

CHAPTER 1

SCIENTIFIC OVERVIEW OF THE RESEARCH

In this chapter, the background of and motivation for the research is described. In this regard the problem statement, the aims of the research, as well as the paradigm perspectives are first presented. Thereafter, the research design, research method and the chapter division are discussed.

1.1 BACKGROUND OF AND MOTIVATION FOR THE RESEARCH

Organisations and the world of work are changing rapidly (Greenhaus & Callanan, 1994; Schreuder & Theron, 2001; Voskuijl, 2005). Globalisation, rapid changes in technology and the political arenas, as well as an increasingly diverse workforce require organisations to adapt in order to remain competitive. The introduction of new technology brings with it the need for the development of new skills; and knowledge-based work places greater demands on employee competencies (Ployhart, 2006). Greater competition may require a closer focus on the core business and the outsourcing of non-core functions; and the information technology boom brought with it talent shortages (Lawler & Worley, 2006). This change in focus may result in fewer, but more skilled employees to meet the demands of high labour flexibility (Furnham, 2000; Mirvis & Hall, 1994).

How is South Africa adapting its environment to create and sustain the competitiveness of its enterprises? According to the IMD World Competitiveness Yearbook of 2007, South Africa is ranked 50th out of 55 countries on 323 criteria in terms of economic performance; (for example, gross domestic product, inflation, international trade and investment, and employment); the efficiency of government administration, business efficiency like skills availability, labour

productivity and competency) and infrastructure such as technology, education and health.

Although there seems to be a big shake-up in economic and business power around the globe (Garelli, 2007), South Africa is still not regarded as competitive enough. This has implications for the country's productivity. Investments in plant, technology, new products and distribution systems are necessary (Ulrich, Zenger & Smallwood, 1999), but organisations are finding that people who have the skills, know-how, and discretion to manage the demands of fast-changing work circumstances are their primary competitive advantage (Cascio, 2006; Mirvis & Hall, 1994). Lawler and Worley (2006) sum it up by stating that, with global competition and technological change, the era of human and social capital has arrived. It is a critical and universally acknowledged element in the effectiveness of organisations and a key source of competitive advantage (Ployhart, 2006).

This also has implications for leadership at all levels of the organisation. As the environment changes to a more competitive market, new leadership results are required and an organisation's ability to source this talent and build its leadership depth will determine its competitiveness in the global market (Ulrich et al., 1999). Leadership does not only reside at the top, but at all levels of the organisation and therefore a company needs to have an up-to-date assessment of the capabilities of its existing employees (Ulrich et al., 1999) and recruit new leaders according to the kinds of skills and qualities required of leadership in the organisation (Cascio, 2006). Lawler and Worley (2006) observe in some of the studies reviewed that one of the factors which increasingly determine the market value of corporations is the quality of their leadership talent.

The selection process is an organisation's first opportunity to ensure that persons with the required leadership competencies enter the organisation, as it is based on the assumption that the procedure can predict one or other important and

relevant behavioural requirement or job performance aspect of the position (Psychological Society of South Africa in association with People Assessment in Industry (PAI, 2005).

Various circumstances and forces in the South African labour context, such as employment equity, industry charters and skills development require a close look at selection which focuses on samples of behaviour obtained through various methods, for example, interviews and the use of psychometric instruments (Cascio, 2006; Foxcroft & Roodt, 2001), whether it is for promotion, training, development purposes or entry into the organisation. In the light of these circumstances, which will be discussed in the following paragraphs, it is important to ensure the soundness of decisions that are based on any method of selection (Smith & Smith, 2005). Decision-makers have to be confident of the validity of the selection method; that is, that the instrument or battery of tests measures what it is supposed to measure (Aiken, 2003; Anastasi & Urbina, 1997; Foxcroft & Roodt, 2001; Gregory, 2000; Smith & Smith, 2005). This property of psychological tests is regarded as *the* most important concept in psychometrics (Smith & Smith, 2005).

The Employment Equity Act (No. 55 of 1998, Section 8) states that 'psychometric testing and other similar assessments of an employee are prohibited unless the test or assessment being used has been scientifically shown to be valid and reliable, can be applied fairly to all employees; and is not biased against any employee or group.'

The need for a fair selection in a multicultural society is further emphasized as companies often use psychometric assessments not only to select people for employment, but also to identify and select employees for training programmes, special education and enriching experiences (De Beer, 2000b; PAI, 2005). The various industries' empowerment charters, such as the mining and financial charters require of companies to ensure the representivity of historically

disadvantaged South Africans in the labour force, identify potential for development and train these persons, as well as ensure the transferability of skills through skills programmes and learnerships (Key Empowerment Charters, 2004). The Skills Development Act (No. 97 of 1998) also requires organisations to contribute to the development of people. The vision of the Act is that of an integrated skills development system which promotes economic growth and increases employment and social development, by focusing on education, training and proper employment services.

Organisations may be incurring unnecessary costs by not evaluating the validity of their selection batteries. Apart from the time, effort and resources spent on the selection process, the cost of recruiting the wrong candidate spirals when one considers, for example, the associated training costs, loss as a result of substandard performance, the possible ripple effect on other employees in the work group, turnover, and the recruitment of a new incumbent (Kreitner & Kinicki, 1992).

Various professional societies regulate the use of psychometric instruments in the work place and formulate standards to ensure that fair and equitable decisions or recommendations on the career and future of an individual are made (Anastasi & Urbina, 1997; PAI, 2005). All instruments must adhere to the standards of validity, reliability and fairness (Anastasi & Urbina, 1997; Foxcroft & Roodt, 2001; PAI, 2005).

Thus, organisations need to determine if *what* they are measuring during selection correlates positively with some outcome measure, for example work performance. One way of determining this is by means of criterion-related validation. This includes two different approaches, where the distinction is the absence or presence of a time lapse between the collection of predictor and criterion data. There could also be a difference in the employment status of the sample used in the two designs (Barrett, Phillips & Alexander, 1981; PAI, 2005).

In concurrent validity, the criterion measure (for example, work performance) is obtained at approximately the same time as the predictor data (for example, psychometric test results) (Gregory, 2000). It determines the accuracy with which these instruments can identify the current behaviour (work performance) of an individual (Anastasi & Urbina, 1997; Foxcroft & Roodt, 2001). In a concurrent validity study, criterion and predictor data of *current* employees are normally used.

In predictive validity studies, the criterion data is obtained at a later date (Gregory, 2000) and the accuracy with which the instruments can predict future behaviour (for example, work performance) is determined (Anastasi & Urbina, 1997; Foxcroft & Roodt, 2001). For example, the psychometric test results of candidates are obtained in the selection process as they enter the organisations, and only after a period of time are their performance results obtained.

People who possess the right leadership competencies can contribute to an organisation's productivity. There is growing recognition that more and more of the market value of organisations rests in their human capital (Lawler & Worley, 2005). Organisations have to ensure that they select people with the required competencies to enter their leadership positions. It is therefore imperative that the test batteries used in the process of selection are valid, that is, they correlate positively with performance seen to be contributing to productivity.

Valid assessment is a necessary condition for equity and the efficient management of personal development (Plug as cited in Anastasi & Urbina, 1997). This is particularly important in our multicultural society. Therefore, more research is needed on the validity, bias and fairness of assessment procedures used in South Africa (Huysamen, 2002). From the foregoing discussion, it seems that this study will add to the local research to determine whether psychometric

tests can predict the work performance of leaders, and more specifically, leaders in first-line supervisory positions.

1.2 PROBLEM STATEMENT

The above provides some reasons for the need to investigate the use of psychometric tests for the selection of first-line supervisors in the mining industry. The background to the specific battery used by a South African mining company will be discussed in the following paragraphs.

An assessment battery to determine the gap between current technical supervisors' competencies, and those which are required by the company formed part of a group-wide project. The business case of this project stipulates –

- technically competent people maintaining and operating the plants, and
- competent supervisors supervising competent subordinates

thereby ensuring that the company gets the maximum return on investment from its two highest expenditures, namely people and equipment. The primary objective of the project was to increase overall plant utilisation by –

- streamlined operating processes and workflows, which includes improved efficiencies and a reduction in operating downtime;
- an appropriately trained and skilled workforce;
- effective production management and control systems, and
- effective maintenance planning and control processes.

The assessment battery was compiled to address the point of an *appropriately trained and skilled workforce* by determining the gap between current

supervisors' competencies and those required by the company, where after supervisors embarked on an eighteen month training programme.

The competencies required of persons in first-line supervisory positions were determined by means of a job analysis. Interviews were conducted by human resource consultants, under the leadership of the task team responsible for this specific part of the project, with a sample group of employees from the ore extraction, ore processing and technical services disciplines. These employees, in the Paterson B to D bands, were members of a best performing team, as well as a team with the biggest challenges in these three disciplines. The aim of the interviews was to develop a more accurate picture of the work done by supervisors in the company, in order to build better development, assessment, performance management, selection and coaching tools. The outcome of these interviews was tabled by the task team at further workshops attended by management consultants specializing in the assessment of supervisory skills, and also by managers and supervisors from all the South African operations. Thereafter, a job profile for the position of first-line supervisor was compiled.

The test battery compiled to measure the identified competencies of first-line supervisors consisted of the following instruments:

- Learning Potential Computerised Adaptive Test (LPCAT);
- Numerical Reasoning Test (NT6.1);
- Verbal Critical Reasoning Test (VC1.1);
- AccuVision System; and
- Assessment Centre.

Apart from its initial purpose of determining the competency gap with the aim of future training and development of supervisors, the test battery will in future also be used to assess candidates for entry into first-line supervisory positions.

Although the assessment battery has a dual purpose in the company, namely development *and* selection, this study will only focus on the validation of the battery for the selection of persons for supervisory positions. As pointed out by Jaffee (1971), the promotion of a good craftsman on the basis of his technical skills only, may result in the exchange of a good craftsman for a poor supervisor. By determining the validity of the psychometric assessment battery, the company should be able to make sound recruitment decisions, save costs and ultimately improve productivity in the long term.

The need to investigate the concurrent validity of the current selection battery implies research into the correlation between the scores obtained by current supervisors in the psychometric tests, and the work performance of these supervisors. Work performance ratings obtained by supervisors in the company's 2006 performance review were used as criterion data. Result areas against which performance was measured were developed in line with the job profile for the position of first-line supervisor.

Based on the preceding discussions, the following literature and empirical research questions have been formulated:

Literature questions:

- What are selection, psychometric testing and validity?
- What role does ability assessment play in predicting work performance?
- What role does the assessment of learning potential play in predicting work performance?
- What role do situational judgement tests play in predicting work performance?
- What role do assessment centres play in predicting work performance?
- What is the link between selection, performance and validation?

Empirical research questions:

- Do the scores of the Learning Potential Computerised Adaptive Test (LPCAT) correlate statistically significantly with job performance?
- Do the scores of the Numerical Reasoning Test (NT6.1) correlate statistically significantly with job performance?
- Do the scores of the Verbal Critical Reasoning Test (VC1.1) correlate statistically significantly with job performance?
- Do the scores of the AccuVision assessment correlate statistically significantly with job performance?
- Do the scores of the assessment centre correlate statistically significantly with job performance?
- Can a test battery, comprising of the above instruments, for the selection of first-line supervisors be utilised to predict job performance?

1.3 AIMS OF THE RESEARCH

The aims of this research are presented below:

1.3.1 General aim

The general aim of this research is to ascertain the concurrent validity of a test battery for the selection of first-line supervisors within a mining company, using their work performance as criterion measure.

1.3.2 Specific aims

The following theoretical aims will be addressed in this study:

- To conceptualise selection, job analysis, psychometric testing and validity.
- To conceptualise the use of ability tests, tests of learning potential and situational judgment and assessment centres in predicting work performance.
- To conceptualise the development of a criterion measure.
- To integrate the aspects of selection, work performance and validation.

The following aims are formulated for the empirical study:

- To determine the correlation between the Learning Potential Computerised Adaptive test (LPCAT) scores and supervisor job performance.
- To determine the correlation between the Numerical Reasoning test (NT6.1) scores and supervisor job performance.
- To determine the correlation between the Verbal Critical Reasoning test (VC1.1) scores and supervisor job performance.
- To determine the correlation between the AccuVision test scores and supervisor job performance.
- To determine the correlation between the Assessment Centre scores and supervisor job performance.
- To evaluate whether a test battery, comprising of the above instruments, for the selection of first-line supervisors can be utilised as a predictor of job performance.
- To determine the moderating effects of the extraneous variables of race, age, gender and education level.

1.4 THE PARADIGM PERSPECTIVE

1.4.1 The disciplinary relationship

The paradigm perspective provides a rationale and framework for the research to be conducted (Terre Blanche & Durrheim, 2002). This research is conducted within the field of industrial psychology which encompasses the sub-disciplines of psychometrics and personnel psychology.

Psychometrics refers to the systematic and scientific way in which psychological measures are developed and the measurement standards, for example, validity and reliability, which these measures must meet to determine different aspects of human behaviour through their use (Anastasi & Urbina, 1997; Foxcroft & Roodt, 2001).

This study is relevant for industrial psychology, because proper selection of first-line supervisors in terms of their abilities and potential is the first step towards ensuring the success of these individuals in their careers.

1.4.2 Applicable psychological paradigms

This study draws from the functionalistic and behaviouristic schools of thought in psychology.

1.4.2.1 *The functionalistic paradigm*

Functionalism, which eventually culminated in behaviourism, does not focus on non-observable behaviour, but on the function of experiences and mental process in individuals' adaptation to their environment and how behaviour is

moulded by broader social forces. It uses techniques such as surveys, interviews and mental tests to collect data (Meyer, Moore & Viljoen, 2003; Plug, Meyer, Louw & Gouws, 1987).

1.4.2.2 The behaviouristic paradigm

Behaviourism has as its goal the understanding of human behaviour in order to predict and control this behaviour. Only observable behaviour is studied. It rejects introspection as a method of psychology and holds that the objective observation of behaviour is the only permissible method. It explains behaviour in terms of stimuli and responses, which are combined through learning (Meyer et al., 2003; Plug et al., 1987).

In this study the behaviour, and more specifically, the work performance of supervisors is observed in the work context with the aim to predict and control.

1.4.3 Applicable concepts

As meta-theoretical concepts in this research, definitions are presented for selection battery and validity.

A selection battery can be defined as a set of systematic and standardised procedures (predictors or tests) for evoking a sample of responses from a candidate, which are evaluated in a quantifiable, fair and consistent manner (Aiken 2003). The aim is to select candidates for certain positions, in such a way that they can be expected to optimally fulfil pre-defined expectations (Roe, 2005).

Validity can be defined as the extent to which a test measures what it was designed to measure (Aiken, 2003; Foxcroft & Roodt, 2001). Types of validity include content validity, construct validity, and the two types of criterion-related

validity, namely predictive and concurrent validity. Criterion-related validation refers to procedures in which test scores are compared with ratings, classifications or other measures of performance (Aiken, 2003).

This research will focus on concurrent validity. In terms of this measure of validity the evidence for the validity (in this instance, test scores) and the criterion (supervisory ratings of work performance) are considered simultaneously.

1.5 RESEARCH DESIGN

The quantitative research design with a focus on correlational analysis was used to achieve the research objectives.

The quantitative approach used implies that data was collected in the form of numbers and statistical types of data analysis used to make broad and generalisable comparisons between the predetermined categories (Terre Blanche & Durrheim, 2002).

In correlational analysis, to determine concurrent validity, the focus is on determining the degree to which there is a relationship between the predictor and criterion data (independent and dependent variables), which were obtained at approximately the same time (Christensen, 1997; Gregory, 2000; PAI, 2005).

The research takes the form of a descriptive study where the relationship between the independent and dependent variables is described (Christensen, 1997; Mouton, 2003; Terre Blanche & Durrheim, 2002).

1.5.1 Variables

The descriptive study describes the relationship between variables. The independent variable is described as the variable manipulated by the experimenter and the dependent variable as the behavioural variable designed to measure the effect of the variation in the independent variable (Christensen, 1997; Greene & D'Oliveira, 2006; Terre Blanche & Durrheim, 2002).

In this research the results of the test battery are the independent variables. These consist of the results for the Learning Potential Computerised Adaptive Test (LPCAT), Numerical Reasoning test (NT6.1), Verbal Critical Reasoning test (VC1.1), AccuVision and Assessment Centre. The dependent or criterion variable is the work performance as measured by the performance assessment tool used by the company.

Extraneous variables such as age, gender, race and education level, that may have an influence on the results, but which the researcher is not able to control or avoid, will be considered statistically to determine their effect.

1.6 RESEARCH METHODOLOGY

The research method consisted of two phases, namely a literature review and an empirical study.

1.6.1 Literature review

The literature review provides a conceptual framework for the research. It was undertaken to conceptualise—

- selection, job analysis, psychometric testing, validity and criterion development; and

- the use of ability, learning potential, situational judgment and assessment centres in predicting work performance.

1.6.2 Empirical study

The empirical study is quantitative and in the form of a descriptive correlation study. The steps to be covered in the empirical study are:

Step 1: Defining the population and sample

Step 2: Outlining the measurement of biographical variables

Step 3: Outlining the measurement of predictor data

Step 4: Outlining the measurement of criterion data

Step 5: Describing the data gathering process

Step 6: Describing data processing

Step 7: Formulating and reflecting on the research hypotheses

Step 8: Reporting and interpreting research results

Step 9: Formulating conclusions

Step 10: Detailing research limitations

Step 11: Formulating recommendations

1.7 CHAPTER ALLOCATION

This chapter has been an introductory chapter and included the background of the research topic and the purpose and procedures of the study.

The following chapters of the research will be presented:

Chapter 2: Validation of selection instruments and criterion development

Chapter 3: Empirical study

Chapter 4: Results

Chapter 5: Conclusion, limitations and recommendations

1.8 CHAPTER SUMMARY

In this chapter, the background to and motivation for the research were discussed. The problem statement was identified, followed by a discussion of the general and specific aims of the research, as well as the research paradigms. The research design and methodology were presented and an outline of chapters was provided. In Chapter 2 that follows, selection and the validation of selection tools are discussed. The chapter will also focus on the development of a criterion measure.