

THE PSYCHOMETRIC PROPERTIES OF AN EMOTIONAL INTELLIGENCE SCALE FOR EMPLOYEES IN THE MINING INDUSTRY

Tebogo Martha Leepile, Hons. BA

Mini-dissertation submitted in fulfilment of the requirements of the degree Magister Artium
in Industrial Psychology at the Potchefstroom Campus of the North-West University.

Study Leader: Dr W.J. Coetzer

Assistant Study Leader: Dr C.S. Jonker

Potchefstroom

2006

REMARKS

The reader is reminded of the following:

- The references as well as the editorial style as prescribed by the *Publication Manual (5th edition)* of the American Psychological Association (APA) were followed in this mini-dissertation. This practice is in line with the policy of the Programme in Industrial Psychology of the North-West University (Potchefstroom Campus) to use APA style in all scientific documents as from January 1999.
- This mini-dissertation is submitted in the form of one research article. The name of the study leader appears on the research article as it was submitted for publication in a national journal.
- Every chapter has its own reference list.

ACKNOWLEDGEMENTS

I wish to extend my gratitude to various individuals who, at various stages during the writing of this mini-dissertation, were prepared to help, guide and support me to complete this research successfully.

- Glory be to God, who gave me the talent, opportunity and strength to complete this research.
- I owe a special debt of gratitude to Dr W.J. Coetzer and Dr C.S. Jonker, my supervisors, for their persistent and competent guidance as well as their motivation, throughout the writing of this thesis.
- I am very grateful to my son Kutlwano, for always giving me a smile and making me proud to be a mother.
- I owe a special debt of gratitude to my parents, Pastor S.G. Helepi, Mentor, W. Boshoff and Coach, R. Morabe, for their continuous prayer, love and support through all these years.
- A special word of thanks to all the employees who have completed the questionnaires.
- I extend my grateful appreciation to Marilette van der Colff for the professional manner in which she conducted the language editing.
- Thank you to my family, friends and colleagues for all their love and support.

TABLE OF CONTENTS

	Page
List of Figures	iv
List of Tables	v
Summary	vi
Opsomming	viii
CHAPTER 1: INTRODUCTION	
1.1 Problem statement	1
1.2 Research objectives	11
1.2.1 General objective	11
1.2.2 Specific objectives	11
1.3 Research method	11
1.3.1 Literature review	12
1.3.2 Research design	12
1.3.3 Participants	12
1.3.4 Measuring battery	13
1.3.5 Statistical analysis	13
1.4 Chapter Division	14
1.5 Chapter summary	14
References	16
CHAPTER 2: RESEARCH ARTICLE 1	20
References	48
CHAPTER 3: CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS	
3.1 Conclusions	53
3.2 Limitations	57
3.3 Recommendations	58
3.3.1 Recommendations for the organisation	58
3.3.2 Recommendations for future research	59
References	60

LIST OF FIGURES

Figure	Description	Page
Figure 1	A circular depiction of the four-branch model of emotional intelligence	29

LIST OF TABLES

Table	Description	Page
Table 1	Dimensions and sub-scales of the EQ-i measure	27
Table 2	Summary of Ability EI measures	31
Table 3	Summary of Trait EI measure	33
Table 4	Characteristics of the Participants	37
Table 5	Pattern matrix of the 33-item EIS for the White racial group and the African racial group	41
Table 6	Pattern matrix of the 33-item EIS for the White racial group and the African racial group	42
Table 7	Descriptive Statistics and Alpha Coefficients of the EIS	43
Table 8	ANOVA's- Differences in emotional intelligence levels of different groups	43

SUMMARY

Topic: The Psychometric properties of an emotional intelligence scale for employees in the mining industry.

Key terms: Psychometric properties, emotional intelligence, measure, reliability, validity, construct equivalence, mining industry.

Business leaders are increasingly coming to recognise that there is more to business success than technical and cognitive competence. Personnel leadership is proving to be critical for business bottom-line achievements considering that most business outcomes are achieved through human capital. Emotional intelligence can be used to the advantage of organisations by developing an emotional intelligence audit. The objective of this study was to investigate the psychometric properties of the Emotional Intelligence Scale (EIS) developed by Schutte, Malouff, Hall, Haggerty, Cooper, and Golden (1998) for employees in the mining industry in South Africa. The psychometric soundness of the EIS was tested.

The general objective of the research was to standardise a psychometric instrument of emotional intelligence and determine the validity of the Schutte Emotional Intelligence Questionnaire (EIS) (Schutte, et al., 1998). A valid and reliable measure of emotional intelligence could be valuable in the organisation to identify specific EI needs that could be developed through the implementation of EI development programmes. In this context a standardised psychometric instrument of EI could be of use in organisations during the training and development of employees.

A cross-sectional survey research method with an availability sample ($N = 324$) from employees in the mining industry was used. Exploratory factor analysis was used to confirm the construct equivalence of the EIS in different racial groups. The results supported a one-factor model of emotional intelligence. ANOVA analysis was conducted to determine the levels of emotional intelligence in terms of various demographic aspects such as gender, racial groups, language groups, and age groups. The results indicated that there are no significant differences between different demographics aspects and the level of emotional intelligence.

Recommendations for future research were made.

OPSOMMING

Titel: Die Psigometriese eienskappe van 'n emosionele intelligensie meetinstrument vir werknemers in die mynindustrie.

Sleutelwoorde: Psigometriese eienskappe, emosionele intelligensie, meetinstrument, betroubaarheid, geldigheid, konstrukwivalensie, mynindustrie.

Sakeleiers besef toenemend dat sakesukses meer beteken as tegniese en kognitiewe bekwaamheid. Personeel-leierskap het van kritiese belang begin word vir wins, inaggenome dat die meeste sake-uitkomste deur menslike kapitaal bereik word. Emosionele intelligensie kan gebruik word tot voordeel van organisasies deur 'n emosionele intelligensie-oudit te ontwikkel. Die doelstelling van die studie was om die psigometriese eienskappe van die Emosionele Intelligensieskaal (EIS) wat deur Schutte, Malouff, Hall, Haggerty, Cooper, and Golden (1998) ontwikkel is, te ondersoek. Die psigometriese gegrondheid van die EIS is ondersoek.

Die algemene doelstelling van die navorsing was om 'n psigometriese instrument van emosionele intelligensie te standaardiseer en die betroubaarheid van die Schutte Emosionele Intelligensieskaal (EIS) (Schutte, et al., 1998) te bepaal. 'n Geldige en betroubare meetinstrument van emosionele intelligensie kan van waarde wees in die organisasie om spesifieke EI-behoeftes te identifiseer wat ontwikkel kan word deur die implementering van EI-ontwikkelingsprogramme. Binne dié konteks kan 'n gestandaardiseerde psigometriese instrument van EI nuttig gebruik word in organisasies tydens die opleiding en ontwikkeling van werknemers.

'n Kruis-seksionele opname ontwerp met 'n beskikbaarheidsteekproef ($N = 324$) van werknemers in die mynindustrie is gebruik. Eksploratiewe factor analise is gebruik om die konstruekwivalensie van die EIS in verskillende rasse-groepe te bepaal. Die resultate het 'n een-faktor model van emosionele intelligensie ondersteun. ANOVA analises is gebruik om die vlakke van emosionele intelligensie ten opsigte van verskillende demografiese aspekte soos geslag, rasse-groepe, taalgroepe, en ouderdomsgroepe te bepaal. Die resultate het getoon

dat daar geen betekenisvolle verskille tussen demografiese aspekte en die vlak van emosionele intelligensie is nie.

Aanbevelings vir toekomstige navorsing is gedoen.

CHAPTER 1

INTRODUCTION

This mini-dissertation focuses on the psychometric properties of an Emotional Intelligence Scale for employees in the mining industry in South Africa.

Chapter 1 contains the problem statement, research objectives and research methodology employed. This chapter starts out with a problem statement, giving an overview of previously related research conducted specifically in the mining industry, and linking it with this research project and its research objectives. A discussion of the research method follows, with details regarding the empirical study, research design, participants, measuring instruments and statistical analysis. It concludes with a chapter summary giving an overview of the chapters that comprise this mini-dissertation.

1.1 PROBLEM STATEMENT

South Africa is one of the world's most important mining countries in terms of the variety and quantity of minerals produced. It has the world's largest reserves of chrome, gold, vanadium, manganese and Platinum Group Metal's (PGM). South Africa is also the leading producer of nearly all of Africa's metal and mineral production apart from diamonds (Botswana and the DRC), uranium (Niger), copper and cobalt (Zambia and the DRC) and phosphates (Morocco) (Gold Fields Minerals Services, 1997).

The South African government derives a large percentage of its revenues from the mining industry. In 1995, the 810 mines then in South Africa contributed 7,70% to the Gross Domestic Product (GDP) and employed 4,10% of the economically active population (Gold Fields Minerals Services, 1997). Gold mines, for example, accounted for 65% of the value of mined output and for 53% of the R44 billion earned in 1995 (Hinde, 1996). In 1978, South Africa produced 72% of Western gold production. This fell to 27,6% in 1995 (Gold Fields Minerals Services, 1997). Gold mining output in South Africa has been falling at an average rate of 4% a year over the last 25 years. Between 1884 and 2004, the local gold-mining sector produced 50 055 tons of gold, which account for about 33% of all gold above surface level.

Over the past decade, the contribution of gold-mining to the total GDP declined from 3,20% in 1994 to 1,50% in 2004 (Anon., 2004).

The changing fortune of this sector is also apparent in the declining employment figures. Employment in the mining industry is falling at an average of 8,4% a year (Anon., 2004). Due to lower production percentages, low gold prices and the marginal nature of many of South Africa's gold mines, the gold mining industry has initiated processes of restructuring and cost saving exercises in order to maintain sustainability (Gold Fields Minerals Services, 1997).

Despite the fact that South Africa has significant expertise in mining and is probably the world leader in the development of mining technology, many other countries like Canada, Australia and the United States of America have opted for more mechanisation due to the cost of labour and mining's poor safety record (McGwin, et al., 2002). In South African mining operations mining is still mostly done in the labour intensive way. Underground mining presents a very unique working environment. Working conditions can sometimes be difficult and hazardous (Anon., 2000), and the work is gruelling (Singer, 2002).

Mine workers spend most of their day performing physical tasks. They work with explosives, place pencil sticks in stopes, test geological formation, operate load haul-dump (LHD) machines and maintain mining machinery in conventional mines (Anon., 2000). The equipment and techniques used are varied and complex, with many areas requiring significant safety and skills training (Anon., 2000). Employees in the mining industry also seem to be faced with a lack of personnel and material resources, organisational politics and bureaucracy (red tape). In a South African study, Le Roux (2005) found that the unique job demands in the mining industry are job insecurity, working hours, working conditions, and workload, whilst the unique job resources are supervision, task freedom, support, pay and benefits, opportunities for growth, and availability of resources.

Mining is a dangerous, backbreaking and often heartbreaking business (Calitz, 2004), and persuading the earth to give forth of its riches requires men and women of exceptional ability, integrity and initiative. With more than one hundred miners killed every year in the South African mining industry, it has the highest rate of fatal occupational injuries (McGwin, et al., 2002). The unique working environment can contribute to health and safety problems.

Faced with the challenge of increasing square metres and higher productivity levels, the industry requires leadership of the highest standard. According to Pretorius (1996), effective leadership is a critical success factor for economic growth and prosperity in South Africa.

Over the past years, there has been an explosion of interest in leadership development. Organisations have recognised the shortage of talented managers, the importance of building their bench strength, and the need to widen perspectives in order to compete globally (Giber, Carter, & Goldsmith, 2000).

Successful organisational leadership appears to rely on a combination of traits, skills, attitudes, environmental and intra-organisational conditions (Sarros & Woodman, 1993). Given the current South African political and business context, Charlton (1993) believes that emotional competencies are important to achieve excellence, especially in terms of leadership. People, who are unable to maintain a degree of control over their emotional life, fight inner battles that sabotage the ability to perform focused work and have clear thoughts. According to Cherniss and Adler (2000), emotional intelligence and cognitive ability work together for effective action in organisations, and it is therefore not surprising that numerous studies point to emotional intelligence as a critical factor for success at work.

Emotion is considered to be a primary adaptive and motivating mechanism, and emotions contribute effectively to logical thinking and intelligence (Leeper, 1948). Furthermore, emotion has a biological-adaptive function as well as a psychological-constructive function, and also plays a role in social interaction, personality functioning, achieving goals, and cognitive processing. Emotions mediate between constantly changing situations and the individual's behavioural responses, and therefore serve as an important adaptive function to the individual (Thompson, 1994).

Skills of managing people are important for the creation of effective management and leadership. Emotional intelligence as 'the subset of social intelligence' (Salovey & Mayer, 1990) may be the most critical component of this class of skills. The scientific investigation of Emotional intelligence (EI) is still in its infancy, having first been proposed as a quantifiable attribute only a decade ago (MacCann, Roberts, Matthews, & Zaidar, 2004).

Emotional intelligence is aimed at complementing the traditional view of intelligence by emphasising the emotional, personal and social contributions to intelligent behaviour (Dawda & Hart 2000). It is defined as a set of abilities that facilitate the perception, expression, assimilation, understanding, and regulation of emotions, so as to promote emotional and intellectual growth (Mayer & Salovey, 1997).

An ability model of emotional intelligence was first presented by Salovey and Mayer (1990). This was later followed by mixed models (ability and personality characteristics), particularly those of Goleman (1995) and Bar-On (1997).

Despite research supporting the ability-based approach (Salovey & Mayer, 1990), the EI literature has generally focused on the trait-based approach to EI. The trait-based model of EI is more pervasive than the ability-based approach, having been popularised by Goleman's (1995; 1998) best-selling books.

Ability models define EI as a set of conceptually related mental abilities that is associated with emotions and the processing of emotional information that are a part of, and contribute to, logical thought and intelligence in general (Palmer, Manocha, Gignac, & Stough, 2003). According to Mayer, Salovey, and Caruso (2002), emotional intelligence comprises four abilities: (1) the ability to perceive emotions in oneself and others, as well as in objects, art and stories (perception of emotion); (2) the ability to generate emotions in order to use them in other mental processes (emotional facilitation of thought); (3) the ability to understand and reason about emotional information and how emotions combine and progress through relationship transitions (understanding emotions); and (4) the ability to be open to emotions and to moderate them in oneself and others (managing others).

Mixed models of EI, in comparison, define EI as a mixture of emotion-related competencies, personality traits and dispositions (Palmer, et al., 2003). Goleman (1995) also proposed five key areas consisting of intrapersonal and interpersonal skills, adaptability scales, stress management scales and general mood. Furthermore, Bar-On (1997) proposed five key areas, namely knowing one's emotions, managing emotions, motivating oneself, recognising emotions in others and handling relationships.

According to Mayer, Salovey, and Caruso's (2000a) ability model, emotional intelligence refers to the abilities used to process information about one's own and others' emotions. The ability model consists of:

- *Emotional perception*, which refers to the ability to register, attend to and decipher emotional messages that are expressed within a variety of contexts, including facial expressions, tone of voice and works of art.
- *Emotional integration*, which refers to an individual's ability to assess and generate feelings that facilitate thought.
- *Emotional understanding*, which is the ability to comprehend the implications of emotions. Individuals with well-developed emotional understanding skills can understand how one emotion leads to another, how emotions change over time and how the temporal patterning of emotions can affect relationships.
- *Emotional management*, which is the ability to regulate emotions. Individuals can choose whether they want to be open to the experience of an emotion, and are able to control the way in which they express their emotions.

Thus, emotional intelligence involves "the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions" (Salovey & Mayer, 1990, p. 189).

A major weakness of EI research literature is the lack of scientifically sound, objective measures of the EI construct. Unlike the many carefully developed cognitive ability measures, measures of EI are almost all based on self-report instruments, lacking norms or a standardisation group, and if measures exist at all, they have unacceptable levels of internal consistency or stability. Almost none of the EI measures provide any data to support the particular interpretations that the test developers claim to make, using a test score (Pfeifer, 2001). This does not necessarily mean that EI may not eventually prove to be a valid or useful psychological construct.

However, it appears that there is still a need for brief, validated measures of emotional intelligence that are based on a comprehensive model of emotional intelligence. The need also arises for a more simplified and more cost effective measure of emotional intelligence (Jonker, 2002). For this reason, it is difficult to assess the levels of EI amongst different groups in South Africa and to identify levels of emotional intelligence. There is also a lack of South African norms, which hampers the implementation and development of emotional intelligence programmes.

Mayer & Salovey (1997) developed the Multifactor Emotional Intelligence Scale (MEIS) to measure emotional intelligence. The MEIS consists of twelve ability measures that fall into the four classes of ability, namely perception of emotion, emotional facilitation of thought, understanding emotions and managing others. Bar-On (1997) developed the Emotional Quotient Inventory (EQ-i) based on his model of non-cognitive skills that includes five broad areas of skills or competencies, and within each, more specific skills that appear to contribute to success. This broad area of skills or competencies is inclusive of intrapersonal skills (emotional self awareness, assertiveness, self regard, self-actualisation, and independence), interpersonal skills (interpersonal relationships, social responsibility, and empathy), adaptability (problem solving, reality testing, and flexibility), stress management (stress tolerance, impulse, and control), and general mood (happiness, and optimism) (Bar-On & Parker, 2000).

In an attempt to operationalise the emotional intelligence construct, Schutte, Malouff, Hall, Haggerty, Cooper, and Golden (1998) based their writing of items for a self-report scale on Salovey and Mayer's (1990) original definition on the grounds that it lends itself to conceptualising the various facets of an individual's current level of emotional development. The 33-item emotional intelligence scale (EIS; Schutte, et al., 1998) assesses EI based on self-report responses tapping the appraisal and expression of emotions in self and others, regulation of emotions in self and others, and utilisation of emotions in problem solving. Three of the scale's items (items 5, 28 and 33) are reverse-scored (Petrides & Furnham, 2000), and participants respond by indicating their agreement to each of the 33 statements using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). A high score reflects a high level of emotional intelligence (Venter, 2003).

Validity of the EIS

Validity refers to the degree to which a certain inference or interpretation based on a test is appropriate (Kaplan & Saccuzzo, 2005). Schutte, et al. (1998) demonstrated that the EIS has good reliability and predictive validity results. To determine the predictive validity of an EI measure, the construct validity of the EI measure must first be established (Day & Carrol, 2004). Various methods can be used to demonstrate a measure's construct validity:

- A specific measure of EI can be correlated with existing measures of the same construct, referred to as convergent validity (Crocker & Algina, 1986). In the case of emotional intelligence it would be difficult to determine its convergent validity due to the fact that very few valid measures of EI exist (Day & Carrol, 2004).
- A measure's factor structure can be examined. The measure's factor structure should comprise the theorised number and pattern of factors (Crocker & Algina, 1986).
- The measure's discriminate validity can be determined. Discriminate validity can be established by showing that the specific measure does not correlate with theoretically unrelated constructs. The EIS should demonstrate low or insignificant correlations with personality (Day & Carrol, 2004) if it is to be consistent with the ability-based EI model of Mayer, Salovey, and Caruso's (2000a). It should be noted that the EIS has consistently been found to be significantly related to measures of personality (Saklofske, Austin, & Minski, 2003; Schutte, et al., 1998). Furthermore, evidence suggests that emotional intelligence has substantial and significant correlations with theoretically related constructs such as alexithymia, mood repair, optimism and impulse control (Schutte, et al., 1998).
- The extent to which the measure differentiates between groups, on theoretical grounds, can be established, which can also support inferences about construct validity (Day & Carrol, 2004). Roberts, Zeidner, and Matthews (2001) conducted one of the few studies that evaluated ethnic group differences in EI and found conflicting results. In view of their mixed findings, Roberts, et al. (2001) state that there is currently an urgent need for studies exploring group differences in EI.

Research conducted by Petrides and Furnham (2000) suggests that the scale has face validity, as well as some evidence of construct, predictive and discriminative validities.

Reliability of the EIS

Reliability refers to accuracy, dependability, consistency, or repeatability of test results. In more technical terms, reliability refers to the degree to which test scores are free of measurement errors (Kaplan & Saccuzzo, 2005).

The reliability of the EIS factors has proven to be very reliable (Ciarrochi, Chan, & Caputi, 2000). Furthermore, the EIS has demonstrated high internal consistency (Cronbach alpha coefficients ranging from 0,87 to 0,90) and good test-retest reliability ($\alpha = 0,78$) (Schutte, et al., 1998).

Although studies conducted on the psychometric properties of the EIS indicate that it possesses some form of validity and reliability, the major criticism against the usability of the EIS is its factor structure. Schutte, et al. (1998) proposed that the scale is unidimensional, but research conducted by others suggests otherwise. A factor analysis of Canadian data resulted in a three-factor structure for the EIS (Austin, Saklofske, Huang, & McKenny, 2004). Ciarrochi, et al. (2002) replicated a four-factor structure but found differences in some of the item loadings and classifications. Similarly, Saklofske, et al. (2003) replicated a four-factor solution, but again, not all of the items loaded on the same factors. Results attained by Chan (2004) through the use of an exploratory item factor analysis indicated that the 33 items emerged in meaningful clusters, describing four dimensions of perceived emotional intelligence.

Based on the research and findings of Petrides and Furnham (2000), a four sub-scale structure is proposed for the EIS consisting of:

- *Optimism/mood regulation*

This sub-scale indicates the extent to which an individual expects that he or she can overcome a problem and be successful in performing activities and tasks. These individuals have the ability to seek out activities that will enable them to experience positive emotions.

Furthermore, they are able to motivate themselves by imagining that a task has a positive outcome.

- *Appraisal of emotions*

This sub-scale indicates the extent to which an individual is aware of the emotions he or she is experiencing. It also includes the awareness of the individual regarding the non-verbal messages he or she is sending to others, as well as the individual's ability to appraise non-verbal communication of others.

- *Social skills*

This sub-scale indicates the extent to which an individual feels comfortable in sharing his or her emotions with others, and whether he or she can sense when to share emotions and when not to. At the same time it indicates the extent to which the individual is available or open so that others can share their emotions with the individual. Lastly, it indicates the individual's ability to exhibit empathy.

- *Utilisation of emotions*

This subscale indicates the extent to which the individual utilises positive emotions to identify new possibilities, solve problems and generate good ideas.

Petrides and Furnham (2000) suggest that both the factor scores and a total score can be used due to the clear evidence of the scales' multidimensionality when interpreting the EIS. A valid and reliable EI measure is important not only for the individual, but also for organisations who wish to incorporate emotional intelligence within their selection criteria, training and development programmes.

In a study conducted by Van der Merwe (2005) on a sample of nurses, a five-factor solution was found explaining 50,04% of the total variance. The five factors were labelled *Positive State* ($\alpha = 0,85$), *Own Emotions* ($\alpha = 0,80$), *Negative Emotions* ($\alpha = 0,58$), *Emotions of Others* ($\alpha = 0,73$) and *Emotional Management* ($\alpha = 0,78$). In another study conducted in South Africa on a sample of university students, Vosloo (2005) found a six-factor solution explaining 45,25% of the total variance. The six factors were labelled *Positive Affect* ($\alpha = 0,73$), *Emotion-Others* ($\alpha = 0,67$), *Happy Emotions* ($\alpha = 0,63$), *Emotions-Own* ($\alpha = 0,63$),

Non-Verbal Emotions ($\alpha = 0,56$), and *Emotion Management* ($\alpha = 0,54$). Item 33 did not load on any of the factors.

Results regarding emotional intelligence and gender differences have been replicated on various occasions. Empirical research indicates that women score higher in measures of EI than males (Charbonneau & Nicol, 2002; Ciarrochi, et al., 2000; Mayer & Geher, 1996; Mayer, Salovey, & Caruso, 2000; Petrides & Furnham, 2000; Van Rooy & Viswesvaran, 2003). Van Rooy and Viswesvaran (2003) further state that this occurrence is not surprising since women have better emotional and interpersonal skills than men. However, these gender differences appear to be more pronounced in studies examining ability-based EI (Day & Carroll, 2004).

Discrepancies regarding age differences in EI are also found in the literature. Research conducted by Bar-On (1997) indicated that the EQ-i and scales scores were positively and significantly related to age. Age was broken into 10-year blocks, with the 40–49 year-old age group consistently having the highest mean values across domains. This finding was replicated by Derkesen, Kramer, and Katzko (2002) and can also be supported by research conducted by Hemmati, Mills, and Kroner (2004). Mayer, Caruso, and Salovey (1999) found that adults score higher on EI, while Roberts, et al. (2001) found no significant age differences.

Based on the above-mentioned problem statement, no research could be found in South Africa on the use of the Schutte Emotional Intelligence Scale (EIS; Schutte, et al., 1998) to measure emotional intelligence in a more industrialised environment such as the mining industry. The objective of this research is therefore to determine the psychometric properties of the EIS for use in the mining industry, to determine the construct equivalence for different language groups and to determine the differences in the experience of emotional intelligence among different groups.

The following research questions emerge from the problem statement:

- How is the importance of a standardised psychometric instrument of emotional intelligence in South Africa conceptualised in the literature?

- What is the validity and internal consistency of an instrument of emotional intelligence in the mining industry?
- What are the group differences of emotional intelligence in terms of biographical data?
- What recommendations for further research can be made?

1.2 RESEARCH OBJECTIVES

Arising from the problem statement described above, the following general and specific objectives are set for this research.

1.2.1 General Objective

The general objective of this research is to determine the psychometric properties of the Schutte Emotional Intelligence Measure for the measurement of emotional intelligence in a sample of employees working in the mining industry.

1.2.2 Specific Objectives

The following specific objectives are formulated for this research, namely to:

- conceptualise emotional intelligence from the literature;
- conceptualise the importance of a standardised psychometric instrument of emotional intelligence in South Africa from the literature;
- determine the construct validity and internal consistency of the Emotional Intelligence Scale for a sample of employees in the mining industry;
- determine the differences in the experience of emotional intelligence in terms of biographical data; and
- make recommendations for future research.

1.3 RESEARCH METHOD

The research method for the purpose of this mini-dissertation consists of a brief literature review and an empirical study. Due to the fact that separate chapters were not targeted for a

literature review, this paragraph focuses on aspects relevant to the empirical study that is conducted. The results obtained from the research will be presented in article format.

1.3.1 Literature review

The literature review focuses on previous research on emotional intelligence and measures of emotional intelligence. An overview is given of the conceptualisation of emotional intelligence, and on the findings in terms of the psychometric properties of emotional intelligence measures. The reader should note that a literature study is conducted for the purpose of the article.

1.3.2 Research design

A cross-sectional design with a survey as the data collection technique is used to achieve the research objectives. Cross-sectional designs are used to examine groups of subjects in various stages of development simultaneously, while a survey is a data-collection technique in which questionnaires are used to gather data about an identified population (Burns & Grove, 1993). Information collected is used to describe the population at that time. This design can also be used to assess interrelationships among variables within a population. According to Shaughnessy and Zechmeister (1997), this design is best suited to address the descriptive and predictive functions associated with the correlational design, whereby relationships between variables are examined.

1.3.3 Participants

The participants may be defined as an availability sample of employees in the mining industry in South Africa ($N = 326$). The sample consisted mainly of Afrikaans-speaking (46,30%) men (79,10%) in their thirties (40,30%), with a grade 12 (44,50%). The average number of years employed in the organisation was between eleven and twenty years (34,90%). The participants were mainly employed in production (32,40%), logistics and services (22,20%), and in C-upper grading positions (30,40%).

1.3.4 Measuring battery

Two questionnaires were administered in this study, namely a biographical questionnaire and the Schutte Emotional Intelligence Scale (EIS, Schutte, et al., 1998).

A *biographical questionnaire* was developed to gather information about the demographical characteristics of the participants. Information gathered included age, gender, race, home language, education, marital status and years employed in the current position.

The *Schutte Emotional Intelligence Scale* (EIS; Schutte, et al., 1998) was developed within the trait EI framework that measures a homogeneous construct of emotional intelligence. The high reliability coefficient for the total EI score ($\alpha = 0,90$) suggests that perhaps the test measures something coherent and internally consistent (Petrides & Furnham, 2000). In developing the EIS, Schutte, et al. (1998) used a set of 62 items derived from the EI model of Salovey and Mayer (1990) and extracted a four-factor solution from them (Saklofske, et al., 2003). The questionnaire comprises 33 items, of which three (items 5, 28 and 33) are reverse-scored (Petrides & Furnham, 2000). In South African results, Cronbach alpha coefficients ranging from 0,54 to 0,85 were obtained (Van der Merwe 2005, Vosloo, 2005).

1.3.5 Statistical analysis

The statistical analysis was conducted with the aid of the SPSS-program (SPSS Inc., 2003). Descriptive statistics (e.g. means, standard deviations, skewness and kurtosis) were used to analyse the data. Cronbach alpha coefficients were used to assess the internal consistency, homogeneity and unidimensionality of the measuring instruments (Clark & Watson, 1995). Coefficient alpha contains important information regarding the proportion of variance of the items of a scale in terms of the total variance explained by the particular scale.

Construct equivalence of the instrument was also performed. According to Van de Vijver and Leung (1997), construct equivalence can be investigated with several techniques, such as factor analysis, cluster analysis, and multidimensional scaling or other dimensionality reducing techniques. The basic idea behind the application of these techniques is to obtain a

structure in each culture – which can then be compared across all cultures involved. The most frequently employed technique for studying construct equivalence is factor analysis.

Exploratory factor analysis was used to examine construct equivalence. A principal components analysis was conducted to determine the number of factors of the EIS in the total sample. In order to determine the solution for each racial group, a direct oblimin rotation was used. Factors obtained in each group were compared (after target rotation). The agreement was evaluated by a factor congruence coefficient, Tucker's phi (Van de Vijver & Leung, 1997). Values above 0,90 pointed to essential agreement between cultural groups, while values above 0,95 pointed to very good agreement. A high agreement implies that the factor loadings of the lower and higher level are equal up to a multiplying constant. The latter was needed to accommodate possible differences in eigen values of factors for the different racial groups.

One-way analysis of variance (ANOVA) was used to determine the significance of differences between the emotional intelligence of demographic groups. ANOVA tests whether or not mean differences among groups on a combination of dependent variables are likely to have occurred by chance (Tabachnick & Fidell, 2001). In addition, Tukey tests were performed to indicate which group differed significantly when ANOVAs were conducted.

1.4 CHAPTER DIVISION

The chapters in this mini-dissertation are presented as follows:

Chapter 1: Introduction.

Chapter 2: Research article.

Chapter 3: Conclusions, limitations and recommendations.

1.5 CHAPTER SUMMARY

This chapter discussed the problem statement and research objectives. The measuring instruments and research method used in this research were explained, followed by a brief overview of the chapters to follow.

In Chapter 2, the psychometric properties of the Schutte Emotional Intelligence Scale will be discussed. Chapter 3 will deal with the conclusions, limitations and recommendations of this study.

References

- Anon. (2000). Underground miners, oil and gas drillers and related workers (NOC 823). In Anon. (2000). *Work Futures 2000 Edition*. British Columbia, Canada: Queens Printers.
- Anon. (2004). As prospects for the yellow metal glister, South Africa output slump rouses concern. *Mining Weekly Online*, February.
- Austin, E. J., Saklofske, D. H., Huang, S. H. S., & McKenny, D. (2004). Measurement of trait emotional intelligence: Testing and cross-validating a modified version of Schutte et al.'s (1998) measure. *Personality and Individual Differences*, 36(3), 555-565.
- Bar-On, R. (1997). *Bar-On Emotional Quotient Inventory*. Toronto: Multi-Health Systems Books.
- Bar-On, R., & Parker, D. A. (2000). *The handbook of emotional intelligence theory, development, assessment, and application at home, school, and in the workplace* (1st ed.). San Francisco, CA: Jossey-Bass.
- Burns, N., & Grove, S. K. (1993). *The practice of nursing research, conduct, critique, and utilization* (2nd ed.). Philadelphia: W.B. Saunders.
- Calitz, P. L. (2004). *Experiences of women in the platinum mining industry*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Chan, D. W. (2004). Perceived emotional intelligence and self-efficacy among Chinese secondary school teachers in Hong Kong. *Personality and Individual Differences*, 36(3), 1781-1795.
- Charbonneau, D., & Nicol, A. M. (2002). Emotional intelligence and pro-social behaviours in adolescents. *Psychological Reports*, 90(2), 361-370.
- Charlton, G. (1993). *Leadership: The human race*. South Africa: Juta & Co, Ltd.
- Cherniss, C., & Adler, M. (2000). *Promoting emotional intelligence in organisations: Make training in emotional intelligence effective*. Alexandria, VA: ASTD.
- Ciarrochi, J. V., Chan, A. Y. C., & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality and Individual Differences*, 28, 539-561.
- Clark, L. A., & Watson, D. (1995). Construct validity: Basic issues in objective scale development. *Psychological Assessment*, 7, 309-319.
- Crocker, L., & Algina, A. (1986). *Introduction to classical and modern tests theory*. Toronto, ON: Harcourt Brace Jovanovich College Publishers.

- Dawda, D., & Hart, S. D. (2000). Assessing emotional intelligence: Reliability and validity of the Bar-On emotional Quotient Inventory (EQ-i) in university students. *Personality and Individual Differences*, 28, 797-812.
- Day, A. L., & Carroll, S. A. (2004). Using an ability-based measure of emotional intelligence to predict individual performance, group performance, and group citizenship. *Personality and Individual Differences*, 36, 1443-1458.
- Derkesen, J., Kramer, I., & Katzko, M. (2002). Does a self-report measure for emotional intelligence assess something different than general intelligence? *Personality and Individual Differences*, 32, 37-48.
- Giber, D., Carter, L. L., & Goldsmith, M. (2000). *Linkage Inc. 's best practices in leadership development handbook*. San Francisco, CA: Jossey-Bass/ Pfeiffer.
- Gold Fields Minerals Services. (1997). *Annual Gold Fields Report 1997*. Johannesburg: Gold Fields of South Africa.
- Goleman, D. (1995). *Emotional Intelligence: Why it can matter more than IQ*. New York: Bantam Books.
- Goleman, D. (1998). *Working with emotional intelligence*. New York: Bantam Books.
- Hemmati, T., Mills, J. F., & Kroner, D. G. (2003). The validity of the Bar-On emotional intelligence quotient in an offender population. *Personality and Individual differences*, 2-12.
- Hinde, C. (1996). RSA mining: An overview. *Mining Magazine*, 68.
- Jonker, C. S. (2002). *The compilation and evaluation of a development programme aimed at emotional intelligence*. Unpublished Doctoral thesis, PU for CHE, Potchefstroom.
- Kaplan, R. M., & Saccuzzo, D. P. (2005). *Psychological testing principles, applications, and issues*. USA: Thomson Learning, Inc.
- Le Roux, A. (2005). *Job demands, job resources and work-related flow of employees in the mining industry in South Africa*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Leeper, R.W. (1948). A motivational theory of emotion to replace 'emotion as disorganised response'. *Psychological Review*, 55, 5-21.
- MacCann, C., Roberts, R. D., Matthews, G., & Zaidar, M. (2004). Consensus scoring and empirical option weighting of performance-based Emotional Intelligence (EI) tests. *Personality and Individual Differences*, 36, 645-662.
- Mayer, J. D., Caruso, D. R., & Salovey, P. (1999). Emotional intelligence meets traditional standards for an intelligence. *Intelligence*, 27, 267-298.

- Mayer, J. D., & Geher, G. (1996). Emotional intelligence and the identification of emotion. *Intelligence*, 22, 89-113.
- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey, & D. Sluyter, (Eds.). *Emotional development and emotional intelligence: Implications for educators* (pp. 10). New York: Basic Books.
- Mayer, J.D., Salovey, P., & Caruso, D.R. (1999). *The emotional IQ test (CD-Rom)*. Needham, MA: Virtual Knowledge.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2002). *The Mayer, Salovey, Caruso Emotional Intelligence Test (MSCEIT): User's manual*. Toronto: Multi-Health Systems.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000a). Models of emotional intelligence. In: R. J. Sternberg (Ed.). *Handbook of human intelligence* (pp. 396-420). New York: Cambridge.
- Mayer, J.D., Caruso, D.R., & Salovey, P. (2000). Emotional intelligence meets traditional standards for an intelligence. *Intelligence*, 27(4), 267-298.
- McGwin Jr, G., Valent, F., Taylor, A. J., Howard, H. J., Davis, G. G., Brisse, R. M., & Rue III, L. W. (2002). Epidemiology of fatal occupational injuries in Jefferson County, Alabama. *Southern Medical Journal*, 95(11), 1300-1312, Nov.
- Palmer, B. R., Manocha, R., Gignac, G., & Stough, C. (2003). Examining the factor structure of the Bar-On emotional quotient inventory with an Australian general population sample. *Personality and Individual Differences*, 35, 1191-1210.
- Petrides, K. V., & Furnham, A. (2000). On the dimensional structure of emotional intelligence. *Personality and Individual Differences*, 29, 313-320.
- Pfeifer, S. I. (2001). Emotional intelligence: Popular but elusive construct. *Roeper Review*, 23(3), 138-143.
- Roberts, R. D., Zeidner, M., & Matthews, G. (2001). Does emotional intelligence meet traditional standards for intelligence? Some new data and conclusions. *Emotions*, 1, 196-231.
- Saklofske, D. H., Austin, E. J., & Minski, P. S. (2003). Factors structure and validity of a trait emotional intelligence measure. *Personality and Individual Differences*, 34, 707-721.
- Salovey, P. & Mayer, J.D. (1990). Emotional Intelligence. *Imagination, cognition and personality*, 9, 185-211.
- Sarros, J. C., & Woodman, D. S. (1993). Leadership in Australia and its organizational outcomes. *The Leadership and Organizational Development Journal*, 4, 3-9.

- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., & Golden, C. J. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25, 167-177.
- Shaughnessy, J. J., & Zechmeister, E. B. (1997). *Research methods in psychology* (4th ed). New York: McGraw-Hill.
- Singer, R. (2002, May). South African women gain ground below surface. *USA Today*, 1-2.
- SSPS Inc. (2003). *SPSS12.0 for Windows*. Chicago, IL: Author.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston, MA: Allyn & Bacon.
- Thompson, R. A. (1994). Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development*, 59, 25-52.
- Van de Vijver, F. & Leung, K. (1997). *Methods and data analysis for cross-cultural research*. Thousand Oaks, CA: SAGE.
- Van der Merwe, S. (2005). *The Psychometric properties of an emotional intelligence measure within a nursing environment*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Van Rooy, D. L., & Viswesvaran, C. (2003). *The emotionally intelligent female: A meta-analysis of gender differences*. Unpublished data, Florida International University.
- Venter, M. (2003). *Die verwantskap tussen koherensiesin en emosionele intelligensie*. [The relation between sense of coherence and emotional intelligence]. Ongepubliseerde meestersverhandeling, Randse Afrikaanse Universiteit, Johannesburg.
- Vosloo, C. (2005). *The psychometric properties of a measure of emotional intelligence*. Unpublished masters dissertation, North-West University, Potchefstroom.

CHAPTER 2

RESEARCH ARTICLE

THE PSYCHOMETRIC PROPERTIES OF AN EMOTIONAL INTELLIGENCE SCALE FOR EMPLOYEES IN THE MINING INDUSTRY

T.M. LEEPILE

W.J. COETZER

C.S. JONKER

*WorkWell: Research Unit for People, Policy and Performance, Faculty of Economic and
Management Sciences, North-West University (Potchefstroom Campus)*

ABSTRACT

The objective of this study was to determine the psychometric properties of an Emotional Intelligence Scale (EIS) in the South African mining industry. A cross-sectional survey design with an availability sample ($N = 324$) was used. A total population of 1 400 employees were targeted in different mining organisations, i.e. Gold, Platinum, Phosphate and Copper; but only responses from organisations in the gold and the phosphate industry were obtained. The Schutte Emotional Intelligence Scale was administered. Descriptive statistics, Cronbach alpha coefficients, exploratory factor analysis and ANOVAs were used to analyse the data. Exploratory factor analysis indicated that the EIS consisted of one factor with a Tucker's Phi value higher than 0,90. This factor was labelled Emotional Intelligence. No differences in the experience of emotional intelligence were obtained for different demographic groups.

OPSOMMING

Die doel van hierdie studie was om die psigometriese eienskappe van 'n Emosionele Intelligensie Skaal (EIS) in die Suid-Afrikaanse mynindustrie te bepaal. 'n Dwarsdeursnee-opname ontwerp met 'n beskikbaarheidssteekproef ($N = 324$) is gebruik. 'n Totale populasie van 1 400 werknemers is geteiken in verskillende mynorganisasies, d.i. Goud, Platinum, Fosfaat en Koper, maar terugvoer is slegs verkry van organisasies in die goud- en fosfaatindustrie. Die Schutte Emosionele Intelligensie Skaal is geadministreer. Beskrywende statistiek, Cronbach alfa koëffisiënte, eksploratiewe faktor analise en ANOVAs is gebruik om die data te analiseer. Eksploratiewe faktor analise het getoon dat die EIS uit een faktor bestaan met 'n Tucker's Phi waarde hoër as 0,90. Hierdie faktor is Emosionele Intelligensie genoem. Geen verskille is gekry in die ervaring van emosionele intelligensie in terme van verskillende demografiese groepe nie.

South Africa is one of the world's richest countries in terms of minerals. The Government of National Unity's (DNU) Reconstruction and Development (RDP) rely on the mineral industry to make substantial contributions to wealth creation and economic growth (South African Consulate, 1997). During 2000, sales of primary mineral products accounted for nearly 35% of South Africa's total export revenue. As a result of an increase in secondary and tertiary industries as well as a continuing decline in gold production, mining's contribution to South Africa's gross domestic product (GDP) has declined over the past 10 years. The contribution of gold mining to the total GDP declined from 3,20% in 1994 to 1,50% in 2004 (Anon., 2004).

Despite the fact that mining has played an important role in the development of the South African economy, underground mining presents a very unique working environment. Working conditions can sometimes be difficult and hazardous (Anon., 2000) and the work is exhausting (Singer, 2002). In 2004, the average production worker in the mining industry worked 45,8 hours per week, although schedules varied widely. Some mines operate 24 hours a day, seven days a week, resulting in a situation where some mine workers work long shifts several days in a row, and then only have four to five days off. Work environments vary by occupation. Scientists and technicians work in office buildings and laboratories, while miners and mining engineers spend much of their time in the mine itself. Geologists who specialise in the exploration of natural resources may have to travel for extended periods to remote locations, in various climatic conditions, in order to locate mineral or coal deposits (Singer, 2002; U.S. Bureau of Labour Statistics, 2004).

Working conditions in mines and quarries can be unusual and sometimes dangerous. Calitz (2004) found that mining is a dangerous, backbreaking and often heartbreaking business. Underground mines are damp and dark, and some can be very hot and noisy. At times, several inches of water may cover tunnel floors. Although underground mines have electric lights, the lights on miners' caps are the only source of illumination in many areas. Workers in mines with very low roofs may have to work on their hands and knees, backs, or stomachs, in confined spaces. In underground mining operations, dangers include the possibility of an explosion or cave-in, electric shock, or exposure to harmful gases (Singer, 2002; U.S. Bureau of Labour Statistics, 2004).

Workers in surface mines and quarries are subject to rugged outdoor work in all kinds of weather and climate. Physical strength and stamina are necessary because the work involves lifting, stooping, and climbing. Surface mining, however, is usually less hazardous than underground mining (Singer, 2002; U.S. Bureau of Labour Statistics, 2004).

Employees do not only face poor working conditions, health and safety problems (Calitz, 2004), but they are also faced with the challenge of cultural differences, increasing square metres and higher productivity (Anon., 2004). Apart from the emerging critical issues regarding people (external, internal, and micro), there are also macro and environmental issues that organisations in South Africa have to face (Grobler, Wörnich, Carell, Elbert, & Hatfield, 2002), such as Affirmative action and Equal Employment Opportunities.

Affirmative action and Equal Employment Opportunity legislation has created a new dimension in industries in South Africa (Pengilly, 2002). The quality of relationships across cultural diversity directly affects an organisation's performance with regard to creativity, effectiveness, and ultimate survival. When energy is wasted on negative aspects of diversity (racism, sexism, bias, and discrimination), draining work relationships (control, lying, and manipulation), or cultural misunderstandings (due to different cultural dictates, realities and experiences), the potential of people is lost and the organisation loses as well (Anon., 2005). Dealing with diversity requires a great deal of self-awareness, sensitivity and skill. In the South African mining industry, where cultural and language differences may complicate comprehension between different groups, it is even more important to develop a high level of empathy and emotional maturity so as to be able to understand working conditions and deal with the real messages received in the workplace (Anon., 2005).

When diversity is managed well, it brings new ideas, experiences and perspectives to individuals, teams and organisations. Given the current challenges posed by the mining industry, it can be established that emotional intelligence may be a way for employees in the mining industry to deal with the increasing emotional demands of their work (Anon., 2005). Emotions that are effectively managed can drive trust, loyalty and commitment as well as many of the greatest productivity gains, innovations and accomplishments of individuals, teams and organisations (Cooper, 1997).

According to Fedderke and Pirouz (2000), the mining industry has been declining both in terms of its importance as an employer, relative to other sectors in the economy, and in terms of the absolute level of employment that it provides. Such job losses have largely affected unskilled workers. Pretorius (1996) indicated that effective leadership is a critical success factor for the economic growth and prosperity in South Africa. Emotional intelligence (EI) has become a crucial aspect of leadership development worldwide (Anon., 2005).

The Emotional Intelligence Quotient (EI) was popularised by Goleman (1995). Business leaders are increasingly recognising that there is more to business than technical and cognitive competence. Leadership is proving to be critical for business bottom-line wins, considering that most business outcomes are achieved through human capital (Arumugam, 2003).

Since the publication of Goleman's book on emotional intelligence (EI) in 1995, this construct has become quite popular in the general press. Media reports have heralded the potential value of emotional intelligence for improving one's professional and personal life (O'Connor & Little, 2003). The popularity of the topic has led to a range of predominantly popular books and articles examining its applications and its development in the context of both individuals and corporations (Dulewicz & Higgs, 2000).

Seeing that we are living in an era of continual change and increased complexity, only fluid, flexible, and highly adaptive organisations will thrive in the fast-paced global economy (Grobler, et al., 2002). However, excessive organisational change influences the individual as well. Organisational effectiveness is influenced by the interaction between individuals, groups and organisational factors (Robbins, 1996). Due to the complexity of the mining environment, those who are able to anticipate, react, and respond to change, and who are able to learn, will likely be the ones who manage to maintain a competitive advantage.

Intelligent individuals with high emotional intelligence experience continuous positive moods and feelings that generate higher levels of satisfaction and well-being, compared to individuals who experience such feelings and moods as disappointment, depression and anger, because they can reach a higher level of general satisfaction and fulfilment (Carmeli, 2003). Goleman (1998) states that EI is twice as important as technical skills and more important than IQ for job success at all levels. Weisinger (1998) also supports this statement

by suggesting that EI is related to success at work and plays a significant role in certain aspects of effective team leadership and team performance. In one study, people who received high scores on a test of emotional intelligence were more empathic than their counterparts (Mayer & Salovey, 1997). In another study, people with high emotion regulation abilities were rated by their peers as demonstrating more visionary leadership capabilities than people with low emotion regulation abilities (Carmeli, 2003). In the same study, people with high emotion regulation abilities also reported receiving more social support, and being more satisfied with communications and with other group members than their counterparts.

Bagshaw (2000) found that insensitive managers, who try to bulldoze their staff, think that steady criticism, backed by a loud voice and veiled threats of redundancy, will spur staff on to greater efforts. This is certainly emotionally unintelligent. The reasons for this behaviour stem from emotions (Bagshaw, 2000). Being badly treated by the manager rouses anger, antagonism, fear, desire to get your own back, and a general feeling of ill will. The manager probably behaves like that because of similar feelings caused by past experiences, or he/she mimics the boss's behaviour. This behaviour evokes bad reactions, which in turn evoke bad behaviour. Once emotionally unintelligent behaviour starts, it creates a downward spiral of low morale, avoidance and negative politics (Bagshaw, 2000).

The hypothesis is made that emotional intelligence increases performance above the level expected from general intelligence (Thi Lam & Kirby, 2002). According to Cooper (1997), emotional intelligence is a hidden advantage in organisations. Emotional intelligence gives an individual a competitive edge (Goleman, 1998). Affirmative Action, a diverse employee population and a relatively young working population call for development and training in organisations in this country. The need for development and training of personnel is increasing, stressing the importance of the realisation of employees as important organisational assets. The optimal development and utilisation of individual characteristics and skills are crucial to better organisational effectiveness (Jonker, 2002). In this regard, the measurement and development of emotional intelligence can play a significant role (Wolmarans, 1998). Taking into account the statement made by Eysenck (1958) that personality could be measured if personality and measurement were defined, it would be feasible to measure EI if the concepts of EI and measurement or assessment were well defined.

Emotional Intelligence

Emotional intelligence may be conceptualised and measured as an ability (Ciarrochi, Chan, & Caputi, 2000; Mayer, Caruso, & Salovey, 1999) or as a personality trait (Schutte & Malouff, 1999; Schutte, Malouff, Hall, Haggerty, Cooper, & Golden, 1998). According to Spector (2003), emotional intelligence is a characteristic that falls between a personality trait and a cognitive ability.

A broader differentiation is made between *trait* emotional intelligence and *information-processing* emotional intelligence (Nikolaou & Tsaousis, 2002). Trait emotional intelligence is manifested in specific traits or behaviours, which a person exhibits – such as empathy, optimism, and assertiveness (Petrides & Furnham, 2000). It is embedded in the personality framework, and is measured by self-report inventories measuring specific behaviours (Bar-On, 1997; Salovey, Mayer, Goldman, Turvey, & Palfei, 1995). Information-processing emotional intelligence concerns the ability to identify, express and label emotions (Petrides & Furnham, 2000). It is much more focussed and explicit, and can be assessed through measures of maximal performance.

Trait Emotional Intelligence

Bar-On (1997, p.14), defines emotional intelligence as ‘an array of non-cognitive capabilities, competencies, and skills that influences one’s ability to succeed in coping with environmental demands and pressures’. Bar-On (1997) developed the Bar-On EQ-i to measure emotional intelligence.

The model upon which Bar-On EQ-i is based regards EI as a collection of interrelated emotional, personal and social abilities that determine our facility to cope with environmental pressures and demands. It measures behavioural outcomes with regard to how people perceive themselves in relation to real life situations and experiences. Table 1 shows the principle dimensions and sub-scales of the EQ-i, which may be regarded as highly relevant to the maintenance of a positive climate for services. However, many of the attributes of the model, such as reality testing, stress management, and impulse control, seem to go beyond what is generally meant by emotion or intelligence.

Table 1

Dimensions and sub-scales of the EQ-i measure (Bar-On, 1997).

EQ-i Scales	Sub-scales
Intra-personal	Self-regards Emotional self-awareness Assertiveness Independence Self-actualisation
Inter-personal	Empathy Social responsibility Interpersonal relationship
Adaptability	Reality testing Flexibility Problem solving
Stress management	Stress tolerance Impulse control
General mood	Optimism Happiness

First is intrapersonal EI, which is further divided into emotional self-awareness, assertiveness, self-regard, self-actualisation, and independence. Second is interpersonal EI, which is divided into empathy, interpersonal relationship and social responsibility. These first two factors are reminiscent of Gardner's (1983) personal intelligence, which is also divided into intrapersonal and interpersonal functions. Third is adaptability EI, which is divided into problem solving, reality testing, and flexibility. Fourth is stress management EI, which is divided into stress tolerance and impulse control (Bar-On, 1997). Lastly, is the general mood, which is divided into happiness and optimism. General mood is viewed as a facilitator of emotional intelligence rather than a part of it (Bar-On, 1997).

Information-processing emotional intelligence

Salovey and Mayer (1990, p.189) define emotional intelligence as "the ability to monitor one's own and others' feelings and emotions, to discriminate among them and to use this information to guide one's thinking and actions". Although this definition encompasses emotional self-awareness and empathy, Mayer and Salovey (1997) later argued that it did not

adequately emphasise 'thinking about feelings'. An understanding of the concept of emotional intelligence requires the exploration of two component terms, namely intelligence and emotion. Since the eighteenth century, psychologists have recognised an influential three-part division of the mind into cognition (or thought), affect (including emotion), and motivation (or conation) (Mayer & Salovey, 1997).

The cognitive sphere includes such functions as human memory, reasoning, judgment, and abstract thought. Intelligence is typically used by psychologists to characterise how well the cognitive sphere functions (Mayer & Salovey, 1997). That is, intelligence pertains to abilities such as the power to combine and separate concepts, to judge and to reason, and to engage in abstract thought (Mayer & Salovey, 1997). Emotions belong to the second, so-called affective sphere of mental functioning, which includes the emotions themselves, moods, evaluations, and other feeling and states, including fatigue or energy. Motivation is the third sphere of personality. It refers to biological urges or learned goal-seeking behaviour (Mayer & Salovey, 1997).

The definition of emotional intelligence should connect emotions with intelligence, if the meanings of the two terms are to be preserved, while motivation should be thought of second. Therefore, emotional intelligence can be defined as 'the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote emotional and intellectual growth' (Mayer & Salovey, 1997, p. 10). This definition combines the ideas that emotion makes thinking more intelligent and that one thinks intelligently about emotions, connecting both intelligence and emotion (Mayer & Salovey, 1997).

Mayer, Salovey, and Caruso (2000) present a comprehensive review of three distinct concepts of emotional intelligence from the literature. The first is a popular representation of current culture – a zeitgeist. The second consists of emotional intelligence as a component of, or synonymous with, personality. The third view, reflecting the perspective of Mayer, et al. (2000), is that emotional intelligence is conceptualised as a mental ability.

The above three distinct concepts imply that emotional experiences are largely and intricately related to the maintenance of social self-images and psychological aspects of self, such as values, beliefs, needs, goals, and expectations (Mayer, et al., 2000). However, emotional

intelligence does not only relate to emotional experience, but is more concerned with the relationship between emotions (feelings), thoughts, and subsequent behaviours. It may be seen as the degree to which individuals vary in their ability to perceive, understand and regulate their own emotions and those of others, as well as the ability to integrate these with their own thoughts and actions (Mayer & Salovey, 1997). The four-branch model of emotional intelligence is depicted below (Mayer & Salovey, 1997):

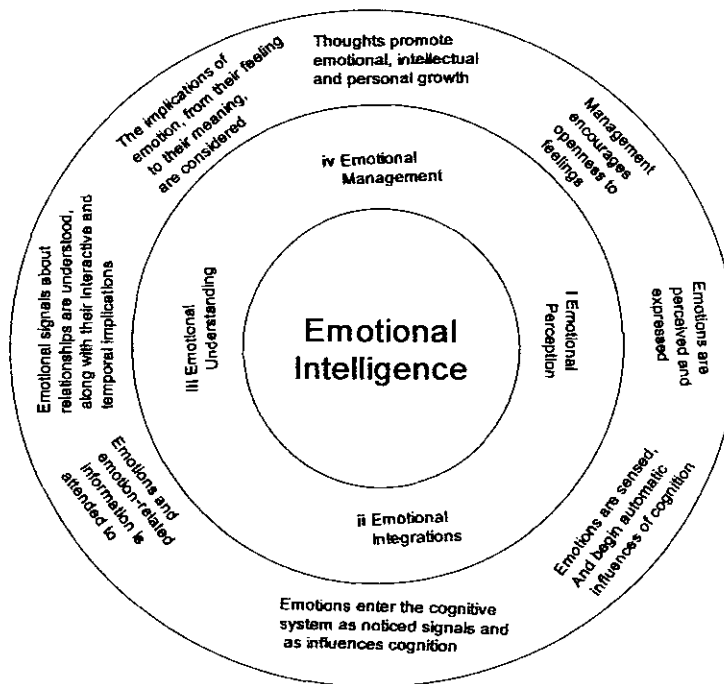


Figure 1: A circular depiction of the four-branch model of emotional intelligence (Mayer & Salovey, 1997)

- *Managing emotions* represents the ability to regulate or change emotions in oneself and in others (Mayer & Salovey, 1997). Emotionally intelligent individuals can repair unpleasant emotions and enhance pleasant emotions, when appropriate, by employing strategies that alter these emotions (Sy & Cote, 2004).
- *Understanding emotion* represents knowledge of emotional vocabulary and how emotions combine, progress, and transit from one to the other (Mayer & Salovey, 1997). According to Sy and Cote (2004), individuals who are skilled in understanding emotions have rich vocabulary regarding emotions, and understand the relationships among terms describing different emotions.

- *Using emotions* is the ability to harness emotions to guide information processing, problem solving and creativity (Mayer & Salovey, 1997). Emotions have important effects on the way people think. Pleasant emotions can make employees think more creatively, whereas unpleasant emotions can help employees focus on specific problems or issues. Emotional intelligent individuals use specific emotions to facilitate various cognitive activities (Sy & Cote, 2004).
- *Perceiving emotion* encompasses the abilities to identify emotions in oneself and in others (Sy & Cote, 2004). People identify their own emotions accurately when they, for example, know that they are angry with another person, or ashamed.

Although much has been said about emotional intelligence theories, less has been said about the measurement of emotional intelligence (Jonker, 2002; Watkin, 2000). Pfeifer (2001), and Petrides and Furnham (2003), confirm this by mentioning that the development of EI measures has not nearly kept pace with the theory and popular interest in the EI construct. The assessment of EI is still a topic of considerable interest and debate (Austin, Saklofske, Huang, & McKenney, 2004). Schutte, et al. (1998) stated that the assessment of EI has not kept pace with the interest in the construct in general.

Davies, Stankov, and Roberts (1998) examined the relationship among various measures of emotional intelligence and personality. They concluded that objective measures of emotional intelligence are unreliable and that self-report measures show considerable overlap with traditional measures of personality (Newsome, Day, & Catano, 2000). This does not necessarily mean that EI may not eventually prove to be a valid or useful psychological construct. Rather, it simply means that no scientifically acceptable instruments were available in 1992 to measure EI constructs (Pfeifer, Soldivera, & Norton, 1992). Researchers have only recently begun to identify valid EI measures (Ciarrochi et al., 2000; Ciarrochi, Deane, & Anderson, 2002; Mayer, et al., 1999; Schutte, et al., 1998). However, in 2003, Saklofske, Austin, and Minski (2003) stated that research on the psychometrics of EI was still in its early stages, leaving a number of unresolved research issues that needed to be addressed. Serious concerns still remain for EI measures, ranging from scoring concerns for ability-based EI measures to discriminant validity concerns for self-report EI measures. Conte, (2005).

According to Pfeifer (2001), there are a dozen or more self-report instruments that purport to measure EI, and a smaller number of EI measures that are not in a self-report format. The following presentation serves to introduce different instruments (based on ability and trait emotional intelligence) that purport to measure the elusive EI construct.

Ability emotional intelligence

Table 2 presents a summary of ability EI measures, along with basic information about their reliability, validity and factor structure provided by Pérez, Petrides, and Furnham, (2005, pp. 127-128.)

Table 2

Summary of Ability EI Measures

Measure	Authors	α	Conv. /Discr. Val.	Structure
EARS. Emotional Accuracy Research Scale	Mayer and Geher (1996)	Low (0,24 for target scoring and 0,53 for consensus scoring)	Small and unstable correlations with self-report empathy	Unclear (4 factors?)
EISC. Emotional Intelligence Scale for Children	Sullivan (1999)	Low to moderate	?	?
MEIS. Multifactor Emotional Intelligence Scale	Mayer, Caruso & Salovey (1999)	Good for global ability EI (0,70-0,80), but low (0,3-0,66) for branches 3 and 4 (better for consensus than for expert scoring)	Small to moderate correlation with crystallised intelligence (Gc) Low correlations with the Big Five.	Unclear factors?) (3)
MSCEIT. Mayer-Salovey-Caruso Emotional Intelligence Test	Mayer, Salovey and Caruso (1997, 2002)	Better for Version 2 than Version 1 (0,68-0,71)	Convergence between general consensus and expert consensus scoring. Very low correlations (< 0,30) with trait EI measures	Unclear factors?) (4)
FNEIPT. Freudenthaler & Neubauer Emotional Intelligence Performance Test	Freudenthaler and Neubauer (2003)	Moderate: 0,69 for 'managing own emotions' and 0,64 for 'managing others' emotions'	'Managing own emotions' correlated with self-reported intrapersonal EI (0,51) and 'managing others' emotions' correlated with self-report interpersonal EI (0,25). Both subscales correlated with the Big Five (0,18 to -0,51)	Unclear factors?) (2)

Note. Information in this table is necessarily succinct and readers are encouraged to consult the original sources for specific details. Entries designated ‘unclear’ do not necessarily indicate conflicting evidence, as they may also refer to lack of adequate data. Question marks indicate that Pérez, et al. (2005) have been unable to obtain data from the relevant entry. α = Reliability estimate Cronbach’s α , Conv./ Discr. Val. = Convergent/ discriminant validity, Structure = Factor structure. Adapted from Pérez, et al. (2005, pp. 127-128).

Trait emotional intelligence

Pérez, et al. (2005) stated that only a few trait EI measures have been developed within a clear theoretical framework, and even fewer have a sturdy empirical foundation. The fact that most self-report questionnaires purport to measure EI as a cognitive ability is indicative of the confusion in the field (Pérez, et al., 2005).

Table 3 presents a summary of trait EI along with basic information concerning reliability, validity and factor structure provided by Pérez, et al. (2005, pp. 130-133). The entries have been organised by year of publication and principal authors.

Table 3

Summary of Trait EI Measures

Measure	Authors	α	Conv./Discr. Val.	Structure
TMMS. Trait Meta Mood Scale	Salovey, Mayer, Goldman, Turvey and Palfai (1995)	0,70-0,85	Moderate correlations with the Big Five	3 factors, but no global score
EQ-I. Emotional Quotient Inventory	Bar-On (1997)	Generally good (about 0,85)	Moderate to high correlations with the Big Five	Unclear
ECI. Emotional Competence Inventory	Boyatzis, Goleman, and Hay/McBer (1999)	0,70-0,85 for global score > 0,85 for social skills	Unclear (small samples); uncorrelated with critical thinking and analytical reasoning	Unclear (4 factors?)
EI-IPIP. Emotional Intelligence-based IPIP Scales	Barchard (2001)	0,70-0,85	?	?
EISRS. Emotional Intelligence Self-Regulation Scale	Martinez-Pons (2000)	0,75-0,94	Unclear	Unclear (1 factor?)
DHEIQ. Dulewicz & Higgs Emotional Intelligence Questionnaire	Dulewicz and Higgs (2001)	Low to moderate (0,54- 0,71)	Unclear	Unclear
TEIQue. Trait Emotional Intelligence Questionnaire	For example, Petrides, Pérez and Furnham (2003)	Generally good (about 0,85)	The TEIQue can be isolated in Giant Three and Five-Factor space (Petrides, 2001)	4 factors, global score
SPTB. Sjöberg Personality Test Battery (EI Scale)	Sjöberg (2001)	0,70-0,85	Moderate correlations with extraversion (0,37) and Neuroticism (-0,50)	?
TEII. Tapia Emotional Intelligence Inventory	Tapia (2001)	0,70-0,85	?	4 factors, global scale
SUETT. Swinburne University Emotional Intelligence Test	Palmer and Stough (2002)	Generally good (about 0,85)	Moderate correlations with neuroticism (-0,41), Extra-version (0,44), openness (0,27)	?
WEIP-3. Workgroup Emotional Intelligence Profile (Version 3)	Jordan, Ashkanasy, Hartel & Hooper (2002)	0,70-0,85	Small to moderate correlations with TMMS	Unclear (7 factors?)
WLEIS. Wong & Law. Emotional Intelligence Scales	Wong & Law (2002)	0,70-0,85	Small negative correlations with IQ	4 factors, global score
LEIQ. Lioussine Emotional Intelligence Questionnaire	Lioussine (2003)	0,70-0,85	Moderate correlations with the Big Five	Unclear (7 factors?)
EIS. Schutte Emotional Intelligence Scales	Schutte et al. (1998)	0,70 – 0,85	Medium to high correlations with the Big Five	Unclear (3 or 4 factors?) global score

Note. Information in this table is necessarily succinct and readers are encouraged to consult the original sources for specific details. Entries designated 'unclear' do not necessarily indicate conflicting evidence, as they may also refer to lack of adequate data. Question marks indicate that Pérez, et al. (2005) have been unable to obtain data from the relevant entry. α = Reliability estimate Cronbach's α , Conv./ Discr. Val. = Convergent/ discriminant validity, Structure = Factor structure. (Adapted from Pérez, et al., 2005, pp. 130–133).

It is evident from tables 2 and 3 that a number of researchers (Bar-On, 1997; Goleman, 1995; Salovey & Mayer, 1990) have attempted to develop self-report measures of EI or EI-related constructs (Ciarrochi, et al., 2002). However, in recent studies, Davies, et al. (1998)

uncovered problems with these measures. First, some of them have poor reliabilities. Second, the more reliable self-report measures have salient loadings on the well-established personality factors of Neuroticism, Extraversion, Psychoticism, Agreeableness, and Openness. Third, although there is factor-analytic evidence supporting the discriminant validity of the two EI factors (emotional awareness and clarity), these factors no longer emerge when unreliable measures are omitted from factor analysis.

In an attempt to address some of these measurement problems and operationalise the emotional intelligence construct, Schutte, et al. (1998) based their writing of items for a self-report scale on Salovey and Mayer's (1990) original definition on the grounds that it lends itself to conceptualising the various facets of an individual's current level of emotional development. The scale is based on a self-report in which a person has to agree or disagree with questions such as '*I often know how I feel*', and others based on the domains of emotional intelligence elaborated in an early ability version of the concept (Salovey & Mayer, 1990).

The *Emotional Intelligence Scale* (Schutte, et al., 1998) assesses perception, understanding, expression, regulation and the harnessing of emotions in the self and others. The brevity of the scale and its accumulating reliability and validity evidence make this scale a reasonable choice for those who are seeking a brief self-report measure of global emotional intelligence. The model of Emotional Intelligence of Salovey and Mayer (1990) provides the conceptual foundation of the items used in this scale. A factor analysis of a larger pool of items suggested a one-factor solution of 33 items. The 33-item scale showed good internal reliability with two different samples. The measure also showed evidence of predictive validity, where college students' Emotional Intelligence scores predicted their end-of-the-year grade average. Potential uses of this scale involve exploring the nature of Emotional Intelligence, the determinants of Emotional Intelligence, the effects of Emotional Intelligence and whether or not it can be enhanced (Schutte, et al., 1998).

The scale has a single factor with 33 items that assesses the appraisal and expression of emotions in self and others, regulation of emotion in self and others, and utilisation of emotions in solving problems (Bar-On & Parker, 2000). The test validity was compromised, however, because the test used the self-report approach, which assesses a person's self-

perceptions rather than his/her actual abilities. The scale was also found to be highly correlated with scales known to assess positive mood – an essentially universal characteristic of self report emotional intelligence scales (Bar-On & Parker, 2000).

In a study conducted by Van der Merwe (2005b) on a sample of nurses, a five-factor solution was found, explaining 50,04% of the total variance. The five factors were labelled *Positive State* ($\alpha = 0,85$), *Own Emotions* ($\alpha = 0,80$), *Negative Emotions* ($\alpha = 0,58$), *Emotions of Others* ($\alpha = 0,73$) and *Emotional Management* ($\alpha = 0,78$). In another study conducted in South Africa on a sample of university students, Vosloo (2005) found a six-factor solution explaining 45,25% of the total variance. The six factors were labelled *Positive Affect* ($\alpha = 0,73$), *Emotion-Others* ($\alpha = 0,67$), *Happy Emotions* ($\alpha = 0,63$), *Emotions-Own* ($\alpha = 0,63$), *Non-Verbal Emotions* ($\alpha = 0,56$), and *Emotion Management* ($\alpha = 0,54$). Item 33 did not load on any of the factors.

Similar to previous studies conducted on the relationship between emotional intelligence and academic performance (Cantor & Harlow, 1994; Cantor & Kihlstrom, 1987; Lohman, 1993), the study by Van der Merwe (2005a) failed to establish support for emotional intelligence within the framework of cognitive abilities. Consistent with these findings, Schutte, et al. (1998) found no meaningful relationship between emotional intelligence and cognitive intelligence. Van der Zee, Thijs, and Schakel (2002) also found no significant relationships.

O'Connor and Little (2003) focus on the difference between self-report and ability-based measures of EI. In recent years, a debate has emerged in the EI literature regarding whether or not self-report measures, such as the Bar-On EQ-i (Bar-On, 1997) and the Schutte Emotional Intelligence Scale (Schutte, et al., 1998), provide an accurate assessment of one's emotional intelligence. Some authors (e.g. Mayer, et al., 1999; Mayer & Salovey, 1997; Mayer, et al., 2000) have argued that EI can be more accurately conceptualised as an ability rather than a conglomeration of traits and characteristics.

In terms of South African studies, no evidence of the validity, reliability and established norms of the EIS for future employees or different occupational groups was found. A lack of research on emotional intelligence in different occupational settings necessitates the current study. In a culturally diverse setting such as South Africa, the understanding of differences in

the experience of emotional intelligence in various groups will contribute to effective measurement and the much needed implementation of emotional intelligence development programmes in this country. The current study focuses on the investigation of the psychometric properties of the EIS for employees working in the mining industry in South Africa.

Method

Research design

A cross-sectional design, with a survey as the data collection technique, was used to attain the research objectives. Cross-sectional designs are used to examine groups of subjects in various stages of development simultaneously, while a survey is a data-collection technique in which questionnaires are used to gather data about an identified population (Burns & Grove, 1993). Information gleaned is used to describe the population at a particular point in time.

Participants

The participants could be defined as an availability sample of employees working in different sectors in the mining industry. A total population of 1 400 employees were targeted in different mining organisations (i.e. Platinum, Gold, Phosphate and Copper). Only responses from organisations in the gold and the phosphate industry were obtained. A response rate of 24% was achieved, of which 324 responses (96%) could be utilised.

Descriptive information of the sample is provided in Table 4.

Table 4

Characteristics of the Participants

Item	Category	Frequency (Percentage)
Age	20-29 years	41 (12,60%)
	30-39 years	131 (40,30%)
	40-49 years	105 (32,30%)
	50-59 years	43 (13,00%)
	Older than 60 years	1 (0,30%)
Gender	Male	258 (79,10%)
	Female	65 (19,90%)
Race	White	185 (56,70%)
	African	132 (40,50%)
	Other	6 (1,80%)
Home language	Afrikaans	151 (46,30%)
	English	41 (12,60%)
	African languages	131 (40,20%)
Marital status	Single	35 (10,70%)
	Engaged/in a relationship	18 (5,50%)
	Married	245 (75,20%)
	Divorced	17 (5,20%)
	Separated	3 (0,90%)
	Remarried	5 (1,50%)
Education	Grade 10	25 (7,70%)
	Grade 11	28 (8,60%)
	Grade 12	145 (44,50%)
	Grade 12 + Diploma	57 (17,80%)
	Grade 12 + Higher Diploma or Degree	41 (12,60%)
	Grade 12 + Higher Diploma or Degree (Honours)	17 (5,20%)

Table 4 (continue)

Characteristics of the Participants

Item	Category	Frequency (Percentage)
	Grade 12 + Higher Diploma or Degree (Master's)	7 (2,10%)
Industry	Gold	251 (77,00%)
	Phosphate	71 (21,7%)
Current position	Human Resources	44 (11,2%)
	Production	107 (32,40%)
	Logistics and Services	74 (22,20%)
	Protection services	3 (0,90%)
	Plant	15 (4,50%)
	Engineering	9 (2,40%)
	Survey	6 (1,80%)
	Contractor	4 (1,20%)
Years employed in current position	One to ten years	106 (32,10%)
	Eleven to twenty years	116 (34,90%)
	Twenty-one years or more	78 (23,40%)
Current Patterson grading	B-band	25 (7,50%)
	C-lower	56 (16,90%)
	C-upper	100 (30,40%)
	D-lower	42 (12,70%)
	D-upper	20 (8,40%)
	E-band	5 (1,50%)

The sample consisted mainly of Afrikaans-speaking (46,30%) men (79,10%) in their thirties (40,30%), having obtained the mean qualification of Grade 12 (44,50%), and working in the Gold industry (77,00%). The average number of years employed in the organisation was between eleven and twenty years (34,90%). The participants were mainly employed in production (32,40%), and logistics and services (22,20%), in C-upper grading positions (30,40%).

Measuring battery

Two questionnaires were administered in this study, namely a biographical questionnaire and the Schutte Emotional Intelligence Scale (EIS; Schutte, et al., 1998).

A *biographical questionnaire* was developed to gather information about the demographical characteristics of the participants. Information gathered included age, gender, race, home language, education, marital status and years employed in the current position.

The *Schutte Emotional Intelligence Scale* (EIS; Schutte, et al., 1998) was developed within the trait EI framework that measures a homogeneous construct of emotional intelligence. The high reliability coefficient for the total EI score ($\alpha = 0,90$) suggests that perhaps the test measures something coherent and internally consistent (Petrides & Furnham, 2000). Upon developing the EIS, Schutte, et al. (1998) used a set of 62 items derived from the EI model of Salovey and Mayer (1990) and extracted a four-factor solution from them (Saklofske, et al., 2003). The questionnaire comprises 33 items, of which three items (5, 28 and 33) are reverse-scored (Petrides & Furnham, 2000). In South African results, Cronbach alpha coefficients ranging from 0,54 to 0,85 were obtained (Van der Merwe 2005b; Vosloo, 2005).

Statistical analysis

The statistical analysis was conducted with the aid of the SPSS-program (SPSS Inc., 2003). Descriptive statistics (c.g. means, standard deviations, skewness and kurtosis) were used to analyse the data. Cronbach alpha coefficients were used to assess the internal consistency, homogeneity and unidimensionality of the measuring instruments (Clark & Watson, 1995). Coefficient alpha contains important information regarding the proportion of variance of the items of a scale in terms of the total variance explained by the particular scale.

Construct equivalence of the instrument was also performed. According to Van de Vijver and Leung (1997), construct equivalence can be investigated with several techniques, such as factor analysis, cluster analysis, and multidimensional scaling or other dimensionality reducing techniques. The basic idea behind the application of these techniques is to obtain a

structure in each culture – which can then be compared across all cultures involved. The most frequently employed technique for studying construct equivalence is factor analysis.

Exploratory factor analysis was used to examine construct equivalence. A principal components analysis was conducted to determine the number of factors of the EIS in the total sample. In order to determine the solution for each racial group, a direct oblimin rotation was used. Factors obtained in each group were compared (after target rotation). The agreement was evaluated by a factor congruence coefficient, Tucker's phi (Van de Vijver & Leung, 1997). Values above 0,90 pointed to essential agreement between cultural groups, while values above 0,95 pointed to very good agreement. A high agreement implies that the factor loadings of the lower and higher level are equal up to a multiplying constant. The latter was needed to accommodate possible differences in eigen values of factors for the different racial groups.

One-way analysis of variance (ANOVA) was used to determine the significance of differences between the emotional intelligence of demographic groups. ANOVA tests whether or not mean differences among groups on a combination of dependent variables are likely to have occurred by chance (Tabachnick & Fidell, 2001). In addition, Tukey tests were performed to indicate which group differed significantly when ANOVAs were conducted.

RESULTS

A simple principle components analysis was performed on the 33 items of the EIS on the total sample of mining industry employees. Analysis of the eigen values (larger than 1) and scree plot indicated that two factors could be extracted, explaining 35,82% of the total variance. Next, principal axis factoring analysis with direct oblimin rotation was used in performing a factor analysis for each racial group (Racial group 1 consisted of White respondents and racial group 2 consisted of Black, Coloured and Asian respondents). The pattern matrices for the two racial groups are reported in table 5.

Table 5

Pattern matrix of the 33-item EIS for the White racial group and the African racial group

WHITE RACIAL GROUP			AFRICAN RACIAL GROUP		
Item	Factor 1	Factor 2	Item	Factor 1	Factor 2
EQ1	0,00	0,49	EQ1	0,17	-0,03
EQ2	-0,03	0,57	EQ2	0,43	0,20
EQ3	0,25	0,45	EQ3	0,54	0,22
EQ4	0,36	0,18	EQ4	0,46	0,00
EQ5	0,30	-0,36	EQ5	-0,01	0,47
EQ6	0,05	0,58	EQ6	0,61	-0,07
EQ7	0,01	0,39	EQ7	0,49	-0,30
EQ8	0,16	0,43	EQ8	0,38	-0,16
EQ9	0,25	0,42	EQ9	0,60	-0,09
EQ10	0,28	0,43	EQ10	0,52	0,02
EQ11	0,03	0,32	EQ11	0,43	-0,09
EQ12	0,29	0,44	EQ12	0,68	-0,08
EQ13	0,24	0,25	EQ13	0,55	-0,12
EQ14	0,04	0,56	EQ14	0,73	0,05
EQ15	0,54	-0,05	EQ15	0,52	-0,03
EQ16	0,53	0,18	EQ16	0,68	0,22
EQ17	0,36	0,31	EQ17	0,66	0,10
EQ18	0,56	0,12	EQ18	0,56	-0,10
EQ19	0,63	-0,00	EQ19	0,54	-0,14
EQ20	0,36	0,20	EQ20	0,71	0,08
EQ21	0,58	0,07	EQ21	0,58	0,10
EQ22	0,67	0,09	EQ22	0,71	-0,11
EQ23	0,50	0,34	EQ23	0,72	0,19
EQ24	0,39	0,16	EQ24	0,73	0,26
EQ25	0,82	-0,25	EQ25	0,45	0,02
EQ26	0,55	0,15	EQ26	0,60	0,05
EQ27	0,43	0,22	EQ27	0,67	-0,07
EQ28	0,02	0,20	EQ28	0,25	0,68
EQ29	0,50	-0,08	EQ29	0,21	-0,33
EQ30	0,54	0,14	EQ30	0,63	0,01
EQ31	0,42	0,24	EQ31	0,70	0,00
EQ32	0,53	0,06	EQ32	0,49	-0,13
EQ33	0,21	-0,06	EQ33	-0,08	0,43

The pattern matrices of the two-factor solutions for the White racial group (group 1) and the African racial group (group 2) were then used as input for an exploratory factor analysis with target rotations. The two-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,94; b) Factor 2 = 0,05). Although the Tucker's phi coefficient for

Factor 1 compared favourably with the guideline of 0,90, it is clear that Factor 2 showed unacceptably low equivalence for the two racial groups.

Inspection of Table 5 revealed that several items were complex and problematic. A one-factor solution was therefore tested.

Table 6

Pattern matrix of the 33-item EIS for the White racial group and the African racial group

WHITE RACIAL GROUP		AFRICAN RACIAL GROUP	
Item	Factor 1	Item	Factor 1
EQ1	0,36	EQ1	0,18
EQ2	0,39	EQ2	0,42
EQ3	0,57	EQ3	0,52
EQ4	0,48	EQ4	0,47
EQ5	0,01	EQ5	-0,05
EQ6	0,47	EQ6	0,62
EQ7	0,31	EQ7	0,52
EQ8	0,47	EQ8	0,39
EQ9	0,54	EQ9	0,61
EQ10	0,58	EQ10	0,52
EQ11	0,27	EQ11	0,44
EQ12	0,59	EQ12	0,69
EQ13	0,41	EQ13	0,57
EQ14	0,45	EQ14	0,74
EQ15	0,46	EQ15	0,53
EQ16	0,63	EQ16	0,67
EQ17	0,56	EQ17	0,66
EQ18	0,60	EQ18	0,57
EQ19	0,57	EQ19	0,55
EQ20	0,48	EQ20	0,71
EQ21	0,59	EQ21	0,59
EQ22	0,68	EQ22	0,72
EQ23	0,72	EQ23	0,71
EQ24	0,49	EQ24	0,71
EQ25	0,55	EQ25	0,46
EQ26	0,62	EQ26	0,60
EQ27	0,57	EQ27	0,68
EQ28	0,17	EQ28	0,20
EQ29	0,40	EQ29	0,24
EQ30	0,61	EQ30	0,64
EQ31	0,57	EQ31	0,70
EQ32	0,53	EQ32	0,50
EQ33_	0,15	EQ33	-0,12

The pattern matrices of the one-factor solutions for the two racial groups were then used as input for an exploratory factor analysis with target rotations. The one-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,98. The Tucker's phi coefficient for the one-factor solution showed an acceptable equivalence for the two racial groups. The factor was labelled Emotional Intelligence.

The descriptive statistics and alpha coefficient of one factor of the EIS are provided in table 7.

Table 7

Descriptive Statistics and Alpha Coefficients of the EIS

Item	Mean	SD	Skewness	Kurtosis	α
Emotional Intelligence	145,45	20,43	-1,06	3,46	0,90

Table 7 shows that an acceptable Cronbach alpha coefficient of 0,90 was obtained, which compares reasonably well with the guideline of 0,70 (0,55 in basic research), demonstrating that a large portion of the variance is explained by the dimensions (internal consistency of the dimensions) (Nunnally & Bernstein, 1994). However, the data was skew, with high kurtosis, and not normally distributed.

ANOVA analysis was conducted to determine the relationship between emotional intelligence and various demographic aspects such as gender, racial groups, language groups, and age groups. The results of these comparisons are reported in Table 8.

Table 8

ANOVAs - Differences in emotional intelligence levels of different groups

Variable	Value	<i>F</i>	<i>Df</i>	<i>p</i>	<i>Partial Eta Squared</i>
Gender	1198,67	2,87	1	0,09	0,01
Racial groups	65,02	0,16	1	0,70	0,00
Language groups	3405,72	0,81	10	0,81	0,03
Age groups	1086,90	0,87	3	0,50	0,01

Table 8 shows that there are no significant differences between different demographic aspects and the level of emotional intelligence.

DISCUSSION

The general objective of this research was to determine the psychometric properties of an Emotional Intelligence scale for employees in the mining industry in South Africa. First, exploratory factor analysis was performed on the EIS per racial group (Racial group 1 consisted of White employees and racial group 2 consisted of Black, Coloured and Asian employees).

After a simple factor analysis had been performed on the EIS, a two-factor structure was identified. The pattern matrices of the two-factor solutions for the White racial group (group 1) and the African racial group (group 2) were then used as input for an exploratory factor analysis with target rotations. The two-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,94; b) Factor 2 = 0,05). Although the Tucker's phi coefficient for Factor 1 compared favourably with the guideline of 0,90, it is clear that Factor 2 showed unacceptably low equivalence for the two racial groups. A one-factor solution was therefore tested.

The pattern matrices of the one-factor solutions for the two racial groups were then used as input for an exploratory factor analysis with target rotations. The one-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,98. The Tucker's phi coefficient for the one-factor solution showed an acceptable equivalence for the two racial groups. The one factor was labelled Emotional Intelligence.

This finding is at variance with that of Petrides and Furnham (2000), who identified a four-dimensional factor structure of the EIS, namely Optimism/Mood Regulation, Appraisal of Emotions, Social Skills and Utilisation of Emotions. Saklofske, et al. (2003) also found a replication of the four-factor structure obtained by Petrides and Furnham (2000). In a South African sample among university students, Vosloo (2005) obtained a six-dimensional factor

structure of the EIS explaining 45,24% of the variance. The six factors were labelled Positive Affect, Emotion-Others, Happy Emotions, Emotions-Own, Non-verbal Emotions and Emotional Management.

An acceptable Cronbach alpha coefficient of 0,90 was obtained, which compares reasonably well with the guideline of 0,70 (0,55 in basic research), demonstrating that a large portion of the variance is explained by the dimension (internal consistency of the dimension) (Nunnally & Bernstein, 1994). However, the data was skew with high kurtosis, and not normally distributed. Analysis of the leaf and stem graph indicated that the data was skew for both racial groups.

One-way analysis of variance (ANOVA) was used to determine the significance of differences between the Emotional Intelligence of demographic groups. ANOVA tests whether or not mean differences among groups on a combination of dependent variables are likely to have occurred by chance (Tabachnick & Fidell, 2001). Tukey tests were performed to indicate which group differed significantly when ANOVAs were conducted. The results indicated that there are no significant differences between different demographics aspects and the level of Emotional Intelligence.

RECOMMENDATIONS

Emotional Intelligence promotes the well-being of individuals (Goleman, 1996), and therefore it would be beneficial to organisations to have a valid and reliable measure of Emotional Intelligence in order to determine specific Emotional Intelligence needs of the individual that can be addressed by the implementation of Emotional Intelligence development programmes. A standardised psychometric measurement instrument for Emotional Intelligence could also be beneficial to organisations during their selection, recruitment, training and development programmes. This would be especially beneficial in the case of managerial positions and positions that are laden with teamwork, as is the case in the mining industry.

Pengilly (2002) argues that EI is vital to the success of personnel in general, but more specifically the success of management; it is of paramount importance to have the EI ability to manage and lead people as opposed to the pre-conceived notions that past experience is the

key to success in a position. Potential management candidates need to understand the importance and potential of EI, which is strongly related to leadership skills, group performance, individual performance, interpersonal or social exchange and managing change (Pengilly, 2002). Cooper (1997) contributes to this notion by saying that EI is a hidden advantage in organisations. Jonker (2002) indicates that EI could enhance organisational commitment, foster organisational citizenship, could be a moderator of role conflict and might even moderate the impact of job control. It is thus evident that a standardised psychometric instrument of EI could be of great value in the organisation to determine EI shortcomings and to develop these EI shortcomings in order to benefit the employee and the organisation in general.

Arumugam (2003) states that, in essence, EI is the glue of organisational life, revealing itself from the time that a potential employee is recruited to the time of exit. In the recruitment process, EI is a critical entry gate. The attraction of potential employees who are emotionally stable and competent in interpersonal relations is crucial to business performance (Arumugam, 2003).

Personal and group engagement and productivity can be enhanced by means of more emotionally intelligent employees. People do not choose their emotions and have little control over the emotions they experience because connections from the emotional system to the cognitive system are stronger than connections from the cognitive system to the emotional system (Le Doux, 1996). Once the cognitive system recognises these emotions, it guards against distracting emotions and builds on enhancing emotions; this facilitates task and group performance (Thi Lam & Kirby, 2002).

Emotional Intelligence is a meta-ability, which co-determines the extent to which a person can utilise his/her potential ability, including intellect. The emotionally intelligent individual perceives his/her own emotions accurately and makes use of integrated, sophisticated approaches for the regulation of his/her emotions in order to achieve important goals (Thi Lam & Kirby, 2002).

Organisations focusing on work/family balance programmes can utilise Emotional Intelligence measurements, since Emotional Intelligence leads to a better ability to balance work and family matters (Sjöberg, 2001). Characteristics such as honesty, energy, trust,

integrity, empathy and commitment, amongst others, are demonstrated by means of Emotional Intelligence. Emotions inspire and enliven good judgement and reasoning, in most cases, and are linked to success (Kapp, 2000). The conclusion can be drawn that literature suggests a relationship between Emotional Intelligence and overall success (well-being and work performance).

This study had several limitations. First, self-report measures were exclusively relied upon. Future studies conducted in this manner would confirm whether or not bias and equivalence do indeed exist for the different racial groups. Another limitation was the size of the sample, specifically the distribution of racial groups and the sampling procedure in the present study, which had significant limitations in terms of the generalisation of the findings applied to the total study population. Future studies could benefit greatly in terms of a stratified random-sample design, which would ensure sufficient representation of the different groups in the total population of students in higher education.

It is suggested that future research should focus on the reliability and validity of the EIS for other occupational settings, as the EIS was found to be reliable and valid for this sample specifically. It is also important to determine norm levels for other occupations in South Africa. Moreover, it is recommended that larger samples with a more powerful sampling method be utilised to enable generalisation of the findings to other similar groups. Furthermore, the use of adequate statistical methods, such as structural equation modelling, equivalence and bias analysis, is recommended. It might also be necessary to translate the EIS into other languages spoken in South Africa.

References

- Anon. (2000). Underground miners, oil and gas drillers and related workers (NOC 823). In Anon. (2000). *Work Futures 2000 Edition*. British Columbia, Canada: Queens Printers.
- Anon. (2004). As prospects for the yellow metal glister, South Africa output slump rouses concern. *Mining Weekly Online*, February
- Anon. (2005). *Talent management. Human Capital Management: Integrating Human Resources with business strategy* (4th ed). South Africa: Shorten Publications.
- Arumugam, S. (2003). EQ:the new business leader's edge. *Management Today*, 22-23.
- Austin, E. J., Saklofske, D. H., Huang, S. H. S., & McKenny, D. (2004). Measurement of trait emotional intelligence: Testing and cross-validating a modified version of Schutte et al.'s (1998) measure. *Personality and Individual Differences*, 36, 555-562.
- Bagshaw, M. (2000). Emotional intelligence: training people to be affective so that they can be effective. *Industrial and Commercial Training*, 2, 61-65.
- Bar-On, R. (1997). *Bar-On Emotional Quotient Inventory*. Toronto: Multi-Health Systems Books.
- Bar-On, R., & Parker, D. A. (2000). *The handbook of emotional intelligence theory, development, assessment, and application at home, school, and in the workplace* (1st ed.). San Francisco, CA: Jossey-Bass.
- Burns, N., & Grove, S. K. (1993). *The practice of nursing research, conduct, critique and utilization* (2nd ed.). Philadelphia: W.B. Saunders.
- Calitz, P. L. (2004). *Experiences of women in the platinum mining industry*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Cantor, N., & Harlow, R. (1994). Social intelligence and personality: Flexible life-task pursuit. In R. J. Sternberg, & P. Ruzgis (Eds.), *Personality and Intelligence*. Cambridge University Press.
- Cantor, N., & Kihlstrom, J. F. (1987). *Personality and social intelligence*. Englewood Cliffs, NJ: Prentice Hall.
- Carmeli, A. (2003). The relationship between emotional intelligence and work attitudes, behavior and outcomes: An examination among senior managers. *Journal of Managerial Psychology*, 18, 788-813.
- Ciarrochi, J. V., Chan, A. Y. C., & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality and Individual Differences*, 28, 539-561.

- Ciarrochi, J., Deane, F. P., & Anderson, S. (2002). Emotional intelligence moderates the relationship between stress and mental health. *Personality and Individual Differences*, 32, 197-209.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7, 309-319.
- Conte, J. M. (2005). A review and critique of emotional intelligence measures. *Journal of Organizational Behavior*, 26, 433-440.
- Cooper, R. K. (1997). Applying emotional intelligence in the workplace. *Training and Development*, 51, 31-38.
- Davies, M., Stankov, L., & Roberts, R. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology*, 75, 989-1015.
- Dulewicz, V., & Higgs, M. (2000). Emotional intelligence: A review and evaluation study. *Journal of Managerial Psychology*, 15, 341-372.
- Eysenck, H. J. (1958). *Sense and nonsense in psychology*. Middlesex: Penguin.
- Fedderke, J., & Pirouz, F. (2002). The role of mining in the South African economy. *South African Journal of Economic and Management Sciences*, 5, 1-34.
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Goleman, D. (1995). *Emotional Intelligence: why it can matter more than IQ*. New York: Bantam.
- Goleman, D. (1996). Emotional intelligence. *Learning*, 24(6), 49-51.
- Goleman, D. (1998). *Working with emotional intelligence*. New York: Bantam.
- Grobler, P. A., Wörnich, S., Carell, M. R., Elbert, N. F., & Hatfield, R. D. (2002). *Human resource management in South Africa* (2nd ed.). Canada: Thomson Learning.
- Jonker, C. S. (2002). *The compilation and evaluation of a development programme aimed at emotional intelligence*. Unpublished Doctoral Thesis, Potchefstroom University for Christian Higher Education, Potchefstroom.
- Kapp, C. A. (2000). Emotional intelligence and success in post-graduate studies: A pilot study. *South African Journal of Higher Education*, 14, 151-160.
- Le Doux, J. (1996). *The emotional brain: The mysterious underpinnings of emotional life*. New York: Touchstone.
- Lohman, D. (1993). Teaching and testing to develop fluid abilities. *Educational Researcher*, 22, 12-23.

- Mayer, J. D., Caruso, D. R., & Salovey, P. (1999). Emotional intelligence meets traditional standards for an intelligence. *Intelligence*, 27, 267-298.
- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds), *Emotional development and emotional intelligence: Educational implications* (pp. 3-32). New York: Basic Books.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). Models of emotional intelligence. In R. J. Sternberg (Ed.), *Handbook of human intelligence* (pp. 396-420). New York: Cambridge University Press.
- Newsome, S., Day, A. L., & Catano, V. M. (2000). Assessing the predictive validity of emotional intelligence. *Personality and Individual Differences*, 29, 1005-1016.
- Nikolaou, I., & Tsaousis, I. (2002). Emotional intelligence in the workplace: Exploring its effects on occupational stress and organizational commitment. *The International Journal of Organizational Analysis*, 10(4), 327-342.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- O'Connor, R. M., & Little, I. S. (2003). Revisiting the predictive validity of emotional intelligence: self report versus ability-based measures. *Personality and Individual Differences*, 35, 1893-1902.
- Pengilly, N. (2002). Executive recruitment - Only a totally professional approach will do. *Management Today*, 18(5), 38-39.
- Pérez, J. C., Petrides, K. V., & Furnham, A. (2005). Measuring trait emotional intelligence. In R. Schulze, & R. D. Roberts (Eds.), *International Handbook of Emotional Intelligence*. Cambridge, MA: Hogrefe & Huber.
- Petrides, K. V., & Furnham, A. (2000). On the dimensional structure of emotional intelligence. *Personality and Individual Differences*, 29, 313-320.
- Petrides, K. V. & Furnham, A. (2003). Trait emotional intelligence: Behavioural validation in two studies of emotion recognition and reactivity to mood induction. *European Journal of Personality*, 17, 39-57.
- Pfeifer, S. I. (2001). Emotional intelligence: Popular but elusive construct. *Roeper Review*, 23(3), 138-143.
- Pfeifer, S. I., Soldivera, S., & Norton, J. (1992). *Consumer's guide to mental health outcome measures*. Villanova, PS : Devereux Foundations.

- Pretorius, B. (1996). The future and effective leadership. *Human Resources Management*, 12-13. Relationship between stress and mental health. *Personality and Individual Differences*, 32, 197-209.
- Robbins, S. P. (1996). *Organisational theory: Structure designs and applications*. Englewood Cliffs, NJ: Prentice Hall.
- Saklofske, D. H., Austin, E. J., & Minski, P. S. (2003). Factor structure and validity of a trait emotional intelligence measure. *Personality and Individual Differences*, 34, 707-721.
- Salovey, P., & Mayer, J. (1990). Emotional Intelligence. *Imagination, Cognition and Personality*, 9(3), 185-211
- Salovey, P., Mayer, J. D., Goldman, S. L., Turvey, C., & Palfai, T. P. (1995). Emotional attention, clarity, and repair: Exploring emotional intelligence using the Trait Meta-Mood Scale. In: J. W. Pennebaker, (Ed.), *Emotion, disclosure, and health* (pp. 125-154). Washington: American Psychological Association.
- Schutte, N. S., & Malouff, J. M. (1999). *Measuring emotional intelligence and related constructs*. Lewiston, NY: Edwin Mellen Press.
- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., & Golden, C. J. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25, 167-177.
- Singer, R. (2002, May). South African women gain ground below surface. *USA Today*, 1-2
- Sjöberg, L. (2001). Emotional intelligence: A psychometric analysis. *European Psychologist*, 6, 79-95.
- South African Consulate. (1997). *Mining, Mineral and energy*. Retrieved October, 31, 2006, from the World Wide Web: www.southafrica-newyork.net/consulate/mining
- Spector, P. E. (2003). *Industrial organizational psychology: Research and practice* (3rd ed.). Hoboken, NJ: John Wiley and Sons.
- SSPS Inc. (2003). *SPSS12.0 for Windows*. Chicago, IL: Author.
- Steiner, C. (1997). *Achieving emotional literacy*. London: Bloomsbury.
- Sy, T., & Cote, S. (2004). Emotional intelligence: A key ability to succeed in the matrix organisation. *Journal of Management Development*, 22(5), 437-455.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Boston, MA: Allyn & Bacon.
- Thi Lam, L., & Kirby, S. L. (2002). Is emotional intelligence an advantage? An exploration of the impact of emotional and general intelligence on individual performance. *The Journal of Social Psychology*, 142(1), 133-143.

- U.S Bureau of Labour Statistics. (2004). *Mining*. Retrieved October 31, 2006, from the World Wide Web: www.bls.gov
- Van de Vijver, F., & Leung, K. (1997). *Methods and data analysis for cross-cultural research*. Thousand Oaks, CA: SAGE.
- Van der Merwe, N. (2005a). *Emotional intelligence, job characteristics and wellness a nursing environment*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Van der Merwe, S. (2005b). *The Psychometric properties of an emotional intelligence measure within a nursing environment*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Van der Zee, K., Thijs, M., & Schakel, L. (2002). The relationship of emotional intelligence with academic intelligence and the big five. *European Journal of Personality*, 16, 103-125.
- Vosloo, C. (2005). *The psychometric properties of a measure of emotional intelligence*. Unpublished masters dissertation, North-West University, Potchefstroom Campus, Potchefstroom.
- Watkin, C. (2000). Developing emotional intelligence. *International Journal of Selection and Assessment*, 8, 89-92.
- Weisinger, H. (1998). *Emotional intelligence at work: The untapped edge for success*. San Francisco, CA: Jossey-Bass.
- Wolmarans, S. (1998). Goodbye Taylor, hello emotions! *Management Today*, 14(2), 26-29.

CHAPTER 3

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

This chapter comprises conclusions regarding the literature review and the empirical study according to the specific objectives. The limitations of the research are discussed, followed by recommendations for the research problem in organisations, and lastly, suggestions are made for future research.

3.1 CONCLUSIONS

The general objective of this research was to determine the psychometric properties of the Schutte Emotional Intelligence Scale for the measurement of Emotional Intelligence in a sample of employees working in the mining industry.

The *first specific objective* was to conceptualise Emotional Intelligence from the literature. Emotional Intelligence can be conceptualised according to two different models, i.e. the trait model (or emotional self-efficacy) and the ability model (or cognitive-emotional ability) (Petrides & Furnham, 2000; 2001). Emotional Intelligence has been defined as the ability to adaptively perceive, understand, regulate and harness emotions within the self and others (Salovey & Mayer, 1990; Schutte, Malouff, Hall, Haggerty, Cooper, & Golden, 1998). Emotional Intelligence refers to an array of non-cognitive skills, capabilities and competencies, which may have an influence on the way in which a person copes with pressures and demands within the environment (Martinez, 2000).

Emotional Intelligence can be conceptualised and measured as an ability (Ciarrochi, Chan, & Caputi, 2000; Mayer, Salovey, & Caruso 2000) or as a personality trait (Schutte & Malouff, 1999; Schutte, et al., 1998). According to Spector (2003), Emotional Intelligence is a characteristic that falls between a personality trait and a cognitive ability.

A broader differentiation is made between *trait* Emotional Intelligence and *information-processing* Emotional Intelligence. Trait Emotional Intelligence is manifested in specific traits or behaviours, which a person exhibits – such as empathy, optimism, and assertiveness (Petrides & Furnham, 2000). It is embedded in the personality framework, and is measured

by self-report inventories measuring specific behaviours (Bar-On, 1997; Salovey, Mayer, Goldman, Turvey, & Palfei, 1995). Information-processing Emotional Intelligence pertains to the ability to identify, express and label emotions (Petrides & Furnham, 2000). It is much more focussed and explicit, and can be assessed through measures of maximal performance.

Emotions are considered primary adaptive and motivating mechanisms, and are part of logical thinking and intelligence (Leeper, 1948). Furthermore, emotion has a biological-adaptive function as well as a psychological-constructive function. Emotions also play a role in social interaction, personality functioning, achieving goals, and cognitive processing (Thompson, 1994), and mediate between constantly changing situations and the individual's behavioural responses, and thus have an important adaptive function for the individual.

Mixed models of Emotional Intelligence, in comparison, define Emotional Intelligence as a mixture of emotion-related competencies, personality traits and dispositions (Palmer, & Stough, 2003).

The *second objective* was to determine the importance of a standardised psychometric instrument of Emotional Intelligence in South Africa from the literature. The *Schutte Emotional Intelligence Scale* (EIS; Schutte, et al., 1998) was developed within the trait EI framework that measures a homogeneous construct of Emotional Intelligence. The high reliability coefficient for the total EI score ($\alpha = 0,90$) suggests that perhaps the test measures something coherent and internally consistent (Petrides & Furnham, 2000). In developing the EIS, Schutte, et al. (1998) used a set of 62 items derived from the EI model of Salovey and Mayer (1990) and extracted a four-factor solution from them (Saklofske, Austin, & Minski, 2003). The questionnaire comprises 33 items, of which three items (5, 28 and 33) are reverse-scored (Petrides & Furnham, 2000). In South African results, Cronbach alpha coefficients ranging from 0,54 to 0,85 were obtained (Van der Merwe 2005, Vosloo, 2005).

The *Emotional Intelligence Scale* (Schutte et al., 1998) assesses perception, understanding, expression, regulation and the harnessing of emotions in the self and others. The brevity of the scale and its accumulating reliability and validity evidence make this scale a reasonable choice for those who are seeking a brief self-report measure of global Emotional Intelligence. The model of Emotional Intelligence of Salovey and Mayer (1990) provides the conceptual

foundation of the items used in this scale. A factor analysis of a larger pool of items suggested a one-factor solution of 33 items. The 33-item scale showed good internal reliability with two different samples. The measure also showed evidence of predictive validity, where college students' Emotional Intelligence scores predicted their end-of-the-year grade average. Potential uses of this scale involve exploring the nature of Emotional Intelligence, the determinants of Emotional Intelligence, the effects of Emotional Intelligence, and whether or not it can be enhanced (Schutte, et al., 1998).

The scale has a single factor with 33 items that assess the appraisal and expression of emotions in self and others, regulation of emotion in self and others, and utilisation of emotions in solving problems (Bar-On & Parker, 2000). The test validity was compromised, however, because the test used the self-report approach, which assesses a person's self-perceptions rather than his/her actual abilities. The scale was also found to be highly correlated with scales known to assess positive mood – an essentially universal characteristic of self report Emotional Intelligence scales (Bar-On & Parker, 2000).

In the study conducted by Van der Merwe (2000), a simple factor analysis was performed on the Emotional Intelligence Scale (SEIS), and six factors were extracted (Vosloo, 2005). These factors were labelled *Positive Affect*, *Emotions-Others*, *Happy Emotions*, *Emotions-Own*, *Non-Verbal Emotions*, and *Emotional Control*.

Similar to previous studies conducted on the relationship between Emotional Intelligence and academic performance (Cantor & Harlow, 1994; Cantor & Kihlstrom, 1987; Lohman, 1993), the study by Van der Merwe (2005a) failed to establish support for Emotional Intelligence within the framework of cognitive abilities. Consistent with these findings, Schutte, et al. (1998) found no meaningful relationship between Emotional Intelligence and cognitive intelligence. Van der Zee, Thijs, and Schakel (2002) also found no significant relationships.

The *third objective* was to determine the construct validity and internal consistency of the Emotional Intelligence Scale for a sample of employees in the mining industry. A simple principle components analysis was performed on the 33 items of the EIS on the total sample of mining industry employees. Analysis of the eigen values (larger than 1) and scree plot indicated that two factors could be extracted, explaining 35,82% of the total variance. Next,

principal axis factoring analysis with direct oblimin rotation was used in performing a factor analysis per racial group (Racial group 1 consisted of White respondents and racial group 2 consisted of Black, Coloured and Asian respondents).

The pattern matrices of the two-factor solutions for the White racial group (group 1) and the African racial group (group 2) were then used as input for an exploratory factor analysis with target rotations. The two-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,94; b) Factor 2 = 0,05). Although the Tucker's phi coefficient for Factor 1 compared favourably with the guideline of 0,90, it is clear that Factor 2 showed unacceptably low equivalence for the two racial groups. A one-factor solution was therefore tested.

The pattern matrices of the one-factor solutions for the two racial groups were then used as input for an exploratory factor analysis with target rotations. The one-factor structure was compared across groups by rotating one solution to the other. After target rotation, the following Tucker's phi coefficients were obtained: a) Factor 1 = 0,98. The Tucker's phi coefficient for the one-factor solution showed an acceptable equivalence for the two racial groups. The one factor was labelled Emotional Intelligence.

An acceptable Cronbach alpha coefficient of 0,90 was obtained, which compares reasonably well with the guideline of 0,70 (0,55 in basic research), demonstrating that a large portion of the variance is explained by the dimension (internal consistency of the dimension) (Nunnally & Bernstein, 1994). However, the data was skew, with high kurtosis, and was not normally distributed. Analysis of the leaf and stem graph indicated that the data was skew for both racial groups.

The *fourth objective* was to determine the differences in the experience of Emotional Intelligence in terms of biographical data. ANOVA analysis was conducted to determine the relationship between Emotional Intelligence and various demographic aspects such as gender, racial groups, language groups, and age groups. The results indicated that there are no significant differences between different demographic aspects and the level of Emotional Intelligence.

3.2 LIMITATIONS

The first limitation of this study was the use of a cross-sectional survey design. In order to deal with the limitation of a cross-sectional design, prospective longitudinal and quasi-experimental research designs are needed to further validate the hypothesised causal relationships within the study.

Even though there was a total population of 1 400 targeted for this study, a response rate of only 24% was achieved. Participants were reluctant to take part in the study and were very suspicious. A lot of external factors have had a negative effect on the mining industry in South Africa, which could have had an adverse effect on the participants. These external factors included strikes that were related to the working conditions and salaries of miners, and the rand-dollar exchange rate that had negative financial influences on the industry, and which could have affected the morale of the mining employees. Furthermore, mines in the North-West Province experienced serious seismic events that caused enormous damage – to such an extent that mines had to be closed down for a period of time (Le Roux, 2005). These factors could have had a negative effect on the morale of the mining employees and the response rate of the questionnaires. Gender also proved to be a limitation in that the majority of the participants were male.

The sampling procedure created problems, and future studies could benefit from using a stratified random-sample design, which would ensure sufficient representation of the different groups in the total population and enable generalisation of findings to the total study population. Data was collected from different positions and grades within the mining industry at different points in time, which means that unique organisational characteristics and/or historical events might have affected the findings. The characteristics of the sample also prevented specific findings regarding a specific position or grading.

The results were obtained solely by self-report measures. This may lead to a problem known as ‘method variance’ or ‘nuisance’. However, several authors argue that this phenomenon is not a major threat if interactions are effected (Dollard & Winefield, 1998). Another limitation was that the questionnaire booklets were given to the Human Resource Managers, who then had to give the instructions to the rest of the mining employees who participated. The participants completed the questionnaire booklets either at home or at work. Some

individuals working in the same area could have discussed the answers and this could have influenced their responses.

The questionnaire was available only in English. The possibility exists that respondents' level of English language skills (with English as a second, third or even fourth language) could have influenced the results.

3.3 RECOMMENDATIONS

The following recommendations for the organisations as well as for future research can be made:

3.3.1 Recommendations for the organisation

Emotional Intelligence promotes the well-being of individuals (Goleman, 1996), and therefore it would be beneficial to organisations to have a valid and reliable measure of Emotional Intelligence in order to determine specific Emotional Intelligence needs of the individual that can be addressed by the implementation of Emotional Intelligence development programmes. A standardised psychometric measurement instrument for Emotional Intelligence could also be beneficial to organisations during their selection, recruitment, training and development programmes. This would be especially beneficial in the case of managerial positions and positions that are laden with team work, as is the case in the mining industry.

Personal and group engagement and productivity can be enhanced by means of more emotionally intelligent employees. Emotions (such as disappointment, happiness and dissatisfaction) form an integral part of any individual's work life (Humpel, Caputi, & Martin, 2001), and this is especially true for mining industry employees who work in teams. For this reason, research is beginning to focus on understanding the causes and effects of emotions (Weiss & Cropanzano, 1996) by conducting studies within the field of Emotional Intelligence.

A number of researchers have suggested that Emotional Intelligence can have a positive impact on an individual's life. These positive outcomes include increased life satisfaction

(Austin, Saklofske, & Egan, 2005; Ciarrochi, et al., 2000; Mayer, Caruso, & Salovey, 1999; Saklofske, et al., 2003), stress tolerance (Parker, Taylor, & Bagby, 2001), empathy (Ciarrochi, et al, 2000), smoother interpersonal interactions (Mayer, Salovey & Caruso, 2000) with family members and peers (Mayer, et al., 1999; Rice, 1999; Trinidad & Johnson, 2001) as well as increased job performance (Mayer, et al., 2000a), which could be the result of a 'better prioritising of life needs and goals', as speculated by Mayer and Salovey (1997, p. 437). Organisations focusing on work/family balance programmes can utilise Emotional Intelligence measurements, since Emotional Intelligence leads to a better ability to balance work and family matters (Sjöberg, 2001).

Individuals and organisations can benefit from EI, but it is important to note that the construct will be conceptualised either as ability-based EI or trait-based EI.

3.3.2 Recommendations for future research

As far as the Emotional Intelligence Scale (Schutte, et al., 1998) is concerned, only three items are reversed scored. It is recommended that future research on the EIS should employ the adapted version of the Schutte Emotional Intelligence Scale (Austin, Saklofske, Huang, & McKenny, 2004), seeing that the adapted version has more reversed scored items.

The results of the study provide supporting evidence for the construct validity of the EIS, although further research on the development and psychometric properties of the EIS is suggested. More research is also needed with regard to the extent to which EI measures can act as predictors for work and general life outcomes.

In view of the coexistence of two conceptualisations of EI, in terms of an ability-based model and a trait-based model, future research can be conducted on the relationship between ability-based EI and trait-based EI, and how the two types can contribute to our understanding and knowledge of EI.

The validation of EI measures should also be based on larger diverse population groups. It is recommended that a stratified random sample be used instead of a convenience sample in order to attain a larger and more representative sample. This will enable the researcher to apply inferential statistical procedures to establish the significance of the results.

REFERENCES

- Austin, E. J., Saklofske, D. H., & Egan, V. (2005). Personality, well-being and health correlates of trait emotional intelligence. *Personality and Individual Differences*, 38(3), 547-558.
- Austin, E. J., Saklofske, D. H., Huang, S. H. S., & McKenny, D. (2004). Measurement of trait emotional intelligence: Testing and cross-validating a modified version of Schutte et al.'s (1998) measure. *Personality and Individual Differences*, 36, 555-562.
- Bar-On, R. (1997). *Bar-On Emotional Quotient Inventory*. Toronto: Multi-Health Systems Books.
- Bar-On, R., & Parker, D. A. (2000). *The handbook of emotional intelligence theory, development, assessment, and application at home, school, and in the workplace* (1st ed.). San Francisco, CA: Jossey-Bass.
- Cantor, N., & Harlow, R. (1994). Social intelligence and personality: Flexible life-task pursuit. In R. J. Sternberg & P. Ruzgis (Eds.), *Personality and Intelligence*. Cambridge: Cambridge University Press.
- Cantor, N., & Kihlstrom, J. F. (1987). *Personality and social intelligence*. Englewood Cliffs, NJ: Prentice Hall.
- Ciarrochi, J. V., Chan, A. Y. C., & Caputi, P. (2000). A critical evaluation of the emotional intelligence construct. *Personality and Individual Differences*, 28, 539-561
- Dollard, M. F., & Winefield, A. H. (1998). A test of the demand-control-support model of work stress in correctional officers. *Journal of Occupational Health Psychology*, 3, 243-264.
- Goleman, D. (1996). Emotional intelligence. *Learning*, 24(6), 49-51.
- Humpel, N., Caputi, P. & Martin, C. (2001). The relationship between emotions and stress among mental health nurses. *Australian and New Zealand Journal of Mental Health Nursing*, 10, 55-60.
- Leeper, R.W. (1948). A motivational theory of emotion to replace 'emotion as disorganised response'. *Psychological Review*, 55, 5-21.
- Le Roux, H. (2005, August). Scientists grapple with origins of earthquakes. *Creamer Media's Mining Weekly Online, South African Mining news*. Retrieved November 16, 2005 from the World Wide Web <http://www.miningweekly.co.za>.
- Lohman, D. (1993). Teaching and testing to develop fluid abilities. *Educational Researcher*, 22, 12-23.

- Martinez, M. (2000). Emotional intelligence as a self-regulatory process: A social cognitive view. *Imagination, Cognition, and Personality*, 19, 331-350.
- Mayer, J.D., Salovey, P., & Caruso, D.R. (2000). Models of emotional intelligence. In R. J. Sternberg (Ed.), *Handbook of human intelligence* (pp. 396-420). New York: Cambridge University Press.
- Mayer, J. D., & Salovey, P. (1997). *What is emotional intelligence?* In P. Salovey & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence* (p. 437) New York: Basic Books.
- Mayer, J. D., Caruso, D. R., & Salovey, P. (1999). Emotional intelligence meets traditional standards for an intelligence. *Intelligence*, 27, 267-298.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). Models of emotional intelligence. In R. J. Sternberg (Ed.), *Handbook of human intelligence* (pp. 396-420). New York: Cambridge University Press.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York: McGraw-Hill.
- Palmer, B. R. & Stough, C. (2002). *Swinburne University Emotional Intelligence Test (Workplace SUEIT). Interim technical manual (Version 2)*. Victoria: Swinburne University of Technology.
- Pérez, J. C., Petrides, K.V., & Furnham, A. (2005). Measuring trait emotional intelligence. In R. Schulze & R. D. Roberts (Eds.), *International Handbook of Emotional Intelligence*. Cambridge, MA: Hogrefe & Huber.
- Petrides, K. V., & Furnham, A. (2000). On the dimensional structure of emotional intelligence. *Personality and Individual Differences*, 29, 313-320.
- Petrides, K. V., & Furnham, A. (2001). Trait emotional intelligence: Psychometric investigation with reference to established trait taxonomies. *European Journal of Personality*, 15, 425-448.
- Rice, C.L. (1999). *A quantitative study of emotional intelligence and its impact on team performance*. Unpublished master's thesis, Pepperdine University, Malibu, CA.
- Salovey, P. & Mayer, J.D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, 9, 185-211.

- Salovey, P., Mayer, J. D., Goldman, S., Turvey, G., & Palfai, T. (1995). Emotional attention, clarity and repair: Exploring emotional intelligence using the Trait Meta-Mood scale. In J.W. Pennebaker (Ed.), *Emotion, disclosure and health* (pp. 125-145). Washington, DC: American Psychological Association.
- Saklofske, D. H., Austin, E. J., & Minski, P. S. (2003). Factor structure and validity of a trait emotional intelligence measure. *Personality and Individual Differences*, 34, 707-721.
- Schutte, N. S., & Malouff, J. M. (1999). *Measuring emotional intelligence and related constructs*. Lewiston, NY: Edwin Mellen Press.
- Schutte, N. S., Malouff, J. M., Hall, L. E., Haggerty, D. J., Cooper, J. T., & Golden, C. J. (1998). Development and validation of a measure of emotional intelligence. *Personality and Individual Differences*, 25, 167-177.
- Spector, P. E. (2003). *Industrial organizational psychology: Research and practice* (3rd ed.). Hoboken, NJ: John Wiley & Sons.
- Sjöberg, L. (2001). Emotional intelligence and life adjustment: A validation study. In: *SSE/EFI working paper series in business admin* (p. 13). Stockholm: Stockholm School of Economics.
- Trinidad, D. R. & Johnson, C.A. (2001). The association between emotional intelligence and early adolescent tobacco and alcohol use. *Personality and Individual differences*, 32, 95-105.
- Van der Merwe, N. (2005a). *Emotional intelligence, job characteristics and wellness a nursing environment*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Van der Merwe, S. (2005). *The Psychometric properties of an emotional intelligence measure within a nursing environment*. Unpublished masters dissertation, North-West University, Potchefstroom.
- Van der Zee, K., Schakel, L. K., & Thijs, M. (2002). The relationship of emotional intelligence with academic intelligence and the big five. *European Journal of Personality*, 16, 103-125.
- Vosloo, C. (2005). *The psychometric properties of a measure of emotional intelligence*. Unpublished masters dissertation, North-West University, Potchefstroom Campus, Potchefstroom.
- Weiss, H. M. & Cropanzano, R. (1996). Affective events theory: A theoretical discussion of the structure, causes, and consequences of affective experience at work. In: B.M. Staw &

L. L. Cummings (Eds.). *Research in Organizational Behaviour*, 18. London: JAI Press Inc.