CHAPTER 4

RESULTS

In this chapter, the results of the empirical study are presented. The interpretation of results is discussed and the results integrated. The chapter ends in a summary.

4.1 DESCRIPTIVE STATISTICS

Descriptive statistics are used to describe the basic features of the data gathered in the research. It enables the researcher to gain an initial impression or overall picture of the data that was collected (Terre Blanche & Durrheim, 2002). Descriptive statistics were calculated for the biographical characteristics of the sample, the predictors and the criteria and are reported on in this section.

4.1.1 Biographical information of the sample

Biographical data by way of age, gender, race, and education level was requested for the sample. Table 4 provides an overview of the gender and race distribution of the sample.

TABLE 1. GENDER AND RACE DISTRIBUTION OF THE SAMPLE (N = 204)

Biographical variable	Count	Percentage
Gender		
Female	10	4,9%
Male	192	94,1%
Missing	2	1,0%
Total	204	100%
Race		
Black	51	25,0%
Coloured	68	33,3%
White	83	40,7%
Missing	2	1,0%
Total	204	100%

In terms of gender, only 5% of the sample was female. This severely limits the interpretation according to gender as the relationship between males and females for any dichotomous data should be at least 30% versus 70% to be included in further analyses (Myers & Well, 2003).

Three race groups were represented with 25 percent Black, 33,3 percent Coloured, and 40,7 percent White.

Supervisors ranged from 25 to 58 years old, with a mean age of 43,30 years (SD = 7,736 years) calculated for the sample.

The education level of the sample is presented in Table 5.

TABLE 2. EDUCATION LEVEL OF THE SAMPLE (N = 204)

Biographical variable	Count	Percentage
Grade 10 or below	75	36,8%
Grade 12	72	35,3%
Post Matric Certificate	25	12,3%
Degree	11	5,4%
Post Graduate Degree	2	1,0%
Missing	19	9,3%
Total	204	100%

The bulk of the sample's education levels were grade 10 or below (36,8%), followed by 35,5% having grade 12 as their highest education level. 18,7% of the sample had a tertiary qualification.

It should be noted that the NT6.1 and VC1.1 are suitable for administration to individuals with a minimum educational level of grade 12. The sample included 75 individuals with an educational level of lower than grade 12. This posed a threat to the accurate interpretation of the results. The discrepancy in terms of fair administration of the cognitive ability tests was taken into account in the analyses reported in the rest of the chapter.

4.1.2 Descriptive statistics for the predictors

Descriptive statistics were calculated for the predictors of the research, namely, the LPCAT and the two ability tests, NT6.1 (Numerical Reasoning) and VC1.1 (Verbal Critical Reasoning), AccuVision and the Assessment Centre.

The descriptive statistics were calculated in order to depict the properties of the instruments and are presented below.

The raw scores of the various instruments were converted into sten scores and made available by the company. The raw scores were not available for the purposes of this study. The consultant responsible for the data analysis converted all scores into sten scores in order to integrate the scores of the various instruments. This was done in the following manner for each of the instruments.

Assessment Centre score

An integrated rating was derived, based on a clinical evaluation of the scores obtained in the three simulation exercises in respect of each of the ten competencies assessed. A numerical value, internationally benchmarked (N = 6 963) was allocated to each rating. An average score of the ten competencies was then computed. The average score obtained by each of the participants was statistically analysed and the sten scores established by creating a class interval for each sten. The raw scores ranged from 35 to 125. The conversion from raw scores to sten scores are presented in Table 6.

TABLE 3. NORM TABLE FOR THE ASSESSMENT CENTRE

Average Score	Sten (N=275)
≤ 49	1
50 – 54	2
55 – 58	3
59 – 63	4
64 – 67	5
68 – 73	6
74 – 78	7
49 – 83	8
84 – 91	9
≥ 92	10

AccuVision scores

The same procedure as described for the Assessment Centre scores was followed in respect of the scores obtained out of 1000 for each of the participants. The raw scores ranged from 10 to 970. The conversion from raw scores to sten scores are presented in Table 7.

TABLE 4. NORM TABLE FOR THE ACCUVISION

Score out of 1 000	Sten (N = 293)
≤ 20	1
21 – 60	2
61 – 160	3
161 – 230	4
231 – 310	5
311 – 390	6
391 – 490	7
491 – 590	8
591 – 710	9
≥ 711	10

Numerical and Verbal Critical Reasoning test scores

Participants were compared to the General Mining Supervisory population (N = 292) and the results of each of the tests were expressed as sten scores as represented in Tables 8 and 9.

TABLE 5. NORM TABLE FOR THE VC1.1

RAW SCORE	STEN (N = 292)
0 – 6	1
7 – 11	2
12 – 16	3
17 – 21	4
22 – 25	5
26 – 30	6
31 – 35	7
36 – 39	8
40 – 44	9
45 – 60	10

TABLE 6. NORM TABLE FOR THE NT6.1

RAW SCORE	STEN (N = 292)
0 – 1	1
2 – 3	2
4 – 5	3
6 – 7	4
8 – 9	5
10 – 11	6
12 – 13	7
14 – 15	8
16 – 17	9
18 – 25	10

LPCAT scores

The results per individual were made available as the individual's standing (potential) for higher learning, applying a five-category description as described in Table 10.

TABLE 7. CONVERSION OF THE LPCAT RESULTS TO A 10-POINT SCALE

ORIGINAL CATEGORY	CONVERTED 10-POINT SCALE
1 (University Post Graduate Degree)	10
2	8
3	6
4	4
5 (Very poor)	2

Descriptive statistics in the form of minimums, maximums, means and standard deviations for the predictors are reported in Table 11.

TABLE 8. MINIMUM, MAXIMUM, MEAN AND STANDARD DEVIATION FOR THE PREDICTORS

Predictor	N	Minimum	Maximum	Mean	Standard Deviation
LPCAT	197	2	10	6,87	2,121
NT6.1	200	1	10	5,87	2,006
VC1.1	200	2	10	5,96	1,886
AccuVision	200	1	10	5,75	2,665
Assessment Centre	197	1	10	6,09	2,772

The reliabilities of the predictors are presented in Table 12.

TABLE 9. ALPHA COEFFICIENTS FOR THE PREDICTORS (N = 204)

Predictor	Alpha coefficient	Reference	Section
LPCAT	0,93	De Beer as cited in Van der Merwe (2003)	3.4.1.3
NT6.1	0,80	SHL (2003a)	3.4.2.3
VC1.1	0,91	SHL (2003b)	3.4.3.3
AccuVision	0,83	Britz (2007)	3.4.4.3
Assessment Centre		-	-

The reliability score of 0,93 for the LPCAT is as reported in the empirical chapter (Section 3.4.1.3). Optimum coefficients of higher than 0,75 are recommended for internal consistency (Terre Blanche & Durrheim, 2002). The alpha coefficient of 0,93 presented in Table 12 is therefore in line with acceptable reliabilities.

The reliability score of 0,80 for the NT6.1 is as reported in the empirical chapter (Section 3.4.2.3). The reliability score for the VC1.1 confirms the reliability score reported in Section 3.4.3.3. Alpha values of greater than 0,75 are considered to indicate high reliability (Levy, 2006; Terre Blance & Durrheim, 2002). A minimum reliability estimate of 0,85 to 0,90 for ability tests is commonly thought to be necessary for selection use (Gatewood et al., 2008). The alpha coefficients for the NT6.1 and VC1.1 presented in table 12 range from 0,80 to 0,91 and are therefore in line with acceptable reliabilities for ability tests.

The reliability score of 0,83 for the AccuVision is as reported in the empirical chapter (Section 3.4.4.3). This alpha coefficient is in line with acceptable reliabilities of predictors in selection.

4.1.3 Descriptive statistics for the criteria

As highlighted in Section 3.5, supervisors' work performance was assessed during the company's performance review by their respective supervisors/managers. Descriptive statistics in the form of the minimum, maximum, mean and standard deviation for supervisory ratings of work performance are presented in Table 13.

TABLE 10. MINIMUM, MAXIMUM, MEAN AND STANDARD DEVIATION FOR SUPERVISOR RATINGS OF JOB PERFORMANCE (N = 204)

	Median	Mean	SD	Minimum	Maximum
Job performance	2,8	2,7	0,50	1,1	3,7

A mean of 2,7 (on a five-point scale) was computed for Work Performance.

4.2 CORRELATION RESULTS

Corrrelational analysis is done to determine the degree to which there is a relationship between the predictors and criterion data. It needs to be determined if *what* is measured during selection correlates positively with the outcome measure, for example, supervisory ratings of work performance (PAI, 2005).

The outcome of the correlations calculated is presented and discussed in this section.

4.2.1 Inter-correlations for the predictors

The inter-correlations for the LPCAT, NT6.1, VC1.1, AccuVision and Assessment Centre are reflected in Table 14. For the purpose of analysis and interpretation,

p-values of p<=0,01 and p<=0,05 were considered as significant levels as suggested by Smith and Smith (2005).

TABLE 11. INTERCORRELATIONS FOR LPCAT, NT6.1, VC1.1, ACCUVISION AND ASSESSMENT CENTRE

		Assessment Centre	AccuVision	VC1.1	NT6.1	LPCAT
Assessment Centre	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	197				
AccuVision	Pearson Correlation	0,164*	1			
	Sig. (2-tailed)	0,022				
	N	195	200			
VC1.1	Pearson Correlation	0,518**	0,214**	1		
	Sig. (2-tailed)	0,000	0,003			
	N	195	196	200		
NT6.1	Pearson Correlation	0,585**	0,220**	0,623**	1	
	Sig. (2-tailed)	0,000	0,002	0,000		
	N	195	196	200	200	
LPCAT	Pearson Correlation	0,448**	0,189**	0,531**	0,671**	1
	Sig. (2-tailed)	0,000	0,008	0,000	0,000	
	N	193	194	195	195	197

* Indicates correlation coefficients with p-values <=0,05.

** Indicates correlation coefficients with p-values <=0,01.

Statistically significant correlations range from *r*=0,19 to *r*=0,67. The strongest correlation of *r*=0,67 (p<=0,01) is reported for the LPCAT and NT6.1. This correlation, as well as the one between the LPCAT and VC1.1 (*r*=0,57; p<=0,01), are in line with the results of a comparison between the LPCAT and other cognitive instruments. According to De Beer (2005), statistically highly significant correlations ranging between 0,400 and 0,645 were reported for comparison with the Paper-and-Pencil Games and between 0,567 and 0,691 for comparison with the General Scholastic Aptitude Test at the secondary school level.

The correlation between the NT6.1 and VC1.1 (*r*=0,62; p<=0,01) is in line with the findings that tests of cognitive ability are highly correlated with each other. These intercorrelations exhibit a positive manifold, arising as a consequence of a general factor of cognitive ability (Ones, Visweswaran & Dilchert, 2005).

Higher correlations were found between the Assessment Centre and the NT6.1 (*r*=0,59; p<=0,01) and VC1.1 (*r*=0,52; p<=0,01). These findings are in line with various meta-analytical studies. Research conducted by Scholz and Schuler, as cited in Ones et al. (2005) found the correlation between Assessment Centre ratings and General Mental Ability to be 0,43. Collins, Schmidt, Sanchez, McDaniel and Le (as cited in Ones et al., 2005) reported the estimated operational validity of cognitive ability in predicting overall Assessment Centre ratings to be 0,65. This indicates substantial overlap between the constructs assessed by overall Assessment Centre ratings and cognitive ability.

The correlations between the AccuVision and the NT6.1 (*r*=0,22; p<=0,01) and VC1.1 (*r*=0,21; p<=0,01) are lower than reported in a meta-analytical study by McDaniel where the true score correlation was found to be 0,46 (Ones et al., 2005). He also reported that situational judgment tests that use knowledge instructions, like the AccuVision, are more highly correlated with cognitive ability measures (*r*=0,55), than those that use behavioural tendency instructions (*r*=0,23).

A correlation of 0,19 (p<=0,01) was reported between the LPCAT and Accuvision, and of 0,45 (p<=0,01) between the LPCAT and the Assessment Centre.

Research could not be found on the correlation between situational judgment tests and assessment centres. Giving the behavioural component of both these instruments, one would have expected the correlation to be higher than 0,16 (p<=0,05).

Intercorrelations with the NT6.1 and VC1.1 highlight a challenge. Both these instruments are only suitable for administration to persons with a minimum education level of grade 12 (Section 3.4.2.1). The frequency analysis for the education levels of the sample indicates 75 individuals with a qualification below this. The analysis of the intercorrelations was repeated, this time excluding the scores of people with an educational qualification below grade 12 and reported in Table 15. Lower intercorrelations were obtained.

TABLE 12. INTERCORRELATIONS BETWEEN THE ABILITY TESTS AND THE OTHER PREDICTORS FOR EDUCATION LEVELS GRADE 12 AND ABOVE (N = 129)

	NT6.1	**VC1.1**
NT6.1	1,00	
VC1.1	0,56**	1,00
LPCAT	0,58**	0,47**
AccuVision	0,17	0,20*
Assessment Centre	0,58**	0,40**

* Indicates correlation coefficients with p-values <=0,05.
** Indicates correlation coefficients with p-values <=0,01.

4.2.2 Correlations between predictors and the criterion

Correlation is concerned with determining the extent to which two sets of measures are related (Aiken, 2003). A number of correlations were calculated for testing the research hypotheses. Correlations between the criterion and predictors are reported on in Section 4.2.2.1. In presenting the results, correlation coefficients are depicted. For the purpose of analysis and interpretation, p-values of p<=0,01 and p<=0,05 were considered statistically significant as suggested by Smith and Smith (2005).

4.2.2.1 *Correlations between the criterion (supervisory ratings of work performance) and predictors*

Correlations between supervisory ratings of work performance as the criterion and the predictors (LPCAT, NT6.1, VC1.1, AccuVision and Assessment Centre) scores are presented in Table 16.

Testing of the coefficient of correlation was done by means of the following hypotheses:

$H_0 : \rho = 0$ indicating that there is no linear relationship between the two variables
$H_1 : \rho \neq 0$ indicating that a statistically significant linear relationship does exist between the two variables

The level of significance (two-tailed), which is also indicated in Table 16, provides information on the amount of statistical evidence supporting the alternative hypotheses. The value indicated represents therefore the probability of observing a test statistic at least as extreme as the one computed, given that the null hypothesis is true.

As reported in Section 4.2.1, the NT6.1 and VC1.1 were administered to 75 individuals with educational levels below grade 12. The scores of these individuals were omitted in the second correlation analysis presented in Table 17.

TABLE 13. CORRELATIONS BETWEEN WORK PERFORMANCE (CRITERION) AND PREDICTORS FOR ALL EDUCATION LEVELS (N = 204)

	LPCAT	NT6.1	VC1.1	ACCUVISION	ASSESSMENT CENTRE
Supervisory rating Pearson Correlation	0,22**	0,18**	0,19**	0,14	0,18*
Sig (2-tailed)	0,002	0,010	0,009	0,053	0,012

* Indicates correlation coefficients with p-values <=0,05.

** Indicates correlation coefficients with p-values <=0,01.

When the test results of the 75 individuals with educational levels below grade 12 were included in the sample, statistically significant correlations were obtained between four of the predictors and job performance. Although not strong, there seems to be a positive correlation between the LPCAT and job performance (r=0,22; p<=0,01). The correlation is statistically highly significant (p<0,002). This suggests that there is evidence to infer that the alternative hypothesis is true and there is a linear relationship between the LPCAT results and job performance.

Positive correlations, although not strong, were also reported between both the ability test results and the criterion measure (r=0,18; p<=0,01 for the NT6.1 and r=0,19; p<=0,01 for the VC1.1). This suggests that there is evidence to infer that the alternative hypotheses are true and that there is a linear relationship between job performance and the results of the two ability tests respectively.

A positive correlation, although very weak, was found between the Assessment Centre results and work performance (r=0,18; p<=0,05). This suggests that there is evidence to infer that the alternative hypothesis is true and that there is a linear relationship between assessment centre results and job performance.

Results indicated that there is no significant relationship between the AccuVision test results and work performance, shown by the very small Pearson correlation of 0,14.

When the test results of the 75 individuals with educational levels below grade 12 were omitted from the sample, no statistically significant correlations were obtained between the predictors and criterion. It can be deducted that the scores of these individuals were responsible for the variance (Joubert, T., personal communication, December 15, 2008).

TABLE 14. CORRELATIONS BETWEEN WORK PERFORMANCE (CRITERION) AND PREDICTORS FOR EDUCATION LEVELS GRADE 12 AND ABOVE (N = 129)

	LPCAT	NT6.1	VC1.1	ACCUVISION	ASSESSMENT CENTRE
Supervisory rating Pearson Correlation	0,04	0,04	0,03	0,06	0,06
Sig (2-tailed)	0,709	0,691	0,792	0,527	0,570

* Indicates correlation coefficients with p-values <=0,05.

** Indicates correlation coefficients with p-values <=0,01.

4.2.2.2 *Correlations between criterion and biographical data*

Correlations were calculated between the biographical data and the criterion data to determine the effect of these moderator variables.

The correlations between age and the criterion are reported in Table 18. The grouping of African and Coloured into a group 'black' was in accordance with the Employment Equity Act (No. 55 of 1998). For the correlations of AccuVision, VC1.1 and NT6.1 N=197. For the LPCAT N=195 and for the Assessment Centre N=194. N=201 for the correlation with job performance. For *Age White*, only white individuals were included in the analysis, while for *Age Black,* Africans and Coloureds were included.

As discussed in Section 4.1.1, correlations between gender and the criterion are not reported on as only 5% of the sample was female.

TABLE 15. CORRELATIONS BETWEEN AGE AND THE CRITERION

	Age		
	All	**White**	**Black**
Job performance	-0,06	-0,09	-0,07

* Indicates correlation coefficients with p-values <=0,05.
** Indicates correlation coefficients with p-values <=0,01.

None of the correlations with job performance reported in Table 18 were significant. The analysis showed no significant difference in terms of the criterion for the white and black race groups (refer to appendix 11).

The correlations between education level and the criterion are reported in Table 19. Educational level was coded as follows: Grade 10 and lower - 1, Grade 12 – 2, Post Matric Certificate – 3, Graduate – 4, Post Graduate – 5).

TABLE 16. CORRELATIONS BETWEEN EDUCATION LEVEL AND THE CRITERION

	Education level (including Grade 10 and lower)	Education level (excluding Grade 10 and lower)
Job performance	0,180*	0,148
Assessment Centre	0,258**	0,116
AccuVision	0,087	0,059
VC1.1	0,345**	0,170
NT6.1	0,392**	0,195*
LPCAT	0,380**	0,261**

* Indicates correlation coefficients with p-values <=0,05.
** Indicates correlation coefficients with p-values <=0,01.

The first column includes the correlations with educational level for the entire sample, including those individuals with an educational qualification lower than grade 12. As indicated in Section 4.2.2, the VC1.1 and NT6.1 are suitable for administration to individuals with a qualification of grade 12 and higher only. For this reason the 75 individuals have been omitted from the sample and the correlations with the predictors and criterion for the remainder is presented in the second column of table 19. The correlations with educational levels of grade 12 and higher are much lower, with no significant correlations with job performance reported.

A scenario of differential validity or range restriction is evident from the above. The predictor is valid for the combined group, but invalid for each of the sub groupings. There is a significant correlation between education level and job performance when the group is more heterogeneous, but not when divided into more homogeneous sub groupings (Cascio & Aguinis, 2005).

4.3 REGRESSION ANALYSIS

Multiple regression analyses were used to investigate the relationship between the predictors and the criterion. The resultant model can be used to predict the particular value and estimate the expected value of the dependent variable (Keller & Warrack, 2005).

Regression analysis, as depicted in Table 20, was done by using LPCAT, NT6.1, VC1.1, AccuVision and Assessment Centre results as the independent variables and supervisory ratings of work performance as the dependent variable.

TABLE 17. REGRESSION SUMMARY FOR THE DEPENDENT VARIABLE: JOB PERFORMANCE

ANALYSIS OF VARIANCE

Model summary

Multiple correlation (R)	0,250[a]
R-squared	0,062
Adjusted R-squared	0,037
Standard Error of Estimate	0,4804

a. Predictors: (Constant), LPCAT, AccuVision, Assessment Centre, VC1.1, NT6.1

ANOVA

Model	Sum of squares	Df	Mean Square	F	Sig
1 Regression	2,815	5	0,563	2,440	0,036[a]
Residual	42,235	183	0,231		
Total	45,050	188			

a. Predictors: (Constant), LPCAT, AccuVision, Assessment Centre, VC1.1, NT6.1

b. Dependent Variable: Job performance

Coefficients

	B	STD. ERROR	BETA	t	p-LEVEL	Zero-Order	Partial	Part
Intercept	2,307	0,142		16,232	0,000			
Assessment Centre	0,014	0,016	0,080	0,882	0,379	0,163	0,065	0,063
AccuVision	0,019	0,014	0,101	1,359	0,176	0,143	0,100	0,097
VC1.1	0,007	0,025	0,025	0,261	0,794	0,155	0,019	0,019
NT6.1	-0,010	0,027	-0,043	-0,383	0,702	0,159	-0,028	-0,027
LPCAT	0,040	0,022	0,176	1,784	0,076	0,216	0,131	0,128

The possibility of a linear relationship between the five independent variables and supervisory ratings of work performance was tested in a multiple regression model represented by the following equation:

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta 5 x_5 + \varepsilon$$

where the independent variables were:
x_1 = Assessment Centre
x_2 = AccuVision
x_3 = VC1.1
x_4 = NT6.1
x_5= LPCAT
ε = error variable
and,
y = supervisory ratings / work performance (dependent variable)

The very small value of the adjusted R square indicates that a very small portion, only 3,7%, of the variation in supervisory ratings of work performance is explained by the variation in the predictor results. However, this does not mean that the test battery cannot predict the work performance of first-line supervisors. The rationale for this reasoning will be presented in Section 4.4.5.

The regression analysis was repeated with the inclusion of race as depicted in Table 21.

TABLE 18. REGRESSION SUMMARY (RACE INCLUDED) FOR DEPENDENT VARIABLE: JOB PERFORMANCE

ANALYSIS OF VARIANCE

Model summary

Multiple correlation (R)	0,256[a]
R-squared	0,065
Adjusted R-squared	0,034
Standard Error of Estimate	0,4819

a. Predictors: (Constant), Race-coded, AccuVision, Assessment Centre, LPCAT, VC1.1, NT6.1

ANOVA

Model	Sum of squares	Df	Mean Square	F	Sig
1 Regression	2,944	6	0,491	2,113	0,0546[a]
Residual	42,041	181	0,232		
Total	44,986	187			

a. Predictors: (Constant), Race-coded, LPCAT, AccuVision, Assessment Centre, VC1.1, NT6.1 b. Dependent Variable: Job performance

Coefficients

	B	STD. ERROR	BETA	t	p-LEVEL
Intercept	2,325	0,147		15,848	0,000
Assessment Centre	0,015	0,016	0,085	0,942	0,347
AccuVision	0,019	0,014	0,100	1,353	0,178
VC1.1	0,005	0,025	0,018	0,189	0,850
NT6.1	-0,020	0,029	-0,080	-0,674	0,501
LPCAT	0,041	0,023	0,180	1,832	0,069
Race-coded	0,074	0,082	0,074	0,905	0,367

No significant difference in results was found with the inclusion of race in the regression analysis (R square = 0,065 as opposed to 0,062. Adjusted R Square 0,034 as opposed to 0,037).

The next step would normally be to perform a stepwise regression analysis to determine the best model. In this study it could, however, be argued that such an analysis would not have served any purpose. This is evident from the eigenvalues reported in Table 22, which indicate the sum of the degree to which each predictor is associated (correlated) with the factor. The general convention is that only those factors with eigenvalues greater than 1 should be considered as meaningful factors (Terre Blanche & Durrheim, 2002). These statistics should be kept in mind when interpreting the stepwise regression analysis in Table 23. The final model, Model 8, shows only the LPCAT to correlate significantly with job performance ($p<=0,05$).

TABLE 19. COLLINEARITY DIAGNOSTICS

Model	Dimension	Eigenvalue	Condition Index
1	1	5,637	1,000
	2	0,158	5,981
	3	0,087	8,042
	4	0,050	10,610
	5	0,040	11,941
	6	0,029	14,014

TABLE 20. STEPWISE REGRESSION SUMMARY FOR THE DEPENDENT VARIABLE: JOB PERFORMANCE

Model		B	Std. Error	Beta	t	p-level
1	(Constant)	2,884	0,163		17,680	0,000
	LPCAT	0,088	0,046	0,194	1,917	0,057
	NT6.1	-0,030	0,059	-0,060	-0,499	0,618
	VC1.1	0,006	0,051	0,012	0,122	0,903
	AccuVision	0,055	0,041	0,100	1,345	0,180
	Ass. Centre	0,048	0,048	0,091	1,002	0,318
	Black	-0,017	0,106	-0,015	-0,158	0,874
	Coloured	-0,102	0,087	-0,099	-1,178	0,240
	Male	-0,092	0,159	-0,042	-0,579	0,564
2	(Constant)	2,886	0,162		17,800	0,000
	LPCAT	0,089	0,045	0,197	1,981	0,049
	NT6.1	-0,028	0,057	-0,057	-0,486	0,628
	AccuVision	0,056	0,041	0,101	1,365	0,174
	Ass. Centre	0,050	0,047	0,094	1,062	0,290
	Black	-0,017	0,106	-0,015	-0,162	0,871
	Coloured	-0,103	0,086	-0,099	-1,198	0,233
	Male	-0,093	0,159	-0,043	-0,588	0,558
3	(Constant)	2,881	0,159		18,171	0,000
	LPCAT	0,090	0,045	0,198	2,003	0,047
	NT6.1	-0,024	0,053	-0,050	-0,459	0,647
	AccuVision	0,056	0,041	0,101	1,371	0,172
	Ass. Centre	0,050	0,047	0,094	1,066	0,288
	Coloured	-0,097	0,077	-0,093	-1,267	0,207
	Male	-0,095	0,158	-0,043	-0,598	0,551
4	(Constant)	2,885	0,158		18,276	0,000
	LPCAT	0,078	0,037	0,172	2,124	0,035
	AccuVision	0,054	0,040	0,097	1,330	0,185
	Ass. Centre	0,041	0,042	0,077	0,964	0,336
	Coloured	-0,092	0,076	-0,088	-1,215	0,226
	Male	-0,101	0,157	-0,046	-0,640	0,523
5	(Constant)	2,788	0,043		64,992	0,000
	LPCAT	0,079	0,037	0,174	2,148	0,033
	AccuVision	0,055	0,040	0,099	1,363	0,175
	Ass. Centre	0,041	0,042	0,077	0,961	0,338
	Coloured	-0,085	0,075	-0,082	-1,143	0,255
6	(Constant)	2,791	0,043		65,211	0,000
	LPCAT	0,094	0,033	0,207	2,822	0,005
	AccuVision	0,058	0,040	0,105	1,452	0,148
	Coloured	-0,083	0,075	-0,080	-1,108	0,269

7	(Constant)	2,764	0,035		79,160	0,000
	LPCAT	0,089	0,033	0,196	2,695	0,008
	AccuVision	0,058	0,040	0,106	1,454	0,148
8	(Constant)	2,760	0,035		79,022	0,000
	LPCAT	0,098	0,032	0,216	3,024	0,003

The regression model assumes that the response variable or the error terms are normally distributed. It is therefore important to plot the distribution of the error terms to ascertain any violation of the normality assumption.

The cumulative proportion of the independent variable against the cumulative proportions of the predictors is displayed in figure 4. Probability plots are used to determine whether the distribution of a variable matches a given distribution. If the selected variable matches the test distribution, the points cluster around a straight line, as is the case in this situation.

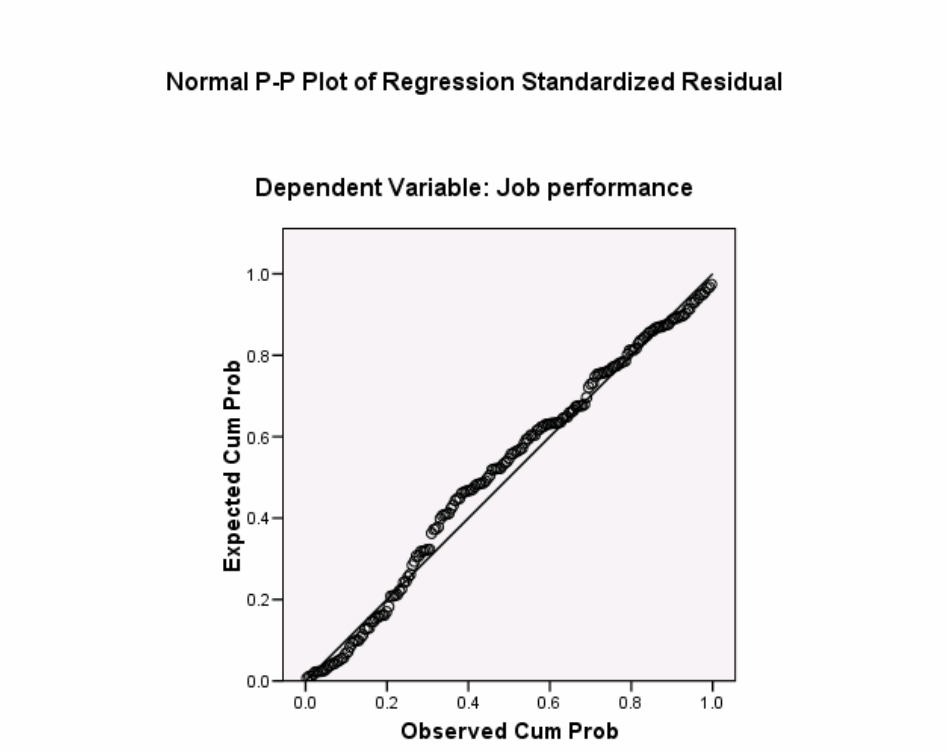

Figure 1. Normal P-P Plot of Regression

4.4 INTEGRATION OF RESULTS

The statistical results for the research are presented in Sections 4.1 to 4.3. In this section, the results will be integrated and discussed. The main purpose of the research was to determine if a test battery could assist in predicting job performance. This purpose will guide the discussion of the results and the focus will therefore be on identifying if a relationship exists between the predictors and the criterion.

4.4.1 The learning potential test predictor

The findings of the research support evidence presented in Chapter 2 of the literature review (Section 2.2.1.3) that learning potential can be used as a predictor of performance. Although not strong, a statistically highly significant correlation (r=0,22; p<=0,01) was found between the LPCAT and job performance when all education levels were included in the analysis. The analysis excluding the 75 individuals with education levels below grade 12 showed no statistically significant relationship between the LPCAT and job performance (r=0,04)

Before the first hypothesis, “There is a statistically significant relationship between the learning potential test scores and job performance” is rejected based on this finding, the limitations of the study as discussed in section 4.4.5 should be considered.

4.4.2 The ability test predictors

The literature review in Chapter 2 (Section 2.2.1.2) highlighted that ability tests have long been accepted as predictors of performance. The results of the

research when including the entire sample irrespective of education level confirm this position. In terms of the critical reasoning tests positive correlations, although not strong, were reported between both the ability tests and job performance (r=0,18; p<=0,01 for the NT6.1 and r=0,19; p<=0,01 for the VC1.1).

The correlation found in this research between the NT6.1 test scores and job performance is weaker than that reported in validation studies for the selection of technical officers and demand forecasters respectively. In these studies (SHL, 1999c; SHL, 2000c) average correlations of numerical critical reasoning to criteria showed correlations of 0,38 and 0,40 respectively.

The correlation found in this research between the VC1.1 test scores and job performance is weaker than that reported in a validation study for the selection of middle managers. In this study (SHL, 1999a) a correlation of 0,33 was reported between tests scores and the assessment of current job performance.

The sample included 75 individuals with an educational level of below grade 12. The NT6.1 and VC1.1 are only suitable for administration to individuals with a minimum education level of grade 12. When this was taken into account and the 75 individuals omitted from the sample, the correlation analysis reported no significant correlations for both the tests (r=0,04 for the NT6.1 and r=0,03 for the VC1.1)

Before the second and third hypotheses, “There is a statistically significant relationship between the numerical ability test scores and job performance” and “There is a statistically significant relationship between the verbal ability test scores and job performance” are rejected based on these findings, the limitations of the study as discussed in section 4.4.5 should be considered.

4.4.3 The situational judgment test predictor

The literature review in Chapter 2 (Section 2.2.1.4) indicated that situational judgment tests are accepted as predictors of performance. The result of this research does not confirm this position. No statistically significant relationship was shown between the AccuVision test results and work performance (*r*=0,14) when all education levels were included in the analysis.

The analysis excluding the 75 individuals with education levels below grade 12 also reported no statistically significant relationship between the AccuVision test results and supervisory ratings of job performance (*r*=0,06).

This finding is not in line with the results of validation studies reported in Section 3.4.4.4 where correlations of 0,43 and 0,41 were shown between test scores and job performance (Britz, P.J., personal communication, September 4, 2007; Resource Connection)

Before the fourth hypothesis, "There is a statistically significant relationship between the situational judgment test scores and job performance" is rejected based on this finding, the limitations of the study as discussed in section 4.4.5 should be considered.

4.4.4 The Assessment Centre

The findings of the research support evidence presented in Chapter 2 (Section 2.2.1.1) that assessment centres can be used as predictors of performance. A statistically significant positive correlation, although very weak, was found between the Assessment Centre results and work performance (*r*=0,18; p<=0,05) when all education levels were included in the analysis.

However, this correlation is significantly weaker than that reported in a meta-analytical study conducted by Gaugler et al. (1987) where a mean validity coefficient of 0,37 was shown for assessment centres. Another study by Cohen, Moses and Byhan (Hunter & Hunter, 1984) reported a median correlation of 0,33 between assessment centres and supervisor ratings of job performance.

The exclusion of the 75 individuals with education levels below grade 12 reported no statistically significant correlation between the Assessment Centre results and supervisory ratings of job performance (r=0,06)

Apart from the reasons discussed in section 4.4.5, this finding could also be the result of only the overall assessment centre score for each individual that was available for the analyses, and not the scores for the various competency clusters measured.

Before the fifth hypothesis, “There is a statistically significant relationship between the assessment centre test scores and job performance” is rejected based on these findings, the limitations of the study as discussed in section 4.4.5 should be considered.

4.4.5 The test battery

In considering the results of the multiple regression analysis, it is evident that none of the predictors correlate with job performance as defined and measured in this study. The high significance values of all the independent variables, Assessment Centre (0,379), AccuVision (0,176), VC1.1 (0,794), NT6.1 (0,702) and LPCAT (0,076) (as reported in table 20) indicate that these factors are not strong predictors of the job performance of first-line supervisors as rated by their immediate supervisors or managers.

The stepwise regression analysis performed indicated that only the LPCAT scores correlate significantly with job performance ($p<=0,05$). However, various limitations of the research should be taken into account before the sixth hypothesis, “There is a significant relationship between the test battery and job performance” is rejected.

The first problem was identified with the criterion. An average KPI score per individual was used and not the separate Key Job Performance/Results Areas as outlined in appendix 8. Twelve subcategories which probably do not correlate significantly with each other were combined, resulting in the unique characteristics of each category being lost. For example, this leads to the specific abilities as measured by the NT6.1 and VC1.1 not correlating strongly with supervisory ratings of work performance (Cascio et al., 2005; Joubert, T., personal communication, December 15, 2008).

In section 3.5 it was reported that the final supervisory rating of work performance was obtained by adding the scores of the individual KRAs and then dividing the sum by the number of KRAs that the individual obtained a score for. This implies that all individuals were not evaluated against the same number of subcategories of the criterion.

These limitations with the data severely affected the analyses. Because the predictors reported such weak correlations with the criterion and high inter-correlations with each other, better results with the regression analysis could not be expected (Joubert, T., personal communication, December 15, 2008). The reported results do not indicate that the test battery cannot predict the work performance of first-line supervisors, but that it cannot successfully predict the criterion as it is used in this study. The choice of a number of different tests to predict work performance is to measure the various aspects relevant to the position. In this study, because of the data available to the researcher, this measurement could not be done.

The negative value of the NT6.1 in the regression table, points to a definite dilemma. This can also be seen in the change from a positive to a negative value from the zero-order correlations to the part and partial correlations. Aguinis (1995) indicates that this is a sign of collinearity, where a strong correlation exists between two variables, making it difficult or impossible to estimate their individual regression coefficients reliably.

Thus, the sixth hypothesis cannot be accepted, nor rejected as the probability of a Type I error (false rejection of the null hypothesis) or Type II error (retaining the null hypothesis when it is false) would be made with this data (Christensen, 1997).

4.4.6 Extraneous variable effect

The extraneous variables of race, gender, age, and education level were considered in the research to determine if they presented any moderating effect. As reported in Section 4.2.2.2 correlation analysis were calculated to this end. No effect was shown in these statistical analyses.

In concluding this chapter, the results of the research have been reported and the specific aims of the empirical study as detailed in Section 1.3.2 have been met.

4.5 CHAPTER SUMMARY

In this chapter the research results were presented, interpreted and discussed. The results obtained and reported on in the statistical analyses enabled the fulfilment of the research objectives. In Chapter 5 that follows, conclusions from the research will be discussed, as well as the limitations of the study and recommendations for future research.