maximum and minimum scores, mean scores and standard deviations to identify the dispersion of scores (Foxcroft & Roodt, 2005; 2009). Spearman rho correlation coefficient was performed to assess the direction and strength of the relationship between learning potential and English language proficiency. In order to counter the probability of type I errors, the significance value at a 95% confidence interval level ($p ≤ 0.05$) was set. In terms of internal consistency, reliability estimates of the various instruments utilised were calculated with the use of Spearman rho correlation coefficient (Cohen, 2008).

Regression analysis was performed in order to investigate the predictive validity of the LPCAT and ELSA scores on work performance (Cohen, 2008; Foxcroft & Roodt, 2005; 2009). The value of the adjusted R^2 was used to interpret the results (Cohen, 2008). R^2 values larger than 0.13 (medium effect) (Cohen, 2008) were regarded as practically significant.

ANOVA was performed to test for statistical significance of mean differences between the racial groups with respect to the LPCAT results (Cohen, 2008). However, the F-tests from

the ANOVA results did not indicate the magnitude or strength of relations. Hence the post hoc test was computed to test which pairwise group differences were significant. The Scheffè test is a method that can be generally applied to all comparisons of means after an ANOVA (Cohen, 2008; Glass & Stanley, 1984). Hence in this study, the Scheffè post hoc comparison and test of means was performed mainly to explore and interpret the results that differ from one another. The Kruskal-Wallis test is used to compare more than two sets of scores from different groups (Cohen, 2008). In this research the Kruskal-Wallis test was used to determine differences between gender groups with regard to the nonparametric data (the ELSA and work performance).

RESULTS

The aim of descriptive statistics was mainly to describe data, distribution of scores and not to draw inferences and conclusions about the sample (Foxcroft & Roodt, 2005; 2009). Table 3 below presents the overall descriptive statistics for work performance, English language proficiency and learning potential of the sample).

Only 94 participants were included in the analysis. The minimum score for the work performance is 1 indicating poor performance and 3 indicating excellent performance merit rating. The minimum and maximum score for the English language proficiency is 1 and 6 indicating poor and excellent performance respectively. The participants' LPCAT mean scores (Post-test, composite) is above average and at NQF level 8 as interpreted on the LPCAT test score.

Table 3 below indicates that the LPCAT post-test and composite mean score for both the male and female sample were at NQF level 8, as was expected with the male score slightly higher than the female score (De Beer, 2010). Similarly, the numeracy and literacy mean scores indicated an above average score as was expected (Hough & Horne, 1994). See table on the next page.

Table 3

Summary of the descriptive statistics for English language proficiency and learning potential

Variables		Gender	N	Mean	Std deviation	Minimum	Maximum
Work performance			94	1.2766	.49523	1.00	3.00
Learning potential			94	64.463	3.6154	52.5	74.0
			94	65.10	3.765	55	75
	Post-test	Female	27	63.74	3.526	55	69
		Male	67	65.64	3.744	58	75
			94	63.83	3.848	50	73
	Composite	Female	27	63.15	4.083	50	72
		Male	67	64.10	3.746	57	73
English Language Proficiency			94	4.39	.816	1	6
	Numeracy		94	2.81	.388	1	3
		Female	27	2.78	.424	2	3
		Male	67	2.83	.375	1	3
	Literacy		94	5.97	1.462	1	8
		Female	27	6.07	1.269	3	8
		Male	67	5.93	1.540	1	8

NONPARAMETRIC CORRELATIONS

The aim of correlation was to describe the strength and direction of the linear relationship that exists between the measured variables (Cooper & Schindler, 2001). The results were described by the $p < 0.01$ and $p < 0.05$ value, and the closer the correlation coefficient is to 1 or -1, the more reliable the instrument. Spearman's rho correlations coefficients were performed to assess the direction and strength of the relationship between learning potential and English language proficiency.

As indicated in Table 4, there was a positive significant correlation (.245) $p < 0.05$ between learning potential and work performance. This indicates that the higher scores on learning potential are related to higher work performance ratings. Furthermore, participants who scored higher on the learning potential assessment could be expected to perform better in the work environment.

Table 4

Correlations analysis between English language proficiency, learning potential and work performance

Variable	Work Performance	Language proficiency	Learning potential
Work Performance	1.000		
Language proficiency	.060	1.000	
Learning potential	.245[*]	.245[*]	1.000

[*]. Correlation is significant at the 0.05 level (2-tailed).

REGRESSION ANALYSIS

Regression analysis was used to provide substantive results regardless of the sample distribution. In this study regression analysis was useful to predict the effects of independent variables (learning potential and English language proficiency on the dependent variable (work performance) (Cohen, 2008). A stepwise regression was performed to investigate the following research questions:

- Is learning potential a significant predictor of work performance?

- Is English language proficiency a significant predictor of work performance?

- Is the combination of learning potential and English language proficiency effective in predicting work performance?

- Are there any differences with regard to race and gender, in terms of learning potential, English language proficiency and work performance?

The LPCAT (post-test and composite scores) and the ELSA (numeracy and literacy scores showing highest correlation with work performance) were entered as predictor variables. Work performance was entered as the dependent variable. The "adjusted R^2" intend to "control for" overestimates of the population R^2 taking into account small samples. The "standard error of estimates" is the standard deviation of the residuals. The larger the R^2, the smaller this will be relative to the standard deviation of the criterion (Cohen, 2008).

Table 5 below summarises the regression analysis using the categorical model, learning potential and English language proficiency scores. The model demonstrated no significant difference in the prediction of work performance.

The R^2 value in table 5 indicates that the categorical model accounts for about 6% of the variation in the language proficiency and learning potential scores on work performance. The analysis of variance (ANOVA) indicates the regression model predictions did not add any value variance to the information with the $R^2 = 0.059$ and the adjusted $R^2 = 0.38$. Altogether, 6% (3.8% adjusted) of the variability of work performance score was predicted by the two independent variables that were entered into the regression. Inspection of the Beta values indicated that when taken individually, learning potential ($\beta = 0.237$, $p = 0.009/p < 0.05$) contributed to the prediction of work performance, while English language proficiency ($\beta = 0.024$, $p = 0.804/p > 0.05$) did not. This means that these variables could be used for relative interpretation only rather than exact predictions of work performance. See table on the next page.

Table 5

Regression analysis with English language proficiency and learning potential as predictors of work performance

Multiple R	R square	Adjusted R square	Apparent prediction Error

ANOVAᵃ					
	Sum of squares	df	Mean square	F	Sig
Regression	5.539	2	2.770	2.849	.063
Residual	88.461	91	.972		
Total	94.000	93			

Coefficients ᵃ					
	Standardized Coefficients				
	Beta	Bootstrap (1000) estimate of Std Error	df	F	Sig
Language proficiency	.024	.095	1	.062	.804
Learning potential	.237	.089	1	7.132	.009

Correlations and Tolerance					
	Correlations			Importance	Tolerance	
	Zero-Order	Partial	Part		After Transformation	Before Transformation
Language proficiency	.070	.024	.023	.028	.962	.962
Learning potential	.242	.233	.232	.972	.962	.962

	Sum of squares	df	Mean square	F	Sig
Regression	5.539	2	2.770	2.849	.063
Residual	88.461	91	.972		
Total	94.000	93			

Standardized Coefficients					
Variable	Beta	Bootstrap (1000) estimate of Std Error	df	F	Sig
Language proficiency	.024	.095	1	.062	.804
Learning potential	.237	.089	1	7.132	.009

R = .243, R^2 = 0.058, Adjusted R^2=0.038, Error .941

Table 6 below summarises the multiple regression analysis of the gender groupings using the enter method, LPCAT (post-test and composite scores) and the ELSA (numeracy and literacy scores). The results indicated that there was no significant difference for either gender group.

Table 6

Regression analysis with the enter method

Gender		R	R square	Adjusted R square	Std error of estimate
F	1	.219[a]	.048	-.125	.50961
M	1	.330[a]	.109	.051	.48974

ANOVA[a]							
Gender			Sum of squares	df	Mean square	F	Sig
F	1	Regression	.287	4	.072	.276	.890[b]
		Residual	5.713	22	.260		
		Total	6.000	26			
M	1	Regression	1.816	4	.454	1.893	.123[b]
		Residual	14.870	62	.240		
		Total	16.687	66			

Coefficients [a]							
Gender			Unstandardised coefficients		Standardised coefficients	t	Sig
			B	Std.error	Beta		
F	1	(Constant)	.048	1.835		.026	.980
		Post-test (LPCAT)	.006	.043	.044	.140	.890
		Composite (LPCAT)	.005	.038	.045	.140	.890
		Literacy level	.028	.087	.073	.319	.753
		Numeracy level	.143	.273	.126	.524	.605

M	1	(Constant)	-1.681	1.115			-1.508	.137
		Post-test (LPCAT)	.043	.029		.318	1.468	.147
		Composite (LPCAT)	-.003	.029		-.019	-.089	.929
		Literacy level	-.016	.042		-.050	-.391	.697
		Numeracy level	.140	.173		.105	.812	.420
		Post-test (LPCAT)	.043	.029		.318	1.468	.147

a. Dependent variable: work performance

b. Predictors: (constant), numeracy level, post-test (LPCAT), literacy level, composite (LPCAT)

Table 7 below summarises the regression analysis of the male sample using the stepwise method with the LPCAT post-test, and ELSA Literacy and Numeracy scores entered as predictors. The results showed that only the LPCAT post-test met the criteria for inclusion, resulting in a statistically significant value (F = 7.138, p = 0.010) in predicting work performance with R^2 = 0.099 and adjusted R^2= 0.085. Altogether 9.9% of the variability of work performance for males was predicted by the LPCAT post-test.

Table 7

Regression using the stepwise criterion: probability of F to enter < = 0.50, probability of F to remove > =0.100

Gender	R	R square	Adjusted R square	Std error of estimate
Male 1	.315[a]	.099	.085	.48095

ANOVA[a]

Gender		Sum of squares	df	Mean square	F	Sig
Male 1	Regression residual Total	1.651	1	1.651	7.138	.010[b]
		15.035	65	.231		
		16.687	65			

Coefficients [a]

Gender		Unstandardised coefficients		Standardised coefficients	T	Sig
		B	Std.error	Beta		

M 1	(Constant)	-1.519	1.039			-1.461	.149
	Post-test (LPCAT	.042	.016		.315	2.672	.010

Excluded variables[a]

Gender		Beta In	t	Sig.	Partial correlation	Collinearity statistics Tolerance
M 1	Composite (LPCAT)	-.006[b]	-.029	.977	-.004	.311
	Literacy level	-.020[b]	-.167	.868	-.021	.959
	Numeracy level	.089[b]	.737	.464	.092	.952

c. Dependent variable: work performance   d. Predictors in the model: (constant), post-test (LPCAT)

COMPARISON OF MEANS OF THE DIFFERENT RACE GROUPS

Additional analyses were done to explore the mean differences of the LPCAT post-test and composite scores between the different race groups. Table 8 below shows the mean percentile rank of the LPCAT (post-test scores) and composite scores for each race group indicating which group had the highest score.

Table 8

Description of sample by race

		N	Mean	SD	Minimum	Maximum
Post-test (LPCAT)	African	14	62.93	4.731	55	72
	Indian	22	64.27	3.494	57	72
	White	56	66.00	3.368	60	75
	Total	92	65.10	3.776	55	75
Composite (LPCAT)	African	14	63.07	5.757	50	72
	Indian	22	63.36	3.513	58	72
	White	56	64.30	3.379	57	73
	Total	92	63.89	3.842	50	73

Table 9 below indicates that there was a significant difference between the race groups on the LPCAT post-test score. The ANOVA test statistics showed that there was a significant effect (F = 4.80, p = 0.010). There was no significant difference between the LPCAT composite score across race groups.

Table 9

		Sum of squares	Df	Mean square	F	Sig.
		ANOVA				
Post-test (LPCAT)	Between groups	126.393	2	63.196	3.250	.010
	Within groups	1171.292	89	13.161		
	Total	1297.685	91			
Composite (LPCAT)	Between groups	25.054	2	12.527	.846	.433
	Within groups	1317.859	89	14.807		
	Total	1342.913	91			

The Scheffe post hoc test was used to further explore the differences highlighted by the ANOVA results (Cohen, 2008). Table 10 below indicates that there was a significant difference (p = 0.021)) between whites and Africans on the LPCAT post-test scores. See table on the next page.

Table 10

Post hoc tests

Multiple comparisons							
Scheffe							
Dependent variable	**(I) Diversity**	**(J) Diversity**	**Mean difference (I-J)**	**Std. error**	**Sig.**	**95% Confidence interval**	
						Lower bound	**Upper bound**
Post-test (LPCAT)	African	Indian	-1.344	1.240	.558	-4.43	1.74
		White	-3.071*	1.084	.021	-5.77	-.37
	Indian	African	1.344	1.240	.558	-1.74	4.43
		White	-1.727	.913	.173	-4.00	.55
	White	African	3.071*	1.084	.021	.37	5.77
		Indian	1.727	.913	.173	-.55	4.00
Composite (LPCAT)	African	Indian	-.292	1.316	.976	-3.57	2.98
		White	-1.232	1.150	.565	-4.09	1.63
	Indian	African	.292	1.316	.976	-2.98	3.57
		Indian	-.940	.968	.626	-3.35	1.47
	White	African	-1.232	1.150	.565	-1.63	4.09
		Indian	.940	.968	.626	-1.47	3.35

The Kruskal-Wallis test is used to compare more than two sets of independent scores from different groups (Cohen, 2008). In this research, the Kruskal-Wallis test was used to determine the differences between the race groups with regard to the nonparametric variables (the ELSA literacy and numeracy levels and work performance).

Table 11 below provides the mean rank of the ELSA numeracy and literacy scores and work performance for each race group to show which group had the highest score. The test statistic chi-square value (Kruskal-Wallis H) indicates the degrees of freedom and the significance level of the variance. The result indicates that there was a statistically significant difference between the different race groups' ELSA literacy levels $(H = 8.677, p = 0.013)$ and ELSA numeracy levels $(H = 10.975, p = 0.004)$. However, the Africans scored lower on both ELSA literacy and numeracy levels. There was no statistically significant difference between the race grouping with regard to work performance $(H = 3.109, p = 0.211)$. See table on the next page.

Table 11

Kruskal- Wallis for nonparametric tests

	Diversity	N	Mean rank
Literacy level	African	14	28.71
	Indian	22	45.16
	White	56	51.47
	Total	92	
Numeracy level	African	14	30.39
	Indian	22	52.64
	White	56	48.12
	Total	92	
Work performance	African	14	37.71
	Indian	22	48.82
	White	56	47.79
	Total	92	

Test statistics[a,b]			
	Literacy level	**Numeracy level**	**Work performance**
Chi-square	8.677	10.975	3.103
Df	2	2	2
Asymp. sig.	.013	.004	.211

a. Kruskal Wallis test
b. Grouping variable: diversity

DISCUSSION

The sample consists of candidate engineers and majority of the participants are whites. The sample is not a true representative of the South African population as reported by Stats SA (2011). Furthermore, the male participants make up the majority of the sample compared to their female counterparts. The latter is understandable because the field of engineering is mostly male dominated as reflected in the ECSA (2012) annual report.

Regarding the overall results of this study, there is evidence that psychological assessments provide useful information in predicting work performance. According to Schmidt and Hunter (2004), general ability test is a best predictor of job performance. Similarly, De Beer (2006), Guion (1998), Hunter and Hunter (1984), Nzama et al. (2008), Outtz (2002), Prinsloo (2001) and Schmidt and Hunter (1998) found that cognitive assessment are best predictors of work performance.

The findings demonstrate that there is a positive relationship and significant correlation between the LPCAT scores and work performance. The LPCAT yielded a small (0.245*) but significant correlation with work performance. These results of the LPCAT are not surprising because existing research reports similar findings (Mnguni, 2011; Nzama, et al., 2008; Schoeman et al., 2008; Taylor, 1994). Males scored highest on the composite score of the LPCAT. The results by De Beer (2010) and Logie (2010) found that the LPCAT have a significant contribution in predicting academic performance.

English language proficiency measured by the ELSA show a correlation coefficient 0.60, which is not significant. This means that there is no correlation between English language proficiency and work performance. This is in line with Schoeman et al. (2008), who found that English language proficiency does not correlate positively with work-related training. However, individuals with higher scores on English language proficiency are found to perform better than those with lower scores (Schoeman et al., 2008).

Lohman (2005, p.113) suggests that "non-verbal tests should be considered in conjunction with verbal and quantitative abilities and achievements if the candidates are not adequately proficient in English". Mnguni (2011) found that both learning potential and English language proficiency are best predictors of work performance. In this study when the learning potential and English language proficiency are combined in the regression model, the learning potential appears to make no significant contribution in predicting work performance.

The regression analysis suggests that the combination of learning potential and English language proficiency does not appear to add any significant meaning on top of learning

potential. In other words, learning potential on its own can be used as predictors of work performance. However, Campbell (1990) and Campbell et al. (1993) theorise that performance is directly determined by an individual's declarative knowledge, procedural knowledge, and motivation and partially determined by individual differences in cognitive ability and personality traits. However, it can be deduced that those who scored higher on the LPCAT and the ELSA tests are more likely to perform better at work than those with lower scores

Differences between biographical variables

The study explores differences between gender and race groups in terms of their learning potential and English language proficiency. Overall, statistically significant differences are found between race groups' levels of learning potential and English language proficiency. Africans performed lower than other races on both ELSA literacy and numeracy levels. Similar to these results, Mnguni (2011) observes differences between Africans and other racial groupings. Meanwhile, whites performed higher on the ELSA literacy. These findings are similar to other studies conducted in the academic field, where LPCAT and English language proficiency were used as predictor variables (De Beer, 2006; 2010; Logie, 2010). Lastly, there is no statistically significant difference between race groupings on work performance.

With reference to the comparison of gender groupings on learning potential scores, there is a statistically significant difference between the male and female sample. Males scored highest on the composite score of the LPCAT. This finding supports the study by De Beer (2010), who found that males scored highest on the LPCAT composite scores. Meanwhile females scored higher on the ELSA literacy. De Beer (2010) found that males' English language scores showed a high predictor value of the dependent variable.

The current study is conducted during the period when the candidate engineers are undergoing transition from university to work. The lack of work experience together with the evaluating errors of allocating merit rating to new employees should be taken into consideration when interpreting these findings. Hence a qualitative study is highly recommended to explore the depth of factors that predict work performance other than learning potential and English language proficiency (Avolio et al., 1990; Borman & Motowidlo, 1997; Campbell, 1990; McDaniel et al., 1988; Motowidlo et al., 1997; Motowidlo & Schmidt, 1999).

Conclusions: implications for practice

In alignment with previous studies cognitive assessments is generally proven to predict work performance (Schmidt & Hunter, 2004). The results demonstrate that, learning potential significantly predict work performance because people with higher scores tend to acquire more job knowledge than their counterparts resulting in higher levels of work performance. The differences in gender and race in LPCAT and ELSA scores could result in an adverse impact. Therefore test results should be carefully interpreted for fair selection, to predict future work performance, for training and development and to continuously manage talent. Additionally, other relevant factors that contribute towards work performance should be considered (De Beer, 2006; Muller & Scheepers, 2003; Outtz, 2002; Prinsloo, 2001). It can be concluded that organisations can benefit from understanding the theoretical and scientific explanation of learning potential and English language proficiency to predict work performance and to better decide on talent selection.

LIMITATIONS OF THE STUDY

The small sample size and the research approach proves to be a limiting factor in this study because it focussed only on historical data obtained from participants who were initially assessed for selection purposes. The study is limited only to candidate engineers in a petrochemical company who had completed the LPCAT and ELSA assessments for the purpose of bursary selection between 2005 and 2006 and had work performance ratings for the year 2012. The small sample size for coloureds is excluded from the comparison analysis, therefore should be taken into consideration when interpreting the racial group differences.

The merit ratings for work performance of candidate engineers is based on overall work performance, excluding the many specific factors that could probably impact on performance (e.g. absenteeism, programme tenure, supervisory judgement, peer judgement, and promotion factors).

Although the relative and absolute approaches to some extent fosters a high performance culture advocated by the participating organisation, in contrast, the rater error, central tendency, remuneration factors significantly influenced the actual work performance merit ratings of the research participants. For instance, the majority of the employees are perceived to be rated on the meet expectation (full performer) band in order to balance the distribution of the remuneration curve. Hence less reward is distributed to the employees rated on the extreme low and high parts of the remuneration distribution curve. Therefore

this method provides a distorted representation of organisational accomplishment as well as employees' actual work performance.

Recency and bias is also evident during performance evaluation. For instance, it is perceived that there is unfair practice because each line manager applies a different method to the KRAs to monitor and evaluate candidate engineers' performance. Similarly, both self-appraisal and 360˚ feedback method is supposedly perceived to be subjective. In a self-appraisal method employees may rate themselves dishonestly either in a positive or negative manner (i.e. overstating or understating their behaviour) influenced by the social desirability aspects. In a 360˚ feedback different raters may observe behaviour differently, for instance customers may have a different perspective on an employee than their peers do. The frequency, validity and consistency of evaluation are therefore not maintained.

RECOMMENDATIONS FOR FUTURE RESEARCH

It is recommended that the study be conducted by selecting a larger, randomised sample from various industries, including artisans and professional engineers. In terms of race, a bigger sample for coloureds should be taken into consideration. Other tasks (technical competence) and contextual factors such as personality and motivation that contributes to work performance should also be investigated in future research. The research did not investigate in-depth differences between the candidate engineers' work performance. It is highly recommended that further studies be conducted to address this limitation. In addition, it is recommended that other performance measures such as absenteeism, programme tenure, supervisory judgement, peer judgement and promotion aspects of the candidate engineers are analysed as moderators in order to add depth and understanding of the complexity of work performance.

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CHAPTER 4: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

In chapter 1, the research problem, the context and the research methodology were explained. In chapter 2 the literature review on learning potential, English language proficiency and work performance was discussed. The empirical study was outlined and discussed in an article format. In chapter 4 an integration of the literature review and the research findings was discussed and presented in the form of conclusions, limitations and recommendations for future studies.

4.1 HYPOTHESES TESTING RESULTS

This section focuses on the formulation of conclusions based on the literature and empirical study.

4.1.1 Conclusions regarding the literature review

Conclusions were drawn in terms of each of the specific aims regarding the relationship between learning potential and English language proficiency.

4.1.1.1 The first aim

The first aim was to theoretically conceptualise learning potential, English language proficiency and work performance, as well as to explore how the learning potential and English language proficiency concepts, can be measured by means of psychological tests.

The first aim, as indicated above, was achieved in chapter 2. Literature on the foundation of the constructs was reviewed. The existing literature reviewed, demonstrated that, despite the richness of the research conducted on learning potential and English language proficiency, continuous examination of the conceptualisation of these constructs is necessary to remain relevant.

In this study, learning potential was studied based on the instrument developed by De Beer (2000a; 2000b; 2000c; 2005; 2006). From the literature review it was concluded that certain variables such as sociocultural and economic factors largely have an influence on learning potential and as such need to be conceptualised and operationalised on the basis of the overview of the literature on this construct. De Beer (2006) emphasises the fact that the LPCAT results should not be used solely on their own but in conjunction with other measures. The LPCAT is characterised by the notion that an individual possesses the potential and opportunity to learn, provided that the environment is conducive to this.

Literature on English language proficiency demonstrates that language development is the result of environmental and cognitive ability predispositions influenced by historical, cultural and educational background. In this study, English language proficiency was approached from Hough and Horne's (1994) perspective.

It is concluded that learning potential and English language proficiency can be measured from a dispositional, situational and environmental adaptation rather than a latent perspective, meaning that sociocultural and educational background should be considered as factors that impact on test performance.

4.1.1.2 The second aim

The second aim was to conceptualise the theoretical relationship between learning potential and English language proficiency in predicting work performance.

According to Schoeman et al., (2008), individuals with higher scores on learning potential tend to score higher on English language proficiency and work performance. A study by Mnguni (2011) also found that there is a relationship between the ELSA literacy and the numeracy scores of cadet pilots. These findings show that in practical terms, the study of the relationship between learning potential and English language proficiency in predicting work performance is important in any organisation for effective functioning of work-related tasks or during training programme and an increased communication. Understanding this relationship would benefit both individual development and maximise organisational success through the selection and development of employees to enable them to achieve high work performance. Individuals who successfully achieve high work performance are likely to add value to organisational success.

4.1.2 Conclusions regarding the empirical study

The specific empirical aims of this study were as follows:

- to assess the empirical predictive validity of learning potential and English language proficiency as predictors of work performance of candidate engineers

- to evaluate the relationship between learning potential and English language proficiency as predictors of work performance of candidate engineers

- to establish whether there are differences in terms of race and gender of the learning potential and English language proficiency scores of candidate engineers

- to provide practical utility and propose recommendations for selection purposes

Table 4.1 below presents the hypotheses that were formulated in chapter 1. Based on the empirical findings, the hypotheses are either rejected or not rejected. Anastasi and Urbina (1997) suggest that the significance levels of less than 0.01 or 0.05 indicate that the null hypothesis should be rejected.

Table 4.1

Hypotheses testing results

Original hypotheses	Results	Reasons/discussion
$H1_1$: The learning potential scores correlate significantly and positively with the work performance of candidate engineers.	$H1_0$ is rejected.	The results indicate that the learning potential scores measured by LPCAT are valid for the prediction of work performance of candidate engineers.
$H2_1$: The English language proficiency scores correlate statistically significantly and positively with the work performance of candidate engineers.	$H2_0$ is not rejected.	The results indicate that the English language proficiency scores measured by the ELSA are not valid for predicting work performance for candidate engineers.
$H3_1$: There is a statistically significant difference between the gender groups with regard to learning potential.	$H3_0$ is rejected	The results indicate that the scores of the LPCAT are significantly different between gender groupings
$H4_1$: There is a statistically significant difference between the race groups with regard to learning potential.	$H4_0$ is rejected.	The results indicate that the scores of the LPCAT are significantly different between race groupings
$H5_1$: There is a statistically significant difference between the gender groups with regard to English language proficiency.	$H5_0$ is rejected.	The results indicate that the scores of the ELSA are significantly different between gender groupings
$H6_1$: There is a statistically significant difference between the race groups with regard to English language proficiency.	$H6_0$ is rejected.	The results indicate that the scores of the ELSA are significantly different between race groupings
$H7_1$: There is a statistically significant difference between the race groups with regard to work performance.	$H7_0$ is not rejected.	The results indicate that the scores of the work performance are not significantly different between race groupings

The research findings and hypotheses warranting discussion will be presented as empirical conclusions in the section to follow. Based on the specific empirical aims, the following conclusions were drawn:

4.1.2.1 The first aim

This aim was to assess the empirical predictive validity of learning potential and English language proficiency as predictors of work performance of candidate engineers.

It was concluded that candidate engineers' learning potential relate significantly and positively to their work performance. Meanwhile the English language proficiency did not show any relationship with work performance. Candidate engineers with a higher score for learning potential and English language proficiency have a tendency to achieve higher work performance.

4.1.2.2 The second aim

This aim was to evaluate the relationship between learning potential and English language proficiency as predictors of work performance of candidate engineers.

It was concluded that there was a positive relationship between learning potential and English language proficiency in predicting work performance of candidate engineers.

4.1.2.3 The third aim

This aim was to establish whether race and gender influence the learning potential, English language proficiency and work performance of candidate engineers.

Based on this research finding, it was found that there was a difference between races with regard to their learning potential in predicting work performance of candidate engineers. There was no difference between gender groupings with regard to learning potential and English language proficiency scores in predicting work performance of candidate engineers. According to Outtz (2002), cognitive assessment provides racial differences compared to other predictors of work performance (i.e. biodata, personality inventories and structured interviews). In South Africa it is imperative to continuously ponder about the impact of the legacy of apartheid on different racial groups as a result of poor educational and socioeconomic factors on cognitive abilities.

4.1.3 Conclusions regarding contributions to the field of industrial and organisational psychology

The findings of the literature review provided insight into the conceptualisation of learning potential and English language proficiency and also confirmed the predictive validity of these constructs on work performance. The possible relationships between these constructs and the differences between biographical groups were already explored in existing research, thereby contributing to the body of knowledge especially in the multicultural society of South Africa (De Beer, 2000a, 2000b, 2000c; 2006; 2010; Hough & Horne, 1994; Logie, 2010; Mnguni, 2011; Nzama, et al., 2008; Schoeman et al., 2008).

The instruments used were developed in South Africa taking into consideration differences in the population. The literature review indicates that the instruments' reliability and validity provide valuable information on the use of psychological assessments for predicting future performance. The conclusions drawn from this study indicate that the instruments utilised generally display acceptable levels of internal consistency reliability (De Beer, 2000a, 2000b, 2000c; Hough & Horne, 1994).

The results of the empirical study provide information on the predictive validity of learning potential and English language proficiency as predictors of work performance. Furthermore, the empirical study indicates that there is a relationship between learning potential and English language proficiency as predictors of work performance. Decision makers are therefore encouraged to utilise these two instruments when predicting and selecting potential employees who will successfully contribute to organisational success.

The empirical study also shows that there are differences based on the learning potential scores between race groupings. These differences could have an adverse impact especially when used for selection purposes in a multiracial group. According to Theron (2009) adverse impact occurs when there is a significant difference in outcomes to the disadvantage of one or more groups defined on the basis of demographic characteristics such as race, ethnicity, gender etc. This adverse impact should therefore be minimised by considering other relevant information, extend the scope of work related aspects beyond testing learning potential, consider reducing the weight of the learning potential score during interpretation and also adherence to the EEA of 1998, etc.(Mauer, 2000a; 2000b; Outtz, 2002; Theron, 2009).

4.2 LIMITATIONS

The limitations below are presented on the basis of the literature review and empirical part of this study.

4.2.1 Limitations of the literature review

The limitations of the literature review relate to the boundaries within which the study was conducted. The research adopted a functionalist approach, which excluded other methods that might be considered important in predicting work performance, such as unquantifiable data obtainable from interviews. However, limiting the research to a particular paradigm is useful in that the researcher is able to focus on a specific area. In addition, extensive research based on predictors of work performance demonstrated that cognitive ability has the highest predictive value compared to other forms of assessments (De Beer & Visser, 2008; Hunter, 1983; 1986; Hunter & Hunter, 1984; Hunter et al., 2000; Jensen, 1986; Nzama, et al., 2008; Ree & Earles, 1992; Schmidt & Hunter, 1998; Schoeman et al., 2008; Taylor, 1994). Although the ELSA is developed in South Africa, there is a limited [4]peer reviewed research available. Therefore an all-encompassing approach to the factors influencing work performance could be considered in future research.

4.2.2 Limitations of the empirical study

Some limitations regarding the empirical study were identified in previous chapters. The following discussion focuses on a summary of limitations specific to the empirical study:

4.2.2.1 Psychological constructs and individual differences

The limitations that were detected include, for example, the exclusion of various other psychological constructs such as personality attributes and individual factors, because only two constructs were measured in order to predict work performance. For instance, individual factors such as participants' attitudes towards the programme, and age and tenure of participants on the programme, which were not measured in this study.

4.2.2.2 Work performance criteria and evaluation

Although participants were drawn from all business units and various engineering disciplines in the organisation in order to consistently evaluate employee's work performance, organisational factors specific to the business unit such as task or contextual work performance, may have influenced the results. Owing to the scope of this study, all factors could not be controlled for or measured, and therefore factors specific to the individual and the environment may also have acted as mediating variables. Possible influencing factors

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[4] For more information, please visit www.kaleidoprax.co.za

include subjectivity of managers on allocating work performance merit ratings and utilisation of the bells curve (Armstrong, 2009; Cascio & Aguinis, 2005; Sonnentag & Frese, 2002).

4.2.2.3 Research design

The empirical study utilised an ex post facto design, and the results were therefore obtained for only a single group of participants, focusing on the history of their assessment results, thus drastically affecting the sample size. According to De Beer (2010), more value could be gained from longitudinal studies, which allow research to be conducted over an extended period of time. A longitudinal design would overcome the possible impact of the small sample size, because it focuses on the relationship of variables not related to various backgrounds.

4.2.2.4 Restriction of range

Given the research design utilised for this study, only participants who initially participated during the selection process of potential engineers were studied to investigate both the predictor and the criterion measures. This means that only a few selected participants who met the cut-off points were considered for this study (Cascio & Aguinis, 2005). Restriction of range poses problems in estimating the true validity of the measuring instruments. In this study, there may be range restriction because only participants who scored higher during the initial stage of the selection process and only those who passed their university degrees became part of this study, thus lowering the validity estimates obtained for the predictors in respect of overall performance. In this study, other moderating or mediating variables such as type of bachelor's degree, tenure and motivation were not investigated as having a positive or negative impact on work performance scores.

4.2.2.4 Sample size

The sample did not represent the candidate engineers within the organisation and South African population of candidate engineers in terms of gender and race. The nature of the method may therefore have had a negative impact on the potential to generalise the results to the broader multicultural and diverse South African population. The small sample size also limited the scope of possible statistical analyses. The sampling method utilised was unavoidable, but although it is a scientific method, a random sampling method rather than the nonprobability convenience sampling method utilised may have rendered the results more generalisable. With reference to the interpretation of differences between the biographical groups, the results should be interpreted with caution in instances where unequal group sizes exist such as small number of coloureds (Cohen, 2008).

4.3 RECOMMENDATIONS

Based on these research findings, the following recommendations are made about the use of psychological assessments in predicting work performance for future studies:

4.3.1 Consideration of other psychological constructs

The results of this study show that it is necessary to consider psychological assessments in order to predict work performance. It is clear from the current results that learning potential assessments tend to predict work performance also evident in findings reported by De Beer (2006) which indicated the level an individual is likely to perform at, provided the learning environment is conducive.

However, adding personality scales to the above constructs could improve the predictive validity around the use of psychological assessments in the work environment. This is demonstrated in the meta-analysis of Hurtz and Donovan (2000) and Tett, Jackson and Rothstein (1991) who found that some aspects of personality dimensions predict work performance. Bartram (2004) shows that careful selection of personality attributes to specific work performance results in high validity thus providing better work performance. It can therefore be inferred that adding other psychological constructs can be beneficial in predicting work performance of candidate engineers.

4.3.2 Consideration of work performance criteria and evaluation

Based on the research findings of Borman and Motowidlo (1997), Campbell (1990); Motowidlo et al. (1997) and Motowidlo and Schmidt (1999), work performance is multidimensional. In addition, Avolio et al. (1990) and McDaniel et al. (1988) observed work performance as a dynamic concept. Hence the extent to which the training programme is managed and the specific criteria set for evaluating work performance may be important in achieving high predictive values. It is suggested that the provision of consistent work performance criteria and methods of evaluation be utilised to curb subjectivity during the ratings process (Murphy & Cleveland, 1995; Murphy & Davidshofer, 2005).

Furthermore, a proper job analysis should be conducted to identify essential skills and competencies required for the success of a candidate engineer. For instance, Viswesvaran and Ones (2000) highlight general competencies most likely to be important in any job. This will ensure that panel review members across the organisation can consistently measure work performance of candidate engineers with less influence from the organisation's human resources processes. If criteria are successfully set, this could be viewed as an opportunity

to provide objective and constructive development feedback to candidate engineers and not just adherence to organisational procedures. In this manner, the process of performance rating will enhance the high performance culture advocated by the organisation, thereby maximising the engineers' talent pipeline. Most importantly this will increase the integrity and credibility of the training programme and the performance management system rather than these being observed as a mere enforcement of the organisation's pay policies associated with rigid advancement procedures.

4.3.3 Future research

There is a need for further research on the relationship between learning potential, English language proficiency and work performance in the South African context. It is recommended that future studies address the limitations identified in this study. This study was limited to a small sample of engineers at entry level. Future studies should therefore include a larger more representative sample in the training and development space. The sample included in this study consisted of candidate engineers across all engineering disciplines because they are considered critical and scarce skills in the industry in which the organisation operates and globally. It is recommended that the study be conducted by selecting a larger, randomised sample from various industries, including semi-professional and professional engineers. In addition, it is recommended that other mediating variables as highlighted in the limitations above are analysed as independent variables.

The focus of this study was on the predictive validity of learning potential and English language proficiency on work performance and the findings added valuable practical knowledge for the field of industrial and organisational psychology, in the South African context in particular. It is recommended that a mixed method approach to the study of these constructs be conducted in order to provide greater depth in their understanding.

4.4 CHAPTER SUMMARY

This chapter discussed the conclusions drawn in this study, as well as the possible limitations of the study, by focusing on both the literature review and the empirical study. Recommendations were made with reference to practical suggestions for evaluation of work performance and future research.

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