CHAPTER 3

EMPIRICAL STUDY

In this chapter, the empirical study is discussed, detailing the research procedure, population, sample, measures of independent and dependent variables, as well as the steps used in gathering and processing the data.

3.1 AIM OF THE EMPIRICAL STUDY

As reported in Section 1.3.2, the aims of the empirical study are:

1. To determine the correlation between the Learning Potential Computerised Adaptive Test (LPCAT) scores and supervisor job performance.

2. To determine the correlation between the Numerical Reasoning test (NT6.1) scores and supervisor job performance.

3. To determine the correlation between the Verbal Critical Reasoning test (VC1.1) scores and supervisor job performance.

4. To determine the correlation between the AccuVision test scores and supervisor job performance.

5. To determine the correlation between the Assessment Centre scores and supervisor job performance.

6. To evaluate whether a test battery for the selection of first-line supervisors can be utilised as a predictor of job performance.

3.2 POPULATION AND SAMPLE

All the technical supervisors (supervisors in the technical services, ore processing and ore extraction disciplines) at three of the mining company's South African operations formed the population group in this study. The total population size at the time of the research consisted of 204 technical supervisors.

The sample consisted of all technical supervisors (N = 204).

For reasons of confidentiality, the name of the company will not be revealed, with complete anonymity of participants also being ensured throughout the study.

3.3 MEASUREMENT OF BIOGRAPHICAL INFORMATION

The following biographical information for the sample was sourced from the organisation's human resources department:

- Age
- Race
- Gender
- Education level

The biographical data enabled the sample to be profiled and was used in observing potential moderating effects. A summary of the biographical data is reported in Chapter 4.

3.4 INDEPENDENT VARIABLE MEASURES

The selection of the independent variables (psychometric instruments) was based on the competencies required of persons in first-line supervisory positions as determined by means of a thorough job analysis. Interviews were conducted by human resource consultants with a sample group of employees from the ore extraction, ore processing and technical services departments.   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, as identified by the management team of the respective operations. 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.

An extract of the interview questionnaire is captured in appendix 1.

The outcome of these interviews was tabled by the task team at further workshops attended by management consultants specialising in the assessment of supervisory skills, and managers and supervisors from all the South African operations. Thereafter, a job profile for the position of first-line supervisor was compiled.   The job profile is captured in appendix 2 and details specific information about the job and its requirements.

Based on the output of the job analysis, the task team, in collaboration with the management consultants, recommended the assessment instruments presented in Table 1 as measures of the critical competencies for the incumbents of supervisory positions in the technical disciplines.

TABLE 1. SUGGESTED ASSESSMENT METHODS

Domain	Test
Learning Potential	LPCAT
Numerical test	NT6.1
Verbal test	VC1.1
Situational Judgment	AccuVision
Assessment centre	In-basket
	Performance Management Interview
	Group exercise

Based on the above analysis process, the independent variable measures for the research are therefore:

- LPCAT
- NT6.1
- VC1.1
- AccuVision
- Assessment Centre

The description and aim of the measures are presented below, as well as details of administration and reliability and validity of the instruments.

3.4.1 LPCAT

3.4.1.1 Description and aim of the instrument

The LPCAT was developed with the aim of measuring learning potential in the domain of nonverbal reasoning ability. Learning opportunities are incorporated into the test situation, as the LPCAT uses a dynamic test-train-retest strategy that provides training as part of the assessment process. Language and prior school

learning play no role in the application of the test, thus allowing candidates equal opportunity to demonstrate what they might be capable of in terms of non-verbal reasoning ability (De Beer, 2000a; De Beer, 2000b; De Beer, 2000c).

The computerised test, which does not require any computer literacy, presents test candidates with a pre-test, whereafter relevant hints and strategies are provided to assist examinees to solve similar problems encountered in the post-test (De Beer, 2000a; De Beer, 2000b; De Beer, 2000c).

The LPCAT is a power test and there are no time limits in the test. It takes approximately one hour to administer. The items included in the test consist of nonverbal, figural items which have been identified as being the most culture-fair. The items represent Figure Series, Figure Analogies and Pattern Completion. An example of the items included in the test is presented in appendix 3. The adaptive process involves items being interactively selected from an item bank during testing to match the estimated level of performance of each individual candidate (De Beer, 2000b).

The measurement of learning potential is based on a combination of the pre-test score and the difference score between the pre- and post-test. The pre-test score provides an indication of current performance level. The post-test score provides an indication of the possible future level of performance that can be attained after relevant training. The difference between the post-test and the pre-test scores provides an indication of undeveloped potential (De Beer, 2000a; De Beer, 2000b; De Beer, 2000c).

Results are interpreted according to the table presented in appendix 4.

3.4.1.2 Administration of the instrument

The LPCAT consists of four phases, namely –

- Introduction and familiarisation with computer keys (ENTER key and SPACE BAR) which are used to answer the questions, as well as example questions before the commencement of the pre-test.
- The pre-test which provides an indication of the present level of performance.
- Training providing additional hints, guidelines and examples.
- The post-test which provides an indication of the potential future level of performance.

The test was administered to individuals on computers and in English. All information, instructions, examples and feedback on example questions are provided on the computer screen for the candidate to read and work through independently. Candidates completed the test under standardised test conditions (De Beer, 2000b).

3.4.1.3 Reliability and validity of the instrument

The LPCAT's internal consistency reliability indices range between 0,925 and 0,987 (De Beer as cited in Van der Merwe, 2003).

A study comparing the LPCAT and ABET training results of an adult group revealed a correlation ranging between 0,398 and 0,610 for the low literate group, and between 0,439 and 0,543 for the secondary school sample (De Beer, 2005).

In another study comparing the LPCAT and academic results of a group of bridging students, a correlation coefficient ranging between 0,313 and 0,525 was reported (De Beer, 2005).

3.4.1.4 Justification for selection of the instrument

Measures of cognitive ability have received criticism in the past with regard to the comparison of mean group performance. The multi-cultural South African society, where people are not equal with regards to educational opportunities and socio-economic status requires the use of tests with little cultural content measuring fluid intelligence, as opposed to crystallised intelligence where abilities have mainly been acquired by education (Bartholomew, 2004; De Beer, 2000b).

The LPCAT's content reflects fluid ability and therefore the test was selected as an alternative measure of cognitive ability.

3.4.2   Numerical Reasoning

3.4.2.1 Description and aim of the instrument

The NT6.1 is part of the Technical Test Battery. It is predominantly used for the assessment and selection of staff for technical positions, such as technicians and process operators. The test measures more advanced number skills, with the emphasis on reasoning and recognising short cuts to reach solutions, rather than complex calculations. It is suitable for candidates with a minimum qualification of Grade 12 (SHL, 2000b).

The test comprises written problems, expressed within the context of technical work, which involve percentages, fractions, decimals and diagrams, as well as knowledge of the four basic rules of arithmetic. An example of the questions is presented in appendix 5 (SHL, 2006c). Candidates are presented with a problem and are required to select the correct answer from five possible answers given (numbered A, B, C, D and E). They are allowed to use calculators. The test

consists of 25 items and candidates have 12 minutes to complete the test (SHL, 2000b).

3.4.2.2 Administration of the instrument

Candidates were requested to complete their name and biographical information in the space provided on the answer sheet. Candidates were introduced to the test by way of a brief explanation of the test. They were then led through a standardised set of instructions on how to complete the test and were presented with three sample questions on which to practice. The administrator reviewed the correct answers to the practice questions and attended to questions which arose. Candidates received a final set of instructions and final questions were answered. They began and completed the test as per the set timelines (SHL, 2000b). The test and instructions were completed in English under standardised testing conditions.

3.4.2.3 Reliability and validity of the instrument

A number of reliability and validity studies with the inclusion of the NT6.1 have been conducted by SHL.

A study involving a sample of 751 individuals reported an alpha coefficient of 0,80 for the Numerical Reasoning Test (SHL, 2003a).

In a study on the future selection of technical officers in a large South African telecommunications company, a validity correlation of 0,38 was shown between test performance and job performance (SHL, 1999c). In a further study involving the future selection of demand forecasters, a validity correlation of 0,40 was reported (SHL, 2000c).

3.4.2.4 Justification for selection of the instrument

The instrument was selected in line with the outputs of the job analysis exercise. It is a measure of the reasoning skills with numbers required by supervisors in the technical disciplines.

3.4.3 Verbal Reasoning

3.4.3.1   Description and aim of the instrument

The VC1.1 is part of the Critical Reasoning Test Battery which is designed for use in the selection, development or guidance of personnel at the supervisory and junior to middle level of management. The test measures the ability to understand written passages and the logical evaluation of argument. It has a relevance to the world of work, where reading, interpretation and evaluation of written material are required (SHL, 2000a).

The test consists of fifteen passages each of which is followed by four statements. The candidate is required to read each passage and then evaluate the truth of the statements which follow, in the light of the passage that preceded them. The statements are either true, false or cannot be evaluated without further information. An example of the questions is presented in appendix 6 (SHL, 2006b). The passages include extracts from text likely to feature in policy statements, overviews, guidelines or brochures. The test consists of 60 items and candidates have 30 minutes to complete the test (SHL, 2000a).

3.4.3.2   Administration of the instrument

Candidates were requested to complete their name and biographical information in the space provided on the answer sheet. Candidates were introduced to the test by way of a brief explanation of the test. They were led through a standardised set of instructions on how to complete the test and were presented with four example questions on which to practice. The administrator reviewed the correct answers to the practice questions and attended to questions which arose. Candidates received a final set of instructions and final questions were answered. Candidates began and completed the test as per the set timelines (SHL, 2000a). The test and instructions were completed in English under standardised testing conditions.

3.4.3.3   Reliability and validity of the instrument

A number of reliability and validity studies with the inclusion of the VC1.1 have been conducted by SHL.

A study involving a sample of 5 508 individuals reported an alpha coefficient of 0,91 for the Verbal Critical Reasoning Test (SHL, 2003b).

A study examining the predictive validity of the VC1.1 with regards to the marks achieved by candidates in a training course, reported a validity correlation of 0,51 (SHL, 1999b). In a further study on the future selection of middle managers to attend a senior management course, a validity correlation of 0,33 between test scores and current assessment of job performance was shown (SHL, 1999a).

3.4.3.4 Justification for selection of the instrument

The instrument was selected in line with the outputs of the job analysis exercise. It is a measure of the ability to understand written passages and to logically evaluate arguments, required by supervisors in the technical disciplines.

3.4.4 AccuVision

3.4.4.1 Description and aim of the instrument

The AccuVision System uses job simulations to measure skills and abilities required for job success. It incorporates video technology to simulate job activities associated with a particular job or family of jobs (Resource Connection, 2008).

The *Supervisory Programme for Blue Collar Supervisors* was selected for inclusion in the test battery for the selection of first-line supervisors in the technical disciplines. The programme comprises sixteen video simulations depicting job relevant situations in which a technical supervisor or manager is shown interacting with others. The supervisors depicted in the video are from the manufacturing, service, production, maintenance, warehouse and other similar settings.

The situations are shown on a screen and at a critical point in every simulation, the candidate is asked to choose one of the behavioural options that correspond to what he considers to be the most effective course of action. Every behavioural option is presented on the screen in text format, as well as being acted out on the video. This reduces the impact of reading ability and standardises the meaning of the textural choice for all candidates.

At the end of every situation, the candidate is allowed 30 seconds to record his choice of action on a separate answer sheet by simply indicating his preference with a cross over the corresponding letter (A, B, C or D) on the answer sheet.

The test takes approximately 1 hour and 45 minutes to complete, including introductory and closing remarks.

The Programme evaluates the five skills and abilities (dimensions) presented in Table 2, which are divided into a number of tasks or elements (Britz, P.J., personal communication, September 4, 2007; Resource Connection, 2008).

TABLE 2. DIMENSIONS OF THE ACCUVISION SUPERVISORY PROGRAMME FOR BLUE COLLAR SUPERVISORS

DIMENSION   **ELEMENT**

Team building

- Soliciting the views and opinions of team members.
- Actively acknowledging and recognizing the positive work efforts and accomplishments of team members.
- Reinforcing team member cooperation and coordinated task accomplishments.
- Optimising productivity and morale by developing realistic projections and estimates regarding work requirements.
- Building and maintaining the job-related confidence of team members.

Situational Style of
Interaction

- Soliciting the ideas and participation of the team when appropriate.
- Accepting the responsibility to be directive and decisive in matters where urgency, seriousness, and/or confidentiality prevent participation.
- Maintaining proper balance between people orientation and task orientation.
- Considering team members' personality, readiness level, or capabilities when determining performance expectations and degree of direction or instruction needed.

Influence	• Discussing issues and personal problems.
	• Monitoring progress/completion of assignments and modifying work activities of self and others to meet unexpected demands.
	• Using work assignments to develop skills and abilities of team members.
	• Providing specific and meaningful performance feedback to individual team members.
	• Providing specific direction and guidance.
Initiative	• Determining which issues to resolve self versus those better referred to others.
	• Initiating action to deal with operating problems.
	• Determining when action is required to improve current procedures.
	• Defending own views and opinions when challenged.
	• Initiating action to deal with performance difficulties experienced by team members.
Analysis and Problem-solving	• Recognising problems attributable to inadequate work systems/procedures versus those attributable to performance of work group members.
	• Modifying work systems/procedures to improve operating effectiveness of the work unit.
	• Assessing performance strengths and weaknesses of team members.

The dimensions and elements are outlined in more detail in appendix 7.

The reports generated by the AccuVision System include information on, for example:

- The person's *probability of being successful* if hired or promoted;
- The person's *performance in the skills measured* by the system;
- On-the-job strategies and guidelines for addressing development needs.

3.4.4.2   Administration of the instrument

A paper and pencil mode of administration was utilized in the completion of the AccuVision simulation. Candidates were requested to complete their name and biographical details in the space provided on the answer sheet.

The video was shown on a big screen or ordinary TV monitor, depending on the size of the particular group being assessed. The video includes a detailed explanation of the test, as well as standardised instructions. This part of the video was first shown to candidates. Two example simulations were presented to ensure that all candidates understood the test and how to complete it.

The test and instructions were completed in English under standardised testing conditions.

3.4.4.3   Reliability and validity of the instrument

A study involving a sample of 401 individuals reported an alpha coefficient of 0,83 for the AccuVision Test (Britz, P.J., personal communication, September 4, 2007). In the same study a validity correlation of 0,43 was shown between test scores and job performance for the blue collar supervisory programme.

Another study examining the concurrent validity of the AccuVision Supervisory and Managerial System with regards to work performance, reported a validity correlation of 0,41 (Resource Connection, 2008).

3.4.4.4   Justification for selection of the instrument

The instrument was selected as a measure of the competencies suggested in the outputs of the job analysis exercise.

3.4.5   Assessment Centre

3.4.5.1   Description and aim of the instrument

The simulations included in the centre for the assessment of first-line supervisors, were developed by Britz (1984) and comprise three exercises, namely:

- In-basket
- Performance Management Interview
- Group exercise

The leadership and business competencies assessed in these three exercises are presented in table 3. The X indicates that the specific competency is assessed in the particular exercise.

TABLE 3. COMPETENCIES MEASURED BY THE ASSESSMENT CENTRE

Leadership & Business Competencies	In-basket	Group exercise	Performance Management Interview
Creating and Conceptualising	X	X	
Enterprising and Performing			
Interacting and Presenting	X	X	X
Adapting and Coping	X	X	X
Knowledge management / Organisational learning focus			
Leading and Deciding	X	X	X
Supporting and Co-operating	X	X	X
Managing diversity	X	X	X
Coaching and Mentoring	X	X	X
Negotiating / Influencing	X	X	X
Organising and Executing	X	X	X
Financial Management			
Analysing and Interpreting	X	X	

(Source: Britz, P.J., personal communication, September 4, 2007)

The In-basket is an exercise that is used most in assessment centres. It represents a simulation of the administrative tasks associated with the

supervisory position. Items consist of a variety of documentation that would typically pass the desk of a supervisor (Britz, 1984). The exercise consists of eighteen items and candidates have three hours to complete it (BMC Theko, 2006b).

After completing the In-basket exercise, candidates are requested to complete a questionnaire in which they give reasons for the actions taken, as well as answer questions that will give the assessor a better idea of the candidates' insight into the in-basket (Britz, 1984).

In the Performance Management Interview the candidate is required to address the past performance of a subordinate in such a manner that will bring insight into his strengths and weaknesses and motivate him to improve performance within a clear framework of agreed upon objectives that are specific and time bound. The participant is provided with background information about the subordinate, whilst the role of the subordinate, which is played by an assessor, is standardised. Candidates are expected to individually prepare for the meeting, after which each has twenty minutes in which to conduct the interview (BMC Theko, 2006c).

An interactive simulation exercise is a standard feature of assessment centres. It simulates the almost daily contact supervisors have with team members, colleagues and superiors at meetings and briefings. Its purpose is to obtain an assessment of the individual's ability and skills in interacting with others in a team context in terms of providing leadership, influencing events, and contributing to the group's decision-making (BMC Theko, 2006a).

The group exercise included in this assessment centre requires candidates to function as members of the promotion committee of a specific plant of a manufacturing company. The task is to debate the merits of seven candidates for the position of team leader in the manufacturing department and to come up with the names of two candidates (in order of merit) to be forwarded to the

Operations Manager for approval. The committee's recommendation must be fully motivated and recorded in case there is any complaint from the union. It is stated that the chairman is not available, but that the meeting should continue (BMC Theko, 2006a).

Candidates are expected to individually prepare for the meeting, documenting their analyses and recommendations and then to present these verbally at the leaderless group meeting for which one hour has been set aside. During the meeting candidates are observed by a panel of assessors.

3.4.5.2   Administration of the instrument

The In-basket exercise was administered to groups of candidates. Candidates were requested to complete their names and biographical details in the space provided on the envelope containing the in-basket items. The administrator read the instructions to the In-basket aloud while the candidates followed on the hard copies provided to them. They began and completed the exercise as per the set timelines (BMC Theko, 2006b). Candidates were then requested to complete the questionnaire in which they were expected to give reasons for the actions they took in the exercise itself.

The Performance Management Interview and Group exercises were administered on the same day, but on a day separate from the In-basket exercise. The order of administration of these two exercises differed for candidates as groups were rotated.

Instructions to the Performance Management Interview were read by the administrator, while candidates followed on the hard copies provided to them. The instruction document also contained relevant correspondence. Candidates began and completed the exercise as per the set timelines (BMC Theko, 2006c).

Instructions to the Group exercise were read by the administrator, while candidates followed on the hard copies provided to them. The instruction document also contained the job requirements of the team leader position, as well as short summaries of the various candidates for the position. These summaries included information obtained from the individuals' personal files and informally from peers and other individuals acquainted with the candidates. Candidates began and completed the exercise as per the set timelines (BMC Theko, 2006a).

All the three exercises and instructions were completed in English under standardised testing conditions.

3.4.5.3   *Reliability and validity of the instrument*

A study investigating the validity of the assessment centre in the South African Transport Services yielded a single correlation of up to 0,748 between assessment centre scores and the various criteria of management success, while a multiple correlation of 0,766 has been achieved (Britz, 1984).

3.4.5.4   *Justification for selection of the instrument*

The instrument was selected as a measure of the leadership and business competencies included in the job profile of a first-line supervisor as depicted in Table 3.

3.5   CRITERION MEASURE

Work performance ratings obtained by supervisors in the company's 2006 performance review were used as criterion data.

Result areas against which performance for the twelve-month period was measured were developed in line with the job profile for the position of first-line supervisor and these are:

- Business and financial results;
- Technical results;
- Planning and Monitoring;
- Communication and Relationship building;
- Team compliance to standards;
- Decision making;
- Project management;
- People management;
- Mine safety, security and environmental effectiveness;
- Diversity management;
- Customer relationship management; and
- Knowledge management.

The measures are contracted with first-line supervisors and tracked and monitored by managers in terms of managing their subordinates' performance.

Appendix 8 details the performance evaluation rating form that was used.

Managers were requested to rate each subordinate supervisor against the scope of activities and performance evaluation standards for each Key Performance/Result Area (KRAs) using the following rating scale:

- 1 Evidence of performance against the standard indicates that the person is not yet a full performer. Improvement in one or more performance areas is needed (Not-yet-full performance).

- 2 Evidence of performance against the standard indicates that the person achieves targets and standards for full performance in all the key performance result areas (Full performance).

- 3 The person is a complete full performer who consistently achieves challenging and stretch goals (Full performance +).

- 4 The person consistently exceeds challenging goals for all job requirements and creates a new standard of performance for his peer group. Results have been achieved for two to three years (Exceptional performance).

The final rating was obtained by adding the scores of the individual KRA's and then dividing the sum by the number of KRA's which the individual obtained a score for.

It should be noted that the criterion measure is quite skewed, with only one of the four scores indicating an unacceptable performance. The ratings of 2, 3 and 4 all indicate acceptable and above performance.

The company did not avail the individual score for each KRA for this study, just a final rating for each supervisor. For commercial and confidentiality reasons, the company only made the data available in this format and used the correct detail data to determine correlations.

3.6   DATA GATHERING PROCEDURE

Permission was obtained from the organisation to conduct the research using the data obtained from the project as outlined in paragraph 1.2.

3.6.1   Predictor Data

All the supervisors were informed of the rationale and dates of the assessments by means of a briefing session on mine (appendix 9), as well as an electronic notice from the respective operation managers (appendix 10). The participants completed a consent form, outlining confidentiality prior to the assessments.

The assessments were conducted over a period of two days. On day one supervisors completed the VC1.1, NT6.1, LPCAT, In-basket exercise and the AccuVision instrument. These instruments were administered by qualified test administrators within the company.

On day two supervisors took part in the performance management interview and group exercise which, together with the in-basket exercise, form part of the assessment centre. These exercises were administered by external consultants.

Each individual received feedback on his results.

3.6.2   Criterion data

The performance statistics for the sample for the twelve-month period as discussed in section 4.5 were obtained.

3.7   DATA PROCESSING

The data processing included descriptive statistics with the aim to describe the data (Terre Blanche & Durrheim, 2002).   Further statistical analyses were then conducted to test the research hypotheses and to determine if a statistical relationship existed between the research variables (Christensen, 1997).   The SPSS computer package was utilised for this purpose.   Details of the specific statistical analyses are discussed below.

3.7.1   Descriptive statistics

Descriptive analysis enables the researcher to gain an initial impression or overall picture of the data that was collected (Terre Blanche & Durrheim, 2002).

For the purpose of this research, descriptive statistics were calculated for reporting on the profile of the sample.   Descriptive statistics by way of means and standard deviations were calculated for the sample, predictors and criterion. Means are the arithmetic averages of all the values in the data set.   Standard deviations represent the degree of variance or distance from the mean (Christensen, 1997).

3.7.2   Correlations

Criterion-related validation, and more specifically in this instance, concurrent validity studies, involve the calculation of a correlation coefficient (Foxcroft & Roodt, 2001; Green & D'Oliveira, 2006; Levy, 2006).   The correlation coefficient represents an index that summarises the degree of relationship between a predictor and a criterion (Aiken, 2003; Gatewood et al., 2008).   In this research, the raw scores were converted to ranks and the Pearson Product Moment Correlations determined.   The Pearson Product Moment correlation is obtained

by dividing the covariance of two variables by the product of their standard deviations (Myers & Well, 2003).

The conversion from raw scores to ranks was done by the company after which the data was made available to the researcher.

A number of correlations were calculated for the purpose of testing the hypotheses and to determine the relationships between the variables.

Correlation coefficients (r) are calculated to measure the strength of a relationship between two variables. It provides information about the direction of the relationship (sign) and the magnitude of the relationship (strength). A correlation of r=1 indicates a perfect positive linear relationship between variables, while r=-1 indicates a perfect negative relationship. A positive relationship is indicated when high scores on one variable reflect high scores on the other variable and low scores on one variable reflect low scores on the other variable. A negative relationship is indicated when high scores on one variable are reflected in low scores on the other variable, and vice versa. A correlation of 0 (r=0) means that there is no linear relationship between the two variables (Gatewood et al., 2008; Gregory, 2000; Levy, 2006; Terre Blanche & Durrheim, 2002). Validity coefficients are more common in the low- to midrange of correlations and rarely exceed 0.80 (Gregory, 2000).

To assist in determining construct validity, inter-correlations were calculated on the sten scores of the tests to determine the magnitude and significance of their relationship. Correlations were also calculated between the six independent variables and the dependent variable data. Correlations were further calculated between the biographical data (race, gender, age, and education level) and the criterion data to determine the effect of these moderator variables.

Correlations are used to determine the degree of relationship between the predictors and criterion, but do not enable the prediction of one set of scores from another set of scores. For this purpose, regression analysis was used (Aiken, 2006; Gatewood et al., 2008; Levy, 2006).

3.7.3   Multiple regression

Multiple regression is a statistical technique that, when used in the selection context, allows us to estimate how well a series of predictors forecasts a performance criterion (Greene & D'Oliveira, 2006; Levy, 2006). This technique was utilised in the research as it assisted in determining the significance of the contribution of the various tests to job performance.

Three objectives of multiple regression can be distinguished, namely –

- To assess the extent to which scores on predictor variables are associated with criterion scores. This is done by calculating multiple correlations between all the variables to assess the significance of correlation coefficients between all pairs of variables, each predictor with the predicted criterion and also between pairs of predictors. High correlations between predictors indicate unnecessary duplication in tests, which may lead to only one of the tests being included in the battery;

- To assess the significance of the variance on the predicted criterion variable contributed by all the predictor variables simultaneously; and

- To assess the predictive effects of individual predictor variables (Greene & D'Oliveira, 2006)

Multiple regression analysis takes into account the weights of the predictors. This is formulated based on the extent of correlation between each of the predictors and the criterion, as well as the intercorrelations between the predictors (Aiken, 2003; Foxcroft & Roodt, 2001). The interrelationships among all the variables must be taken into account in the weights assigned to the variables.

3.7.4 Statistical Significance

All results obtained by statistical methods suffer from the disadvantage that they might have been caused by pure statistical coincidence. The level of statistical significance is determined by the probability that this has not, in fact happened. Significance levels therefore refer to the level of risk researchers are prepared to take in drawing conclusions from research data (Smith & Smith, 2005).

P is an estimate of the probability that the results have occurred by statistical coincidence. It is also referred to as the 'alpha level' and 0,05 is traditionally used in research. This means that the probability of error is 5 out of a hundred or 5 percent (Smith & Smith, 2005).

For the purpose of the research, p-values of $p <= 0,05$ and $p <= 0,01$ are highlighted and interpreted as statistically significant (Smith & Smith, 2005)

3.8 RESEARCH HYPOTHESES

Research hypotheses were formulated for the research to indicate whether a relationship exists between the test results and supervisory ratings of job performance. The following hypotheses were postulated:

Hypothesis 1: There is a statistically significant relationship between the learning potential test scores and job performance.

Hypothesis 2: There is a statistically significant relationship between the numerical ability test scores and job performance.

Hypothesis 3: There is a statistically significant relationship between the verbal ability test scores and job performance.

Hypothesis 4: There is a statistically significant relationship between the situational judgment test scores and job performance.

Hypothesis 5: There is a statistically significant relationship between the assessment centre scores and job performance.

Hypothesis 6: There is a statistically significant relationship between the test battery and job performance.

REMARK

In concluding this chapter, the empirical process has been detailed and the framework from which the empirical aims for the research (as presented in Section 1.3.2) will be tested, has been provided.

3.9 CHAPTER SUMMARY

This chapter provided information on the population and sample for the study. The measuring instruments of the dependent and independent variables were presented, followed by a discussion of the data gathering procedure. The data processing was outlined and the chapter was concluded with a presentation of

the research hypotheses. In Chapter 4 that follows, results are reported and discussed.