CHAPTER 7

PSYCHOMETRIC CONSIDERATIONS OF THE STUDY

7.1 INTRODUCTION

In this chapter the psychometric considerations of the study are extensively discussed. The concepts of validity and reliability are discussed as well as the construction of the Survey of Work Values of Wollack et al (1971), the Internal Control Index of Duttweiler (1984), the Work Value Survey of Hofstede (1980) and the Multifactor Leadership Questionnaire of Bass et al (1997).

7.2 VALIDITY

Validity refers to the extent to which an empirical measure "adequately reflects the real meaning of the concept under consideration (Babbie, 1989: 124). A similar definition is offered by Bohrnstedt and Knoke (1988: 12), namely "… the degree to which an operation results in a measure that accurately reflects the concept it is intended to measure". For De la Rey (1978: 30) an instrument or test is valid if it does measure the particular concept or characteristic it pretends to measure. The validity of an instrument is expressed as a validity coefficient which is determined by means of correlation (coefficient) statistics. According to Smit (1983: 47) the validity estimate is determined by calculating a correlation between the performances in a test and an independent, objective measure of the behavioural aspect (criterion) being measured (Smit, 1983: 47).

Babbie (1989: 124) distinguishes between three types of validity, viz criterion-related validity, content validity and construct validity. Criterion-related validity (also referred to as predictive validity) is based on some external criterion. It refers to the "relationship between a test and a criterion rather than a construct or domain" (Mason & Bramble, 1989: 264). It indicates the presence or absence of one or more criteria considered to represent traits or constructs of interest. Criterion-related validity may be separated into two types, namely predictive validity and concurrent validity. Predictive validity refers to the degree to which a measure forecasts the presence or absence of the trait or construct in the future (Mason et al, 1989: 264). Smit (1983, 52) indicates that the Bravais-Pearson product moment correlation or multiple regression is used to determine a predictive validity estimate. Concurrent validity is concerned with the capacity of a measure to reflect the present status of the criteria (Mason et al, 1989: 264). Therefore, it is diagnostic in nature. It is particularly useful in cases where the sample size and time are too restricted to do a validation study within the framework of predictive validity (Smit, 1983: 62).

Content validity, according to De la Rey (1978: 31) indicates the degree to which the content of a test is representative of the behavioural aspect or construct being measured. It can be regarded as a qualitative, non-statistical type of validity. Smit (1983: 48) refers to the fact that content validity is concerned with the content of a test, that is the substantive elements.

Construct validity indicates how well a test measures the construct it is intended to measure and refers to the meaning of test scores in terms of the constructs being measured (Cronbach & Meehl, 1955). Construct validity evaluates both the construct as well as the adequacy of the test in measuring the construct (Smit, 1983: 64). Mason et al (1989: 261) present two approaches to the study of construct validity, viz convergence and discriminant validity. Convergent validity involves the gathering of data concerning the construct being measured by using a known established method and comparing the results of this measure with those of the test being evaluated. Convergence therefore refers to the extent to which the results of a test correlate with those of existing tests measuring the same concept. Discriminant validity, according to Mason et al (1989: 261), refers to the level to which "…a construct may be discriminated from other constructs that may be somewhat similar or entirely different". In this regard Smit (1983: 66) emphasises that it is also important that a test must correlate low with all tests not being measures of the same construct.

In addition to the above two approaches towards determining construct validity, Smit (1983: 66) mentions a third, namely factor analysis of inter-correlations obtained from a number of tests. In essence factor analysis is a method of analysing the internal statistical structure of a set of variables that are supposed to be a measure of the specific construct. In the factor analysis of test items, each item is regarded as a variable. In this way maximum homogeneity with regard to the construct can be achieved (Smit, 1983: 66).

Lastly, (De la Rey, 1978: 31) also refers to face validity (or expert validity). It simply refers to how obviously a test measures the construct it intends to measure. It could constitute the degree of consensus between experts that a measure represents a particular concept (Dane, 1990: 257).

7.3 SURVEY OF WORK VALUES

The Survey of Work Values (SWV) was developed to measure a person's attitude towards work in general, rather than his feelings about one specific job. According to Wollack et al (1971: 331), the SWV differ from other previous scales in that it evaluates separate areas of values and that it is limited to the construct of the Protestant Ethic (as discussed in Chapter 3).

7.3.1 COMPOSITION OF THE SCALE

Wollack et al (1971) gives a thorough explanation of the composition of the scale. Due to the fact that the intrinsic aspects of work (i.e. work is rewarding in itself) form such an important part of the Protestant Ethic, the authors selected three dimensions of Protestant Ethic covering the intrinsic aspects of work:

- Pride in work. The satisfaction and enjoyment one gets from doing one's work well.
- Job involvement. The degree to which a worker is actively interested in co-workers and company functions and desires to contribute to job-related decisions.
- Activity preference. It refers to a preference by the worker to stay busy on his job.

Considerable emphasis was also placed on extrinsic rewards by including the following subscales:

- Attitude toward earnings. The value of making money on the job.
- Social status of the job. The effect of the job alone on a person's standing among his friends, co-workers and relatives.

Two further dimensions of the Ethic that are regarded to be of a mixed nature (intrinsic/extrinsic) were also included:

- Upward striving. The continuous desire to seek a higher level job and a better standard of living.
- Responsibility to work. It refers to the belief that man has an obligation to work and that he must depend on himself rather than others for support.

The last dimension, namely "responsibility to work" was eliminated after determining the internal validity of the dimensions. The scale therefore consists of the remaining six sub-scales, which in total, contain 54 items. The items representing each of the sub-scales are as follows:

Sub-scale	Items
Pride in Work	12, 13, 16, 32, 36, 43, 48, 52, 53
Job Involvement	6, 7, 14, 17, 24, 25, 33, 37, 44
Activity Preference	5, 9, 20, 27, 29, 39, 46, 50, 54
Attitude towards Earnings	10, 15, 21, 23, 30, 34, 41, 47, 51
Social Status	1, 2, 3, 4, 18, 26, 38, 45, 49
Upward Striving	8, 11, 19, 22, 28, 31, 35, 40, 42

7.3.2 VALIDITY OF THE SURVEY OF WORK VALUES

The construct validity of the Survey of Work Values of Wollack et al (1971) was determined in this instance by means of a factor analysis. The Kaiser-Meyer-Olkin (KMO) measure, as well as the Bartlett's test of sphericity were calculated. The KMO is an index of sampling adequacy for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. If the sum of the squared partial correlation coefficients between all pairs of variables is small when compared to the sum of squared correlation coefficients, the KMO is close to 1 (Norusis, 1990:317). Small values of the KMO measure are an indication that a factor analysis of the variables may not be a good idea, as correlations between pairs of variables cannot be explained by other variables. Also, if the significant level of the Bartlett's test of sphericity is small ($p \leq 0.05$), the hypothesis that the correlation is an identity matrix, has to be rejected (Norusis, 1990: 316). The Bartlett's test of sphericity is based on a chi-square (χ^2) transformation of the determinant of the correlation. The values of the KMO measure and Bartlett's test of sphericity are presented in Table 7.1.

Table 7.1: Kaiser-Meyer-Olkin measure and Bartlett's Test of Sphericity for the Survey of Work Values.

Measure	Value
Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)	.766
Bartlett's Test of Sphericity:	
Approx. Chi-Square	4583.996
df	1431
Sig	.000

The values of the KMO and the Bartlett's test of sphericity imply that there can be proceeded with a factor analysis.

The negative of the partial correlation coefficient is an estimate of the correlation between the unique factors and should be close to zero (0) when the factor analysis assumptions are met. The negative of the partial correlation coefficient is called the anti-image correlation. If the proportion of large coefficients is high, the use of a factor analysis should be reconsidered (Norusis, 1990)

Anti-image correlations were determined and the coefficients obtained are in general very low. This implies that there can be conveniently proceeded with a factor analysis. Figure 7.1 shows that a five-factor model should be sufficient for the sample.

Figure 7.1: Scree Plot: Survey of Work Values.

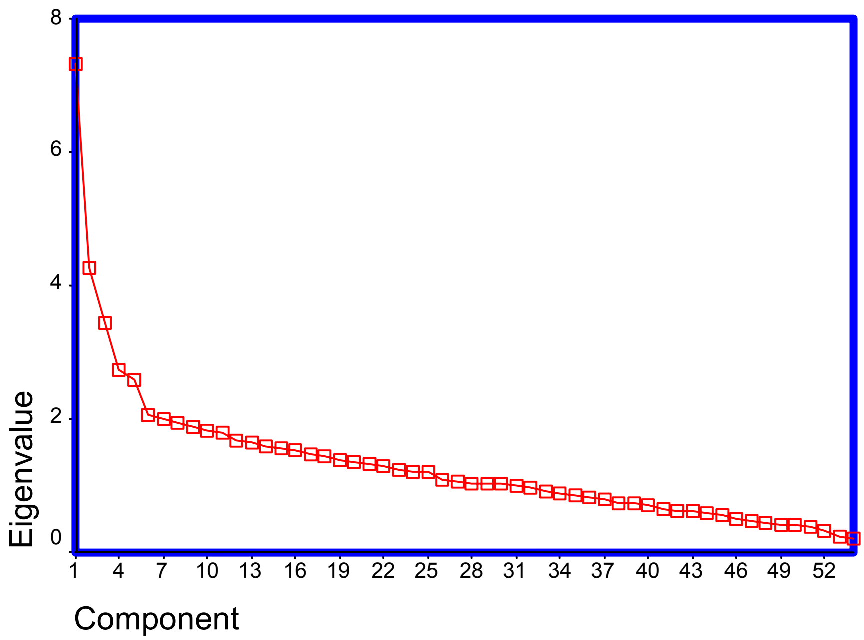


Figure 7.1 presents a plot of the total variance associated with each factor. It is evident that there is quite a break between the steep slope of the first three large factors and the gradual trailing off of the rest. This gradual trailing off "resembles the rubble that forms at the foot of the mountain" (Cattell, 1966). At the utmost only five factors of worth were obtained. The rotated component matrix is presented in Table 7.2.

Table 7.2: Rotated component matrix for Survey of Work Values.

	Rescaled Component						
	1	2	3	4	5	8	18
B30		.355					
B15		.276					
B51							
B37	.471						
B34							
B46	.454						
B43	.451						
B49							
B47							.392
B27	.437						
B35	.416						
B24	.396						
B26							.502
B16	.383						
B38					.338		
B9	.357						
B44	.341						
B25	.317						
B20	.289						
B7							
B31		.439					
B54		.419					
B53		.409					
B12		.400					
B5		.371					
B36		.365					
B48		.359					
B11							
B17		.326					
B19		.326					
B39		.313					
B32		.292					
B13		.263					
B52		.225					
B42			.604				
B22			.543				
B41			.509				
B2				.588			
B3				.532			
B33				.397			
B1					.579		
B10							
B14							
B18						.488	

Table 7.2 (continued)

	Rescaled Component						
	1	2	3	4	5	8	18
						.430	
B8							
B29				.324			
B28		.270					
B50		.272					
B21	.404						
B40						.290	
B23							
B6							.325
B4					.301		
B45					.302		

Extraction method: Principle Component Analysis

The results of the rotated component matrix are in agreement with the plot in Figure 7.1. According to Table 7.2 only five factors at the most are of importance to the study, with the first three the most important. The information in Table 7.2 shows that in general, the content of the questions classified under Factor (Component) 1 relate to “a negative work ethic”. It refers to a typical attitude of “as little work as possible” and “non-involvement”. The questions classified under Factor 2 relate to a “positive work ethic” and emphasise the value of “hard work” and “doing a good job”, while the questions classified under Factor 3 revolves around “stability” and a low “motivation for advancement” in one’s job. There is a distinct lack of correspondence between the factors as found by the rotated component matrix in this case and the six discriminantly different sub-scales resulting from reallocation[1], as presented by Wollack et al (1971). They too found a lack of correspondence between the two procedures used (factor analysis and reallocation). The researcher therefore decided to use the factors (sub-scales) of the survey as they were standardised by Wollack et al (1971) for the purpose of statistical data processing.

The total variance explained is presented in Table 7.3.

[1] Reallocation groups items in terms of whether they have been judged to be relevant to a particular defined category (Wollack et al, 1971: 336).

Table 7.3: Total variance explained: Survey of Work Values.

Component	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	5.480	10.148	10.148
2	3.430	6.361	16.499
3	2.256	4.178	20.677
4	1.739	3.221	23.897
5	1.656	3.067	26.964
6	1.456	2.697	29.661
7	1.375	2.546	32.207
8	1.340	2.481	34.688
9	1.297	2.402	37.089
10	1.255	2.324	39.414
11	1.217	2.253	41.667
12	1.185	2.194	43.861
13	1.178	2.182	46.043
14	1.153	2.135	48.178
15	1.119	2.073	50.250
16	1.092	2.022	52.272
17	1.047	1.939	54.211
18	1.034	1.914	56.125
19	1.016	1.882	58.007

As is evident from Table 7.3, the first six components explained 29.661% of the variance.

7.4 INTERNAL CONTROL INDEX

The Internal Control Index (ICI) was developed by Duttweiler (1984) as an answer to problems encountered with existing locus of control measures. Owing to the criticism having been levelled against the use of the Rotter (1966) Internal-External scale (Duttweiler, 1984: 211; De Kock, 1995: 8), the researcher decided on the use of an instrument measuring internality (namely the ICI). The instrument was developed in an attempt to eliminate the shortcomings of prior instruments such as the Rotter-scale.

Points of criticism being levelled by Duttweiler (1984: 210) against the use of the I-E scale, include the following:

- A low item total-score correlation.
- The multi-dimensionality of the scale.
- The use of a forced-choice format. This format takes longer to administer, is more susceptible to social desirability response and the

items to be chosen from are not necessarily symmetrical. The items making up the scale, also vary in their referents.

- The inclusion of items not representing the construct.
- The heterogeneity of the external control orientation. Externality may have various sources that should be investigated separately (Kleiber, Veldman & Menaker, 1973;Levenson, 1974).

7.4.1 COMPOSITION OF THE SCALE

The development of the ICI was conducted in four phases, viz the pretesting development phase, the tryout testing, the field test administration, and the Gainesville Junior College administration. The development began with the identification of a nomological network that surrounds the locus of control construct (Duttweiler, 1984: 211). This involves cognitive processing, autonomy, resistance to influence attempts, delay of gratification, and self-confidence. These variables seem to be most pertinent to internality (Lefcourt, 1976)

According to Duttweiler (op cit) the pretesting phase embraced the evaluation of items to identify the items that appeared to tap the internal control dimension. After the investigation of the response set, steps were taken to attenuate the effect of the various sets affecting self-report measures. Thereafter, the format, responses and the instrument itself were evaluated and revised for clarity, conciseness, and ease of administration (Duttweiler, 1984: 211). The tryout test was done by administration of the index to a sample of junior college, continuing education, college, and university students. Of the answer sheets obtained, 548 sets of data were usable. These data were subjected to both an item and factor analysis, which produced 28 items suitable for field administration and construct validation procedure. Field administration was done to a population similar to that used in the tryout phase. Usable data from the sample were derived from 684 answer sheets. Score means were computed for each level of the demographic variables and the instrument was evaluated by means of analysis of variance, item analysis and factor analysis (Duttweiler, 1984: 212).

In the final phase the instrument was applied to a sample of 133 students from Gainesville Junior College, Gainesville, Georgia. Together with this instrument, the Mirels' Factor I of the Rotter I-E Scale (Mirels, 1970 as quoted by Duttweiler, op cit) was also administered. Item analysis and factor analysis were computed for the data obtained from the Internal Control Index (ICI) to determine whether the findings of the field test would replicate. Convergent validity was also determined by means of the correlation between the ICI and Mirels' Factor I of the Rotter I-E scale.

7.4.2 VALIDITY OF THE INTERNAL CONTROL INDEX

Mean scores of each level of the demographic variables and the analysis of variance were computed by means of a Statistical Analysis System (SAS) program. The Gainesville Junior College administration did not reveal any differences (Duttweiler, 1984: 213). The exploratory factor analysis was done by means of the Statistical Package for the Social Sciences (SPSS). The SPSS program for principle axis factoring with iteration, yielded eight (8) factors with eigenvalues of ≥1.00 on both the field test and the Gainesville initial extractions, as is evident from Table 7.4

Table: 7.4: Field test and Gainesville principle axis factoring with interaction eigenvalues, percents of variation, and cumulative pertcentages.

	FIELD TEST			GAINESVILLE		
Factor	Eigenvalue	% of Var	Cum %	Eigenvalue	% of Var	Cum %
1	5.008	17.9	17.9	5.943	21.1	21.2
2	2.670	9.5	27.4	2.246	8.0	29.2
3	1.764	6.3	33.7	1.876	6.7	35.9
4	1.445	5.2	38.9	1.680	6.0	42.0
5	1.236	4.4	43.3	1.470	5.3	47.2
6	1.175	4.2	47.5	1.319	4.7	51.9
7	1.046	3.7	51.2	1.243	4.4	56.4
8	1.014	3.6	54.8	1.173	4.2	60.5

(Source: Duttweiler, 1984: 215)

Duttweiler (1984: 215) considered the reduction of 28 items to eight factors of little explanatory value or insight. Therefore the eigenvalues were examined for a discontinuity that would be sufficient to warrant rotation to a lesser number of factors. It was decided to perform a two factor varimax rotation (Duttweiler, 1984: 215). The results of this varimax rotation is presented in Table 7.5.

Table: 7.5: Field test of Gainesville two factor varimax rotation communalities and factor loadings.

	FIELD TEST			GAINESVILLE		
ICI Item	Comm	Factor 1	Factor 2	Comm	Factor 1	Factor 2
1	.049	.177	.131	.268	.306	.418
2	.255	.285	.417	.203	-.048	.448
3	.212	.416	.198	.183	.371	.213
4	.138	.305	.212	.152	.287	.264
5	.165	.386	.128	.178	.241	.141
6	.161	.209	.342	.179	.083	.415
7	.160	.363	.167	.411	.640	.035
8	.125	.029	.353	.231	.074	.475
9	.217	.457	.090	.358	.598	-.007
10	.119	.332	.075	.143	.331	.185
11	.243	.122	.478	.198	.064	.440
12	.106	.009	.325	.152	.340	.190
13	.245	.488	-.079	.526	.725	-.014
14	.363	.063	.599	.366	.111	.595
15	.299	.547	-.011	.468	.674	.115
16	.293	.542	.002	.316	.358	.433
17	.131	.050	.358	.061	.141	.203
18	.155	.374	.126	.175	.063	.413
19	.158	.058	.393	.197	.369	.247
20	.306	.553	-.007	.358	.483	.353
21	.175	.414	.054	.200	.294	.338
22	.323	.095	.560	.274	.232	.469
23	.259	.243	.448	.435	-.644	-.142
24	.255	.060	.501	.112	.140	.304
25	.233	.479	.063	.131	.272	.240
26	.326	.149	.551	.22	.287	.370
27	.381	.077	.612	.190	.161	.406
28	.337	.578	.049	.216	.377	.271

(Source: Duttweiler, 1984: 216)

It is obvious from Table 7.5 that the Gainesville two factor varimax rotation produced two factors quite similar to those produced on the field test. The Gainesville Factor 1 accounted for 76.9% of the common variance and contained 13 items with loadings at 0.300 or higher, viz 1, 3, 7, 9, 10, 12, 13, 15, 16, 19, 20, 23, and 28. Factor 2 contained items 1, 2, 6, 8, 11, 14, 16, 18, 20, 21, 22, 24, 26, and 27 with loadings of 0.300 or more. According to Duttweiler the results as presented in Table 7.5 suggest that the ICI may be a stronger, more reliable instrument for measuring internal locus of control.

In the case in hand, the Duttweiler scale was applied to a sample of 509 respondents from different categories of age, home language, religion, educational qualifications, occupational level, work experience and population groups. These data were subjected to a factor analysis with varimax rotation and principle components extraction. The results of the Kaiser-Meyer-Olkin measure (KMO) and the Bartlett's test are presented in Table 7.6.

Table 7.6: Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity for the Internal Control Index.

Measure	Value
Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)	.813
Bartlett's Test of Sphericity:	
Approx. Chi-Square	2173.037
df	378
Sig	.000

It is evident from Table 7.6 that there can comfortably be proceeded with a factor analysis, as the KMO values equal 0.813, which is meritorious, and Bartlett's test of sphericity has a very small probability level (Bartlett's test of sphericity = 2173.073 with 378 df and $p = 0.000$ p being < 0.05). The KMO is a measure of sampling adequacy and if the sum of squared partial correlations between all pairs of variables is small when compared to the sum of squared correlation coefficients, a factor analysis is advised (Norusis, 1990:317). The Bartlett's test of sphericity tests the hypothesis that the population matrix is an identity matrix. The hypothesis that the population matrix is an identity can comfortably be rejected in this instance because the probability is small (0.000).

Figure 7.2 shows that a three-factor model should be sufficient for the sample used in this study.

Figure 7.2: Scree Plot: Duttweiler ICI.

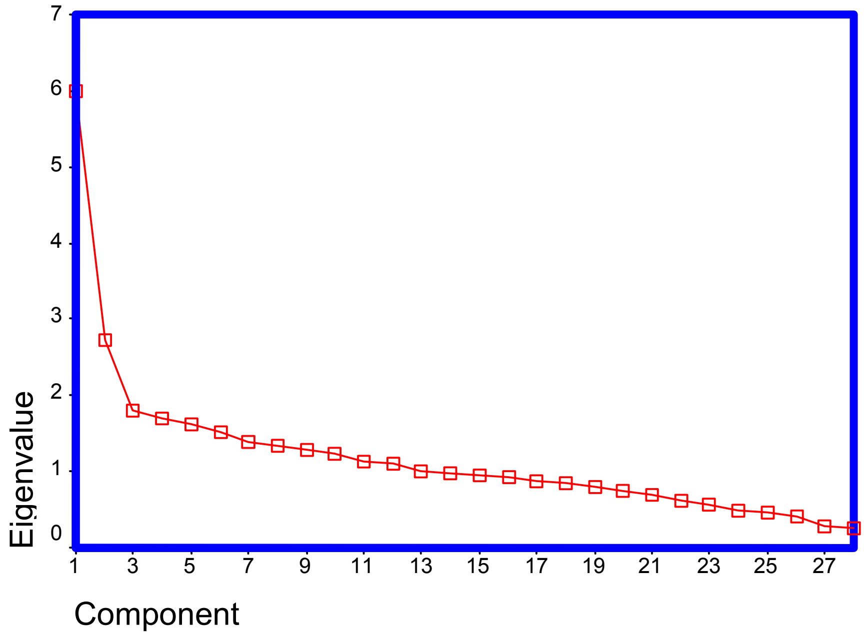


Figure 7.2 is a plot of the total variance associated with each factor. It is quite evident that there is a distinct break between the steep slope of the large factors and the trailing off of the rest of the factors. The matrix with total variance explained is presented in Table 7.7.

Table 7.7: Total variance explained: ICI.

	Component	Extraction of Squared Loadings		
		Total	% of Variance	Cumulative %
Rescaled	1	4.167	14.883	14.883
	2	2.596	9.271	24.154
	3	1.287	4.597	28.750
	4	1.106	3.949	32.700
	5	1.103	3.938	36.637
	6	.975	3.482	40.120
	7	1.075	3.839	43.958
	8	.892	3.187	47.145
	9	.897	3.202	50.348
	10	.861	3.074	53.421

From Table 7.7 it is clear that the first three components explained 28,750% of the variance. Therefore a model of three factors should be adequate to represent the data. The rotated component matrix with the three factors is presented in Table 7.8.

Table: 7.8: Rotated component matrix: ICI.

	Rescaled					
	Component					
	1	2	3	4	5	6
C1			.450			
C2			.700			
C3	.294					
C4					.431	
C5	.298					
C6						
C7	.591					
C8				.872		
C9	.415					
C10	.391					
C11						
C12	.508					
C13	.639					
C14		.769				
C15	.508					
C16	.498					
C17						
C18		.437				
C19				.556		
C20						.806
C21						
C22						.410
C23			.330			
C24			.679			
C25	.509					
C26					.735	
C27		.785				
C28	.404					

(Extraction Method: Principle Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation)

The results of the Rotated Component Matrix are in agreement with Figure 7.2. It is clear that, according to Table 7.8, three factors of importance to this study were extracted. The contents of the questions classified under Factor 1 relate to “internality”. Under Factor 2 the questions content seems to be related to the “influence of powerful others”. For Factor 3 the question contents could be described as “attitude towards difficult challenges”. The total variance explained is presented in Table 7.9.

Table 7.9: Total variance explained: ICI.

	Component	Initial Eigenvalues		
		Total	% of Variance	Cumulative %
Raw	1	5.989	17.739	17.739
	2	2.739	8.113	25.852
	3	1.803	5.339	31.191
	4	1.688	4.998	36.189
	5	1.611	4.772	40.962
	6	1.528	4.524	45.486
	7	1.399	4.143	49.629
	8	1.340	3.968	53.597
	9	1.294	3.831	57.428
	10	1.231	3.645	61.073
	11	1.139	3.374	64.447
	12	1.104	3.270	67.718
	13	1.011	2.995	70.713
	14	.984	2.915	73.628
	15	.960	2.842	76.470
	16	.915	2.711	79.180
	17	.871	2.580	81.760
	18	.843	2.496	84.256
	19	.801	2.372	86.629
	20	.747	2.211	88.840
	21	.684	2.025	90.865
	22	.628	1.860	92.726
	23	.563	1.668	94.394
	24	.492	1.456	95.850
	25	.453	1.341	97.190
	26	.408	1.208	98.398
	27	.284	.840	99.238
	28	.257	.762	100.00

(Extraction Method: Principle Component Analysis.)

7.5 VALIDITY OF THE VALUE SURVEY MODULE

A factor analysis done by Hofstede (1980) on his Value Survey Module yielded four value dimensions which he called individualism, masculinity, uncertainty avoidance and power distance. The same results were obtained by Hofstede & Bond (1984) and Singh (1990) through factorial analysis of data procured by the repeated application of Hofstede's Value Survey Module.

A validity study on the Work Value Survey of Hofstede (1980) was done by Theron (1992) using a sample of 215 respondents from the South African mining industry. He determined the construct validity by means of a factor analysis with principle axis factoring and varimax rotation, the results of which are presented in Tables 7.10 and 7.11.

Table 7.10: Eigenvalues: extracted factors – Value Survey Module.

Factor	Eigenvalue	Percentage of variance	Cumulative percentage
1	8.58	31.8	31.8
2	1.23	4.5	36.3
3	0.79	2.9	39.2
4	0.65	2.4	41.7

(Source: Theron, 1992: 321)

According to Table 7.10 only 36.3% of the variance is declared by the factors with eigenvalues higher than one. The rotated factor matrix, presented in Table 7.11, however, produced four factors.

Table 7.11: Rotated factor matrix: – Value Survey Module.

Variable	Factor 1 Factor score	Factor 1 Factor score	Factor 1 Factor score	Factor 1 Factor score
Q25	0.81			
Q19	0.80			
Q22	0.76			
Q21	0.75			
Q24	0.74			
Q17	0.74			
Q27	0.73			
Q15	0.72			
Q13	0.72		0.41	
Q29	0.70			
Q28	0.70			
Q18	0.67			
Q20	0.63			
Q12	0.63			
Q26	0.58			
Q23	0.50			
Q14	0.40			
Q33		0.54		
Q35		-0.44		
Q16	0.42		-0.55	
Q37				0.35

(Source: Theron, 1992: 322)

The factor matrix in Table 7.11 differs completely from the factor structure obtained by Hofstede (1980) and Singh (1990). Theron (1992) points out that this may be due to the prevalent ethnic differences in the South African society. He terms the first of the extracted factors, with eigenvalues higher than one, “work environment” and the second “work security”.

In the case in hand the researcher also determined construct validity by means of a factor analysis. The data was subjected to a principle axis factoring with varimax rotation. The items used for the factor analysis were those determined by Hofstede (1980) and used by Theron (1992). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity are presented in Table 7.12.

Table 7.12: Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity for the Value Survey Module.

Measure	Value
Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)	.870
Bartlett's Test of Sphericity:	
Approx. Chi-Square	1285.017
df	91
Sig	.000

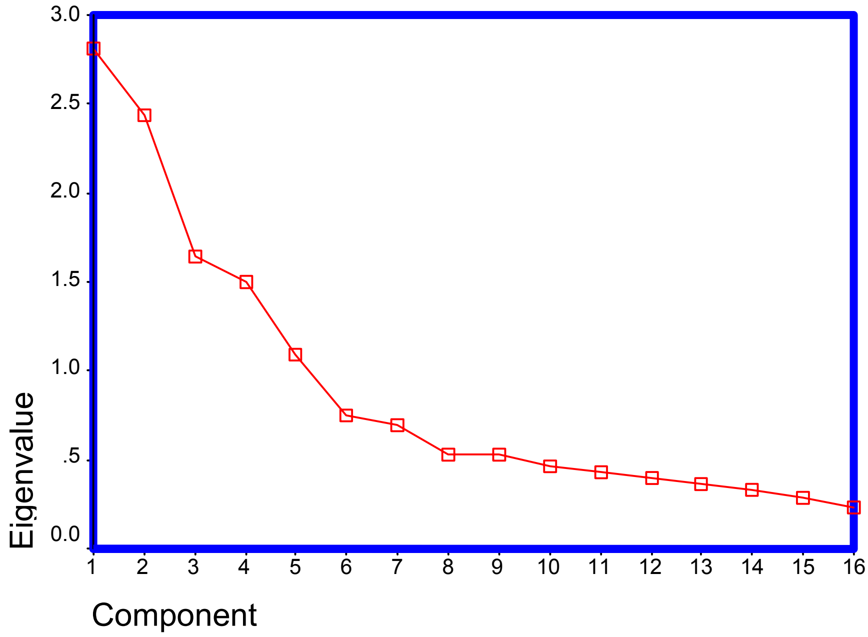
A KMO value of 0.870 (0.90 by approximation) is meritorious and the probability value of 0.000 ($p<0.05$) of the Bartlet's test indicates that there could be proceeded with the factor analysis. After rotation, four factors with eigenvalues higher than one (1.0) could be obtained, which differed substantially from the results of the factor analysis done by both Hofstede (1980) and Theron (1992). The eigenvalues are presented in Table 7.13.

Table 7.13: Eigenvalues: extracted factors for Value Survey Module

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.295	26.844	26.844	4.264	26.651	26.651
2	1.440	9.000	35.844	1.388	8.676	35.327
3	1.177	7.356	43.200	1.182	7.389	42.716
4	1.104	6.899	50.099	1.181	7.383	50.099

Table 7.13 shows that the four factors with eigenvalues higher than one declare 50.099% of the variance.

Figure 7.3: Scree Plot – eigenvalues: Value Survey Module.



From Figure 7.3 it is also obvious that Factor 1 explains the largest percentage of the variance. The rotated component matrix is presented in Table 7.14.

Table 7.14: Rotated component matrix: – Value Survey Module.

	Component			
	1	2	3	4
E1			.724	
E2		.574		
E8		.639		
E4			.674	
E9				.748
E3		.689		
E15	.525			
E21	.636			
E16	.555			
E18	.658			
E19	.703			
E22	.715			
E27	.633			
E20	.679			
E28	.719			
E25	.660			

According to Table 7.14 the varimax rotation produced four factors with only one item loading onto the last factor. Although four factors with eigenvalues higher than one were obtained, an analysis of the content of the items classified under each item, shows that the factor matrix differs completely from the structure and value dimensions obtained by previous research (Hofstede, 1980; Hofstede & Bond, 1984). For the purpose of statistical data analysis in this study the researcher shall use the factor items as standardised by Hofstede (1980) viz Power Distance, Uncertainty Avoidance, Individualism and Masculinity.

7.6 THE MULTIFACTOR LEADERSHIP QUESTIONNAIRE

7.6.1 BACKGROUND

The Multifactor Leadership Questionnaire (MLQ) was developed by Bernard Bass & Bruce Avolio and has been extensively used in field and laboratory research to study transformational, transactional and nontransactional leadership styles. Since 1982, the MLQ has been the principle means to reliably differentiate highly effective from ineffective leaders in many kinds of organisations, including government, military, educational, manufacturing, church, and medical. According to Bass et al (1997) the MLQ can be appropriately used for selection, transfer and promotion activities as well as for individual, group, or organisation development counselling. The MLQ leadership factor scale scores can identify managers suited to a particular kind of organisation culture, department, work group, project, or situation (Bass et al, 1997: 8). It can also be used to help place managers in positions for which they are best suited and will require the least training. Matching a leader to an appropriate situation without unnecessary costs, can help an organisation to solve a potentially difficult situation. The results of the MLQ could also be used as a basis for coaching the leader through a particular period in the group's or organisation's development.

7.6.2 DESCRIPTION

The current questionnaire, the MLQ (5X) (Revised), contains 45 questions (36 leadership items and 9 outcome items) that identify and measure key leadership and effectiveness behaviours shown (in prior research) to be strongly linked with both individual and organisational success. It comprises nine (9) leadership components along a full range of leadership styles, each measured by four (4) highly intercorrelated items that are as low in correlation as possible with items of the other eight (8) components (Bass et al, 1997: 11). According to Bass & Avolio (op cit) the MLQ (5X) (Revised-63) adds two items per component that tend to load on more than one component, i.e. transformational items within scales also correlate with other transformational scales. It is useful for training and coaching purposes, but less so for research studies.

Various forms of the MLQ has been used in over a dozen countries and in numerous languages, business and industrial firms, hospitals, military organisations, colleges, schools and government agencies. It has been shown to be equally effective when supervisors, colleagues, peers, or direct reports rate the leader (Bass & Avolio, op cit).

7.6.3 INITIAL DEVELOPMENT OF THE MLQ

The MLQ has a long history of development. It started with a total number of 142 items on leadership behaviour generated from a review of theoretical literature on the basis of responses to an open-ended survey of 70 senior executives, all of whom had experience with a transformational leader. These items were reviewed by 11 students enrolled in a graduate seminar on leadership who were asked to read pertinent material about the distinction between transformational and transactional leadership. The 142 items were sorted into three categories, viz transformational, transactional, and "can't say" by each of these students. Seventy three (73) items were then selected for inclusion in a questionnaire, all based on the following response allocation criterion: eight or more students (judges) identified the item as transformational, and none or one identified the item as transactional, or *vice versa*. Bass et al (1997: 33) consider a typical transformational item as one reading "enables me to think about old problems in new ways". A typical transactional item would be "points out what I will receive if I do what needs to be done".

7.6.4 FACTOR ANALYSIS OF THE MLQ

Data was generated from a sample of 176 senior military officers and subjected to a factor analysis conducted by Bass (1985). Through using varimax rotation of the 73 items, seven leadership factors (of the nine components now to be found in the MLQ) were produced as shown in Table 7.15.

Table 7.15: Means, standard deviations, and intercorrelations among MLQ factor scores.

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
Attributed Charisma	2.56	.84	.86											
	2.69	.90	.87											
Idealised Influence	2.64	.85	.79	.87										
	2.71	.89	.83	.89										
Inspirational Motivation	2.64	.87	.85	.86	.91									
	2.69	.91	.85	.90	.91									
Intellectual Stimulation	2.51	.86	.76	.84	.85	.90								
	2.50	.86	.75	.84	.85	.88								
Individualised Consideration	2.66	.93	.82	.82	.87	.84	.90							
	2.62	.94	.83	.86	.88	.84	.90							
Contingent Rewards	2.20	.89	.68	.69	.73	.70	.75	.87						
	2.04	.94	.51	.58	.62	.60	.62	.86						
Management-by-Exception (Active)	1.75	.77	-.12	-.03	-.10	-.08	-.12	.03	.74					
	1.71	.81	-.10	-.08	-.05	-.05	-.11	.21	.73					
Management-by-Exception (Passive)	1.11	.82	-.54	-.54	-.55	-.52	-.54	-.34	.28	.82				
	1.17	.88	-.54	-.59	-.50	-.41	-.51	-.07	.44	.83				
Laissez-Faire	0.89	.74	-.53	-.54	-.51	-.47	-.49	-.29	.18	.74	.74			
	0.99	.88	-.57	-.50	-.50	-.40	-.50	-.07	.40	.82	.87			
Extra Effort	2.60	1.16	.68	.69	.73	.69	.74	.62	.03	-.36	-.34	.91		
	2.51	1.14	.71	.75	.78	.75	.82	.63	-.01	-.36	-.35	.86		
Effectiveness	2.26	.72	.51	.44	.46	.41	.44	.32	-.14	-.35	-.41	.45	.91	
	2.66	.88	.62	.48	.52	.40	.53	.26	-.04	-.41	-.45	.48	.87	
Satisfaction	2.57	1.28	.25	.22	.21	.18	.27	.19	.06	-.21	-.25	.23	.15	.94
	2.38	1.28	.35	.18	.22	.08	.24	.11	.18	-.17	-.19	.19	.40	.93

NOTE: First values in each column show correlation from the validation set of samples (N = 1 394 after listwise deletion) and second values in each column show correlations from the cross-validation set of samples (N = 1 490 after listwise deletion)

(Source: Bass & Avolio, 1997: 65)

The transformational factors that emerged were labelled Charisma, Inspirational Motivation, Individualised Consideration and Intellectual Stimulation. The transactional factors were Contingent Reward and Management-by-Exception. The nontransactional factor comprises Laissez-Faire or "hands-off" leadership. Important to note here is that Hater and Bass (1988) extracted the same factors except that their analysis produced an active and passive version of Management-by-Exception instead of a single factor.

A second order factor analysis of the scales indicated that they clustered into either active or passive dimensions with Laissez-Faire emerging as the most inactive form of leadership (Hater et al, 1988). Hater et al (1988) also found that all factors involved active leadership except Management-by-Exception and Laissez-Faire. Recent analysis by Bycio, Hackett & Allen (1995) of these original items have generally produced a similar factor structure. In summary, the factors included in the MLQ were conceptually and empirically derived and confirmed originally from two independently conducted factor analyses using the principle components method with varimax rotation, and almost the same structure in various replications of the original factor analysis were obtained (e.g. Seltzer & Bass, 1990; Avolio, Bass & Jung, 1996). Each component is described in Table 7.16.

Table 7.16: Summary of first factor analytic findings for Items most representative of each factor (Rater Form).

MLQ FACTORS (with profile names)	**N = 176**	**N = 335**	**SAMPLE ITEMS**
Charisma (CH)	.77	.66	Has a sense of mission, which he or she communicates to me.
Inspirational Motivation (IM)	.63	.69	Uses symbols and images to focus our efforts.
Intellectual Stimulation (IS)	.69	.69	Has ideas that have forced me to rethink ideas of my own which I have never questioned before.
Individualised Consideration (IC)	.56	.67	Gives personal attention to those who seem neglected.
Contingent Reward (CR)	.67	.46	Sees that I get what I want in exchange for my co-operation.
Management-by-Exception (MBE)	.72	.38	Is satisfied with my performance as long as the established ways work
Laissez-Faire (LS)	.72	.72	Is hard to find when a problem arises.

NOTE: A sample of 335 middle-level managers working for a nationally based service organisation collected by Hater and Bass (1988) provided an independent confirmation of the factor analysis on the original derivation sample conducted with 176 senior military officers.

(Source: Bass & Avolio, 1997: 35)

The factors included in the final version of the 45-item MLQ are as follows (Bass et al, 1997):

- Factors 1 and 2 revolve around Idealised Influence, which is generally referred to as the reasons why associates identify with and want to emulate their leader.

- Factor 3 refers to Inspirational Motivation and includes those actions aimed at increasing awareness and understanding of mutually desired goals.

- Factor 4 entails Intellectual Stimulation which is used to encourage others to question their old ways of doing things and to break away from the past.

- Factor 5, Individualised Consideration, is used by leaders who treat associates differently but equally on a one-to-one basis. There is a strong focus on the development of associates.

- Factor 6 is called Contingent Reward and involves an interaction between leader and associates that stresses exchanges. The achievement of agreed-upon objectives is emphasised.

- Factors 7 and 8 encompass active and passive forms of Management-by-Exception. These leaders only focus on deviations, errors and mistakes and intervene only when they do occur.

- Factor 9 is the non-leadership factor, viz Laissez-Faire, which indicates the absence of leadership, the avoidance of intervention, or both.

Two confirmatory factor analyses (CFA) were also done using LISREL VII (Avolio & Bass, 1991). The first was conducted on the data containing all the items of the MLQ (5X). This included eight items for Attributed Charisma (AC), ten items for Idealised Influence (II), 10 items for Inspirational Motivation (IM), 10 items for Intellectual Stimulation (IS), nine items for Individualised Consideration, nine items for Contingent Reward, eight items for MBE-active, eight items for MBE-passive and eight items for Laissez-Faire (LF). Based on the correlation matrix generated by PRELIS, CFA was performed with LISREL VII using the method of maximum likelihood estimation. Even after ten iterations, the nine-factor model did not converge, probably due to high intercorrelations among the transformational leadership factors, as well as high correlations between MBE-passive and Laissez-Faire. Bass et al (1997: 66) report a Goodness of Fit Index (GFI) and a Root Mean Square Residual

(RMSR) of .73 and .10 respectively. After an item selection process[2], a second CFA was run to determine whether the data were better represented by several different competing models. The results, after the second CFA, showed improved measures of fit, as well as chi-squares, as the model progressed from a one-factor to a nine-factor solution. Bass et al (1997) declare that this improvement was substantial.

In this research the MLQ construct validity was also determined through a factor analysis by subjecting the data to a principle axis factoring with varimax rotation. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's test of sphericity for the MLQ data set are presented in Table 7.17.

Table 7.17: Kaiser-Meyer-Olkin measure and Bartlett's test of sphericity for the MLQ.

Measure	Value
Kaiser-Meyer-Olkin (Measure of Sampling Adequacy)	.927
Bartlett's Test of Sphericity:	
Approx. Chi-Square	7186.292
df	990
Sig	.000

The value of the KMO, viz 0.927 is excellent and the probability value of 0.000 ($p<0.05$) indicates that there can be comfortably proceeded with the factor analysis. The initial eigenvalues are presented in Table 7.18.

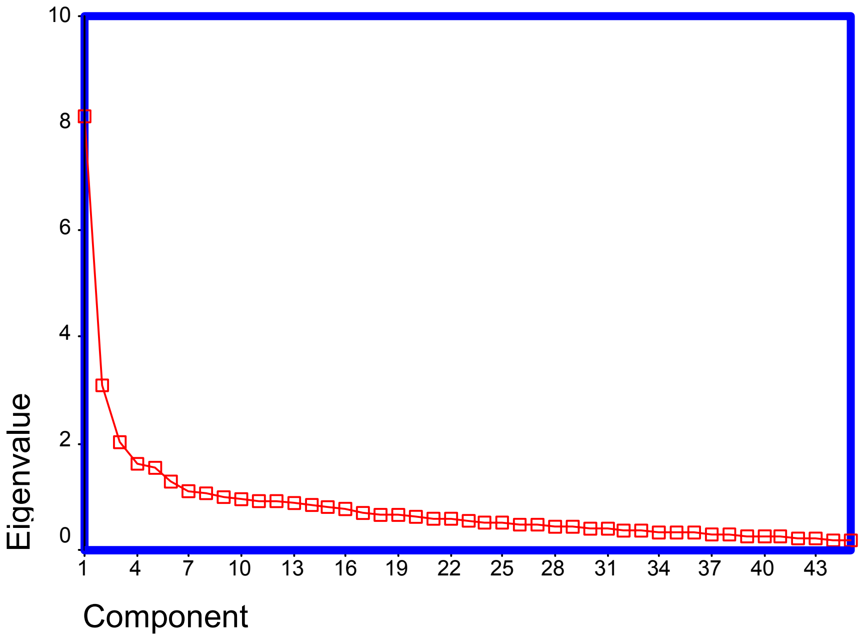
[2] Four items were selected for each leadership factor based on the MI indices generated by LISREL VII. All of these items exceeded the recommended cut-offs for discriminant and convergent validity (Bass et al, 1997: 67).

Table 7.18: Initial eigenvalues: MLQ.

	Component	Initial Eigenvalues		
		Total	% of Variance	Cumulative %
Raw	1	8.131	20.901	20.901
	2	3.105	7.980	28.882
	3	2.021	5.194	34.075
	4	1.620	4.163	38.239
	5	1.554	3.994	42.233
	6	1.278	3.286	45.519
	7	1.105	2.840	48.359
	8	1.080	2.775	51.134
	9	1.009	2.594	53.728
	10	.943	2.425	56.153
	11	.934	2.400	58.553
	12	.905	2.326	60.879
	13	.878	2.256	63.136
	14	.828	2.128	65.263
	15	.794	2.042	67.306
	16	.769	1.978	69.283
	17	.694	1.784	71.067
	18	.678	1.743	72.810
	19	.653	1.677	74.497
	20	.622	1.598	76.085
	21	.592	1.521	77.606
	22	.570	1.466	79.073
	23	.553	1.422	80.495
	24	.528	1.357	81.851
	25	.502	1.291	83.142
	26	.477	1.225	84.367
	27	.466	1.198	85.565
	28	.451	1.160	86.726
	29	.447	1.148	87.874
	30	.416	1.069	88.943
	31	.403	1.035	89.978
	32	.379	.973	90.951
	33	.357	.918	91.868
	34	.337	.866	92.734
	35	.326	.837	93.572
	36	.322	.828	94.399
	37	.305	.784	95.183
	38	.285	.732	95.915
	39	.272	.699	96.614
	40	.264	.678	97.292
	41	.243	.625	97.917
	42	.219	.562	98.479
	43	.208	.533	99.013
	44	.197	.506	99.519
	45	.187	.481	100.000

According to Table 7.18 nearly 54% of the total variance is attributable to the first nine (9) factors. The remaining 36 factors account for 47% of the variance. Thus, a model with nine factors may be adequate to represent the data.

Figure 7.4: Scree Plot – eigenvalues: MLQ.



The scree plot in Figure 7.4 shows only seven factors to be adequate. Norusis (1990: 319) suggests that only factors that account for variances greater than 1.00 should be included. Factors with values less than 1.00 “are no better than a single variable” since each variable has a variance of 1.

The rotated component matrix for the 45 items of the MLQ is presented in Table 7.19.

Table: 7.19: Rotated component matrix: MLQ.

	Rescaled						
	Component						
	1	2	3	4	5	6	7
F1							
F2		.297					
F3							
F4							
F5				.668			
F6							.781
F7				.691			
F8		.516					
F9			.783				
F10			.376				
F11	.444						
F12				.612			
F13	.461						
F14	.586						
F15	.605						
F16	.587						
F17							
F18		.387					
F19		.774					
F20						.722	
F21	.450						
F22					.627		
F23	.403						
F24							
F25	.522						
F26			.611				
F27					.837		
F28							
F29		.701					
F30	.510						
F31	.708						
F32	.621						
F33						.702	
F34	.464						
F35	.518						
F36	.620						
F37	.598						
F38	.729						
F39	.536						
F40	.618						
F41	.534						
F42	.644						
F43	.581						
F44	.644						
F45	.494						

Table: 7.19 (continued)

	Rescaled					
	Component					
	8	9	10	11	12	13
F1			.959			
F2						
F3						.868
F4	.774					
F5						
F6						
F7						
F8						
F9						
F10						
F11						
F12						
F13						
F14						
F15						
F16						
F17					.977	
F18						
F19						
F20						
F21						
F22						
F23						
F24		.896				
F25						
F26						
F27						
F28				.751		
F29						
F30						
F31						
F32						
F33						
F34						
F35						
F36						
F37						
F38						
F39						
F40						
F41						
F42						
F43						
F44						
F45						

(Extraction Method: Principle Component Analysis.
Rotation Method: Varimax with Kaiser Normalisation)

It is clear that, according to Table 7.19, six factors of importance to this study of leadership were extracted. The factor matrix in Table 7.19 differs completely from the nine-factor structure obtained by Bass et al (1997). There is a distinct lack of similarity between the factors as found by the rotated component matrix in this case, and the nine factors produced by Bass et al (1997). The analysis shows that 23 items clustered into the first factor. All nine so-called "leadership outcomes items" are included in these items. The rest of the items (except for three items, which were originally associated with Contingent Reward) consist of a mix of transformational items. This may be due to the high intercorrelations among the transformational leadership factors reported by Bass et al, (1997: 66). The contents of the questions classified under Factor 2 relate to both intellectual stimulation and individualised consideration. The third factor consists of items relating to inspirational motivation and idealised influence. All three other factors consist of items originally associated with MBE-passive and Laissez-Faire. This may also be explained by the high intercorrelation between MBE-passive and Laissez-Faire, as reported by Bass et al (1997: 66). The content of the items classified under these three factors relate to "leadership avoidance" or "non-involvement".

For the purpose of statistical data analysis in this study the researcher shall use the standardised leadership factors in the 45-item MLQ as reported by Bass et al (1997). These leadership factors (or styles), with associated items, are presented in Table 7.20.

Table 7.20: Standardised leadership factors of the MLQ.

	LEADERSHIP FACTOR	RELATED ITEMS
TRANSFORMATION LEADERSHIP	Idealised Influence (attributes)	10, 18, 21, 25
	Idealised Influence (behaviour)	6, 14, 23, 34
	Inspirational Motivation	9, 13, 26, 36
	Intellectual Stimulation	2, 8, 30, 32
	Individualised Consideration	15, 19, 29, 31
TRANSACTIONAL LEADERSHIP	Constructive Transaction	1, 11, 16, 35
	Management by Exception (active)	4, 22, 24, 27
	Management by Exception (passive)	3, 12, 17, 20
NON-TRANSACTIONAL LEADERSHIP	Laissez Faire	5, 7, 28, 33
LEADERSHIP OUTCOMES	Extra Effort	39, 42, 44
	Effectiveness	37, 40, 43
	Satisfaction	38, 41, 45

7.7 RELIABILITY

7.7.1 RELIABILITY DEFINED

Babbie (1989: 121) defines reliability as the degree to which a particular technique (like a psychometric test) applied repeatedly to the same object, would yield the same result each time. It could thus be seen as the consistency or stability of a test score when the test is repeated or replicated. Mason et al (1989: 265) present the following definition: “the consistency or dependability of the test score” or “… the ratio of variance in true scores to variance in observed scores” (1989: 266). They offer the following formula:

$$r_{xx} = \frac{\sigma_t^2}{\sigma_0^2} = \frac{\sigma_t^2}{\sigma_t^2 + \sigma_e^2}$$

where r_{xx} = reliability
σ_t^2 = variance in true scores
σ_0^2 = variance in observed scores, and
σ_e^2 = variance of error.

7.7.2 METHODS FOR COMPUTING RELIABILITY

Five different methods for judging reliability are discussed by De La Rey (1978: 31). These are split-half reliability, test-retest reliability, parallel-forms reliability, judgemental reliability, and internal consistency.

7.7.2.1 Split-half reliability

When using this method for determining reliability, the test being evaluated is divided into two halves (odd and even numbered items may, for example be grouped together). For each respondent two scores are then calculated, one for each half. If the scores of the respondents on both halves have a high correlation, there is enough evidence of consistency in the test (De la Rey, 1978: 31).

7.7.2.2 Test-retest reliability

Test-retest reliability is a description of the ability of an instrument to be reliable over a period of time (Howard, 1985: 25). Two repeated administrations of the same test are therefore required, the scores of which are then compared by means of correlation statistics. The correlation coefficient obtained indicates the consistency of the test over time (De la Rey, 1978: 32). It is important that the same group of people be used for both administrations of the test. Smit (1983: 36) warns that the choice of length of time between the two administrations is critical. If too little time is allowed, the reliability score may be influenced by carry-over effects such as experience and memory, while a period that is too long may result in maturation[3] influencing the reliability score (Smit, 1983: 36).

7.7.2.3 Parallel forms reliability

This form of reliability calculation is very similar to the split-half method. While two halves of the same test is used in the split-half method, this method involves the use of two equivalent forms of the same test on the same group. The performance of the group on the two versions of the test is then compared. (Smit, 1983: 30). The method has the advantage of preventing the transfer of prior knowledge of item content from one test to the next.

Smit (1983: 31) notes that when a short period has elapsed between the administrations of the two forms, the reliability coefficient is referred to as the coefficient of equivalence. In the case of a longer period between the two administrations, the reliability coefficient is known as the coefficient of stability and equivalence.

7.7.2.4 Judgemental reliability

The correlation coefficient obtained when the scores of two different judges "rating the same thing at the same time" is compared, refers to judgemental reliability. It could, for example entail the marking of the same set of test answers by different judges, after which the scores are correlated.

7.7.2.5 Internal consistency

Internal consistency as a reliability approach is frequently used as it requires only one administration of a test (Mason et al, 1989: 268). It refers to the consistency and stability of performance among items of the same test and therefore is primarily "… concerned with the internal structure of the test" (Brown, 1976: 84). During this approach a statistical analysis is done on the responses on each individual item of the test (De la Rey, 1978: 32).

Three methods for computing internal consistency estimates are provided by Mason et al (1989: 268), namely the split-half reliability approach by using the

[3] The biological, emotional, and psychological processes that change subjects over time (Smit, 1983).

Spearman-Brown formula, the Kuder-Richardson formula 20, and the Cronbach coefficient alpha.

When using the split-half reliability approach, a test is split into halves after which the correlation between the item scores of the two halves is computed (Mason et al, 1989: 268). Again, a popular approach is to split the test into odd and even numbered items. Because, when following this approach, the test is shortened, a lower reliability index may be obtained, which requires a correction to be introduced. The Spearman-Brown method is used for this correction. Mason et al (1989: 268) offers the following formula for the Spearman-Brown method:

$$r_{tt} = \frac{2r_{oe}}{1 + r_{oe}}$$

where r_{tt} = corrected reliability coefficient of the test, and
r_{oe} = the reliability coefficient of the split half.

A second formula for the reliability correction, the Guttman formula, is described by Smit (1983: 35). In contrast to the Spearman-Brown method, this method does not require the initial calculation of correlation between the two halves. The following formula is offered by Smit (1983: 35):

$$r_{tt} = 2(1 - \frac{\sigma_A^2 + \sigma_B^2}{\sigma_t^2})$$

where (σ_A^2) = variance of form A
(σ_B^2) = variance of form B, and
(σ_t^2) = variance of the total group.

Similar to the split-half method, the Kuder-Richardson formula 20 method is also a measure of homogeneity or scalability of the test material (Ferguson, 1981: 439). Higher reliability estimates can be obtained, as this method does not require the test to be split into two halves. Mason et al (1989: 269) explain this as follows: "…the method provides an estimate of the average split-half reliability for all possible splits in a test without requiring actually splitting the test" and advance the following formula:

$$r_{xx} = \frac{n}{n-1} \frac{s_x^2 - \sum_{i=1}^{n} p_i q_i}{s_x^2}$$

where n = number of items
s_x^2 = variance of scores on test

($p_i q_i$) = product of proportion of passes and fails for item *I*

$\sum_{i=1}^{n} p_i q_i$

= sum of these products for *n* items.

The Kuder-Richardson formula 20 is usually applied in the case of tests consisting of dichotomously scored items. Theron (1992: 329) notes that it may also be applied to tests comprising items that elicit responses from more than two categories, i.e. attitude scales. In such a case, each category is assigned a weight, the individual item variances are then calculated and their sum substituted in the Kuder-Richardson formula 20 for:

$$\sum_{i=1}^{n} p_i q_i$$

A more simplified form of the Kuder-Richardson formula 20 may be used when test items are dichotomously scored and where it is assumed that all test items are equally difficult. Ferguson (1981: 439) advances the following formula:

$$r_{xx} = \frac{n}{n-1}\left[1 - \frac{\overline{X}(n-\overline{X})}{ns_x^2}\right]$$

where $\overline{X}$ = mean test score, and
s_x^2 = variance.

In this case the formula is referred to as the Kuder-Richardson formula 21.

7.7.3 THE RELATIONSHIP BETWEEN RELIABILITY AND VALIDITY

Reliability affects validity in that the lower the reliability of a test become, the less validity it can have. Mason et al (1989: 256) explain this by noting that in practice, the squared validity coefficient cannot be greater than the reliability coefficient. Therefore, the validity of a test will be at its maximum when the validity coefficient, squared, equals the reliability coefficient. Important to note is that the vice versa is not true. Although the reliability of a test may be high, the test may have no validity. The researcher should therefore always pay attention to both reliability and validity of the tests or instruments he uses.

7.7.4 RELIABILITY OF THE SURVEY OF WORK VALUES

The Coefficient Alpha and test-retest reliability measures were calculated for the six sub-scales, the results of which are presented in Table 7.21 (Wollack et al, 1971: 334).

Table 7.21: Median intrascale item intercorrelations, Coefficient Alpha reliabilities, and test-retest reliabilities.

Subscale	Industrial workers		Government Workers		Insurance employees
	M dn. R	Alpha	*M dn. R*	Alpha	Test-retest
Status	.16	.63	.12	.55	.71
Activity	.16	.63	.15	.61	.71
Striving	.14	.59	.12	.55	.76
Earnings	.16	.59	.18	.66	.65
Pride	.16	.63	.15	.61	.69
Involvement	.11	.53	.16	.63	.68

Coefficients of determination point to a low reliability, explaining only 42% of the variance (subscale "earnings") to 57% (by approximation 60%) of the variance in subscale "striving". Wollack et al, (1971) ascribe this seemingly low reliability to the relatively low number of items within each subscale.

The reliability coefficients of the present study are presented in Table 7.22.

Table 7.22: Reliability of the Survey of Work Values.

Cronbach's Alpha	Part 1	Value	.374
		N of items	27
	Part 2	Value	.530
		N of items	27
	Total N of items		54
Correlation Between Forms			.420
Spearman-Brown Coefficient	Equal Length		.592
	Unequal Length		.592
Guttman Split-Half Coefficient			.587

It is evident from Table 7.22 that a split-half reliability estimate, with Spearman-Brown correction for equal length, of 0.592 was obtained and a coefficient Alpha of 0.374 and 0.53 for the two halves respectively.

7.7.5 RELIABILITY OF THE INTERNAL CONTROL INDEX

The split-half reliability coefficient with Spearman-Brown correction was also calculated for the Internal Control Index. This coefficient as well as the Alpha values for the two halves are presented in Table 7.23.

Table 7.23: Reliability of the Internal Control Index.

Cronbach's Alpha	Part 1	Value	.643
		N of items	14
	Part 2	Value	.577
		N of items	14
	Total N of items		28
Correlation Between Forms			.628
Spearman-Brown	Equal Length		.771
Coefficient	Unequal Length		.771
Guttman Split-Half Coefficient			.771

According to Table 7.23, the Duttweiler Internal Control Index has a split-half reliability with Spearman-Brown correction for equal length of 0.771 (0.8 approximately) and a Cronbach's Alpha of 0.643 for the first part and 0.577 (0.6 approximately) for the second half. The correlation between the two halves is 0.63.

7.7.6 RELIABILITY OF THE VALUE SURVEY MODULE OF HOFSTEDE

Theron (1992: 329-330) obtained a split-half reliability estimate with Spearman Brown correction of 0.88 for equal length. An Alpha coefficient of 0.90 was also obtained. The reliability estimates in the present study is presented in Table 7.24.

Table 7.24: Reliability of the Value Survey Module.

Cronbach's Alpha	Part 1	Value	.197
		N of items	8
	Part 2	Value	.829
		N of items	8
	Total N of items		16
Correlation Between Forms			.202
Spearman-Brown	Equal Length		.336
Coefficient	Unequal Length		.336
Guttman Split-Half Coefficient			.327

As is evident from Table 7.24, the reliability estimates are very low. This might be the result of only 16 items having been subjected to the reliability tests. The Spearman-Brown coefficient for equal length only equals 0.336. A Cronbach's Alpha of 0.197 for the first half and 0.829 for the second were obtained. The correlation between the two parts is 0.202.

7.7.7 RELIABILITY OF THE MULTIFACTOR LEADERSHIP QUESTIONNAIRE

For the Multifactor Leadership Questionnaire (MLQ), the test-retest reliability for the MLQ (5R) was computerised for the factor scales using data collected from 33 middle to upper-level managers. The reliabilities ranged from 0.44 to 0.74 for the self-ratings and 0.53 to 0.58 for ratings by others. Bass et al (1997: 55) warned, however, that the reported reliabilities may underestimate the true test-retest reliability of the scales, as the group of managers used in the analysis had received team development and individual training through the six-month interval.

For the case in hand the internal consistency estimate was determined by means of the split-half method with Spearman Brown correction. The coefficient Alpha was also calculated. The results are presented in Table 7.25.

Table 7.25: Reliability of the Multifactor Leadership Questionnaire.

Cronbach's Alpha	Part 1	Value	.705
		N of items	23
	Part 2	Value	.844
		N of items	22
	Total N of items		45
Correlation Between Forms			.657
Spearman-Brown	Equal Length		.793
Coefficient	Unequal Length		.793
Guttman Split-Half Coefficient			.790

Table 7.25 reveals a high split half reliability with Spearman-Brown correction of 0.793 (approximately 0.80) for unequal length. The Cronbach's Alpha for part 1 is 0.705 and for part 2 it is 0.844.

7.8 SUMMARY

In this chapter the psychological evaluations used in the study were analysed. The construction and development of the Survey of Work Values, the Internal Control Index, the Value Survey Module, and the Multifactor Leadership Questionnaire were also discussed. The concepts of validity and reliability were referred to in detail. The construct validity of the questionnaires was determined by means of factor analysis and the internal consistency was determined by means of the split-half reliability techniques with Spearman-Brown correction.