CHAPTER VIII
SOME PSYCHOMETRIC CONSIDERATIONS OF THE STUDY

8.1 INTRODUCTION

In this chapter the psychometric approach used in the study is extensively discussed. The construction of the Motivation Questionnaire, the Locus of Control Inventory, and the Transformation Questionnaire, as well as the concepts of validity and reliability are discussed. Reliability estimates were determined for each of the scales and are reported in this chapter.

8.2 THE MOTIVATION QUESTIONNAIRE

A motivation survey is used to determine the specific factors or needs that influence work motivation during the transformation of the organization. The researcher decided on a questionnaire that has been successfully utilized on a similar staff population at another bank in South Africa. The Motivation Questionnaire of Fourie (1989) was used in this study. The target group for the research project was similar to the one used by Fourie, and included a diversity of bank officials. All the employees of the Head Office and all the Branch Offices participated in this survey, including staff on various job levels, management, and cleaning staff. Fourie (1989:85) developed the questionnaire by involving employees and using the following specific principles:

- "Generate ideas and views from participants through brainstorming and group discussions;
- Listing of ideas;
- Feedback of participants on ideas and clarifying of each;
- Evaluation of each idea; and
- Prioritising of ideas".

The questionnaire consists of a biographical data section and a section where the respondent must give his/her opinions/feelings on various aspects relating to the work environment. The content and process theories discussed earlier as well as the information gathered from the employees involved in the development process were combined to structure the statements of the questionnaire.

It consists of 39 statements on which respondents react according to a five-point Likert attitude scale, viz.:

- Strongly in agreement (SA);
- In agreement (A);
- Uncertain (U);
- Disagree (D), and
- Disagree strongly (DS).

The questionnaire measures the attitudes of employees on motivational factors in the work environment, viz.:

- Herzberg's "hygiene or maintenance" factors, including remuneration, job security, level and quality of supervision and interpersonal relationships;
- Herzberg's "motivators", including nature of the work, personal growth, advancement and recognition;
- Assessing the level of role clarity, expectations and communication;
- Assessing conflict management and its impact on social needs;
- Assessing perceptions on equity in the remuneration policies, and
- Assessing the use of human potential and self-actualization.

The questionnaire was standardized on similarly employed staff and all interpretation- and other problems were solved. A statistical consultant verified the validity of the questionnaire.

8.3 THE LOCUS OF CONTROL INVENTORY

Rotter and his associates (1966) developed the concept of Internal-External Locus of Control. They employed it to study the effect of reward on behaviour. An internally orientated person believes that his/her own behaviour affects the rewards that follow the behaviour. Externally orientated people believe that outside forces shape and reward their life (Gurin, Gurin, Lao and Beattie, 1969:29). According to Schepers (1995:3-7) there were many other instruments developed after the Rotter scale of 1966, viz. the Internal, External Locus of Control-scale. These instruments varied from a general focus to a very specific focus. Some of these instruments are applicable to children and others to adults. The Locus of Control Inventory of Schepers (1995) was developed to correct defects of other instruments and to establish a reliable and valid instrument for use on adults. The Locus of Control Inventory of Schepers (1995) is used in this research to determine the effect and possible connection of locus of control on work motivation and need satisfaction.

Conceptually this instrument of Schepers is based on attribution theory and social learning theory. An item analysis of the items was done and yielded three factors. These factors were interpreted as Autonomy, Internal Control and External Control. The three scales were accordingly subjected to an item analysis, and the reliabilities of the scales were determined with Cronbach's coefficient alpha. All three the scales yielded reliability coefficients of the order of 0,8 (Schepers, 1995:1). Next, the sample was subjected to a cluster analysis using the three scores of the Locus of Control Inventory as input - variables. Two distinct clusters emerged: Cluster 1 is low on Autonomy and Internal Control and high on External Control, Cluster 2 is high on Autonomy and Internal Control, but low on External Control (Schepers, 1995:1). According to Schepers (1995:1-2) these clusters were subsequently compared in respect of the following variables, viz.:

- The General Scholastic Aptitude Test (Verbal and Non-verbal IQ), the Senior Aptitude Tests, and Matric Score;
- The Sixteen Personality Factor Questionnaire;
- The Jung Personality Questionnaire;
- The Personal, Home, Social and Formal Relations Questionnaire;
- The Survey of Study Habits and Attitudes;
- The Career Development Questionnaire; and
- The 19 Field Interest Inventory.

Statistically significant differences in means between the two clusters were obtained in respect of most of the variables, and indeed as was expected on theoretical grounds.

The Locus of Control Inventory consists of 80 statements on which respondents react according to a seven-point Likert scale.

8.4 THE TRANSFORMATION QUESTIONNAIRE

A Transformation Questionnaire is used to determine employees' attitudes regarding specific factors (or needs) within the organization during transformation. An external consultant- Transformatum Counselling Services- developed the questionnaire for the target organization.

The development of the questionnaire involved employees and the principles were:

- Generating ideas through views from employees during individual interviews or focus group discussions;
- Listing of all ideas and clarifying them with the participating employees;

- Evaluation of each idea;
- Prioritising of ideas;
- Generation of ideas into statements to which respondents indicate their reaction on a five-point Likert attitude scale; and
- Grouping statements under headings of the questionnaire.

The questionnaire consists of a biographical data section and sections where respondents give opinions/feelings on various aspects relating to the transformation environment and process, including:

- The objectives of the organization;
- The objectives of the participant's own work;
- Job satisfaction;
- The transformation process;
- The situation in each respondent's department/section/work group;
- Competence in each respondent's department/section/work group;
- Feelings towards supervisors and management in general;
- Feelings regarding decisions within the organization;
- Conflict handling;
- Change in the organization;
- The past two years in the respondent's job;
- Communication;
- The climate in the organization;
- Attitudes towards work and life;
- Team building in the work environment;
- General feelings in the organization;
- Respondent's future and stress;
- Needs;
- Feelings regarding diversity in the organization;
- A framework for sharing personal issues about work and life; and
- Proposals to assist individuals with the transformation process.

The questionnaire was standardized on similarly employed staff to solve interpretation and other problems. A statistical consultant verified the validity of the questionnaire.

8.5 THE BIOGRAPHICAL QUESTIONNAIRE

A Biographical Questionnaire forms part of the Motivation Questionnaire, the Locus of Control Inventory, and the Transformation Questionnaire. The information of the biographical questionnaires is structured according to the independent variables. These eight independent variables have been selected to explore the relationships among the dependent variables (work motivation needs, internality, externality, autonomy, and the transformation factors). The independent variables (discussed in chapter VII) may all have an important bearing on the perceptions, work-related attitudes, and work-related needs of the different individuals and groups within this changing organization. The Biographical Questionnaire is different from the Transformation Questionnaire that was administrated after the Motivation and Locus of Control Questionnaires. The questions in the biographical section of the Motivation and Locus of Control Questionnaire relate to:

- Age;
- Gender;
- Home language;
- Marital status;
- Religious denomination;
- Educational qualifications;
- Salary per month;
- Years of service;
- Branch Office/section at Head Office; and
- Job grade.

The questions in the biographical section of the Transformation Questionnaire relate to:

- Academic qualifications;
- Home language;
- Department/section/work group at Head office;
- Job grade;
- Occupational group;
- Years of service;
- Employers in the last ten years;
- Monthly income;
- The primary source of income; and
- Dependants to support financially.

8.6 VALIDITY

Babbie (1989:98) views validity as a descriptive term used of a measure that accurately reflects the concept it is intended to measure. De la Rey's view (1978:30), that a test is valid only if it measures the concept or characteristic it pretends to measure, ties in with this definition. Validity is usually determined by means of correlation statistics and expressed as a validity coefficient. There is also a non-statistical approach to the determination of psychological test validity, namely content validity that is a matter of judgement and not of empirical correlation (Guion, 1965:125).

The validity estimate is usually determined by calculating the correlation between performance in a test and an independent, objective criterion of the behaviour being measured (Smit, 1983:47). But this is only one kind of validity, i.e. predictive validity that could either be concurrent or predictive, as is illustrated later on in this chapter. De la Rey (1978:31) distinguishes between construct validity, content validity, criterion-related validity, concurrent validity, face validity and synthetic validity. Construct validity is the extent to which a test measures the construct it was designed to measure (Mason and Bramble, 1989:260). Construct validity is determined by comparing a new test with existing valid tests measuring the same concept. A high significant correlation points to construct validity (Smit, 1983:63-67). Construct validity evaluates the construct as well as the adequacy of the test in measuring the construct (Mason et al., 1989:261; Smit, 1983:64). Dane (1990:259) and Smit (1983:66) distinguish three approaches to the study of construct validity, viz. convergent validity, discriminant validity and factorial analysis. Convergent validity points to the extent to which a measure correlates highly with existing psychological tests measuring the same concept. Discriminant validity, on the contrary, is the extent to which a measure does not correlate too obviously or not at all with tests measuring different concepts. The construct discriminates between similar and entirely different constructs (Smit, 1983:66). By means of factor analysis, the numbers of common factors, explaining the variance, are identified. These factors can predict performance in a test. By identifying the factors common to a construct it is possible to construct a test that is a refined and clear measure of a specific theory or concept (Smit, 1983:66).
Content validity is of a qualitative nature and ascertains the degree to which the contents of a questionnaire are representative of the construct being measured (De la Rey, 1978:31). Criterion-related validity may be separated into predictive validity and concurrent validity (Howard, 1985:100). Predictive validity concerns the degree to which a test predicts future behaviour or performance correctly (Smit, 1983:51). A predictive validity estimate is

determined by means of Bravais-Pearson product moment correlation or multiple regression analysis (De la Rey, 1978:310). The validity coefficient is usually interpreted by means of its numerical size (magnitude), coefficient of alienation, coefficient of determination and the standard error of measurement (Smit, 1983:52-53).

Concurrent validity implies the degree to which test variance correlates with variance in a test (criterion) available at essentially the same time (Smit, 1983:61). Smit views concurrent validity as a relationship expressed in terms of a correlation coefficient between a test score and another yielded by a measure already accepted as valid of the same behavioural construct (Smit, 1983:62). In other words, concurrent validity involves comparing a new measure to an existing valid measure with an emphasis on the present status of the measure or the respondent (Smit, 1983:62).

Face validity or expert validity is the degree of consensus between experts that a measure represents a particular concept (Dane, 1990:257). Synthetic validity refers to presumed validity (De la Rey, 1978:31). Howard (1985:56) also distinguishes between external and internal validity. External validity deals with the extent to which a researcher can generalize across samples, situations, settings and times based on evidence from a particular study. Internal validity is defined as the extent to which procedures enable one to draw reasonable conclusions (Howard, 1985:110).

8.6.1 VALIDITY OF THE MOTIVATION QUESTIONNAIRE

The construct validity of the Motivation Questionnaire was determined by means of a factor analysis. The Kaiser-Meyer-Olkin measure (KMO) of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. If the sum of the squared correlation coefficients between all partial variables is small when compared to the sum of squared correlation coefficients the KMO is close to 1. Small values of the KMO measure are an indication that a factor analysis of the variables may not be a good idea since correlations between pairs of variables cannot be explained by other variables. The KMO value of 0,78 indicates that a factor analysis is applicable on the data. Also, as the significant level of the Bartlett's test of sphericity is small ($p = 0{,}000$), the hypothesis that the correlation matrix is an identity matrix, has to be rejected. Bartlett's test of sphericity is based on a chi-square transformation of the determinant of the correlation matrix. The negative of the partial correlation coefficient is an estimate of the correlation between the anti-image correlation.

This partial correlation should be close to 0 if all the assumptions of a factor analysis have been met. The proportion of low coefficients-the anti-image correlation matrix is very high. Therefore a factor analysis is a good idea, which explains why a factor model is used as a result (Norusis, 1984).

The categorizing of the items of the five factors found for the Motivation Questionnaire is as follows:

- Factor 1, namely personal job satisfaction, and satisfaction with the work environment in terms of equitable practices, growth opportunities, and relationships: items
  10, 27, 21, 23, 35, 15, 26, 6, 8, 39, 38, 29, 31, 22, 7, 33, 14, 37, 20, 13, 34, 24;
- Factor 2, namely factors related to social and esteem needs through constructive conflict management, development opportunities, and recognition: items
  2, 4, 6, 8, 34;
- Factor 3, namely coaching for development: items
  4, 5, 7, 9, 16, 19;
- Factor 4, namely individual-centred leadership: items
  1, 24, 28, 32; and
- Factor 5, namely team spirit: items
  25 and 30.

The criteria for determining the number of factors were to include only those that account for variances greater than 1 as the eigenvalue is greater than 1. The eigenvalues of the five factors are presented in Table 8.1.

TABLE 8.1: EIGENVALUES: EXTRACTED FACTORS: MOTIVATION QUESTIONNAIRE.

Factor	Eigenvalue	Percentage of variance	Cumulative percentage
1	10,43	26,7	26,7
2	5,36	13,7	40,5
3	3,90	10,0	50,5
4	3,17	8,1	58,6
5	2,81	7,2	65,8

The final statistics in Table 8.1 show the factor statistics after the desired number of factors has been extracted. A particular criterion suggested to determine the number of factors is to only include the factors that account for variances greater than 1 as the eigenvalues are greater than 1.The eigenvalues are an indication of the total variance explained by each factor. The next column refers to the percentage of total variance attributable to each factor. It is clear that 65,8% of the total variance is attributable to the first 5 factors. The remaining 34 factors together account for 34,2% of the variance. Therefore a model of 5 factors should be adequate to represent the data.

The rotated factor matrix with the 5 factors is presented in Table 8.2.

TABLE 8.2: ROTATED FACTOR MATRIX: MOTIVATION QUESTIONNAIRE.

Variable	Description	Score: Factor 1	Score: Factor 2	Score: Factor 3	Score: Factor 4	Score: Factor 5
Q 10	Dissatisfaction with income	-0,78				
Q 27	Growth opportunities	0,73				
Q 21	Equity in remuneration	0,69				
Q 23	Utilization of potential	0,68				
Q 35	Work environment satisfaction	0,66				
Q 15	Promotion opportunities	0,65				
Q 26	Satisfaction: Psychological contract	0,64				
Q 6	Herzberg's Motivators	-0,64	0,59			
Q 8	Conflict handling / social relations	-0,62	0,59			

TABLE 8.2: (CONTINUED)

Q 39	Inequity in remuneration	0,61				
Q 38	Interpersonal relationships	0,61				
Q 29	Esteem, self-actualization in career	0,60				
Q 31	Psychological contract – Job objectives	-0,59				
Q 22	Career planning	0,58				
Q 7	Psychological contract - Organization objectives	-0,54		-0,52		
Q 33	Working conditions	0,54				
Q 14	Adequate development	0,54				
Q 37	Job security	0,53				
Q 20	Utilization of potential	0,52				
Q 13	Growth opportunities	0,51				
Q 2	Adequate recognition		0,60			
Q 34	Dissatisfaction with this organization	-0,52	-0,57			
Q4	Adequate training		-0,55	0,53		
Q 9	Job pressure			0,66		
Q 5	Satisfaction with management			-0,62		
Q 19	Satisfaction with work position			0,59		
Q 16	Relationship with management			0,58		
Q 24	Career planning	-0,55			-0,63	
Q 1	Level of supervision				0,61	
Q 28	Quality of supervision				0,60	
Q 32	Communication by superior				0,54	
Q 25	Work pressure					0,61
Q 30	Team spirit					-0,54

The information in Table 8.2 shows that in general, the content of the questions classified under Factor 1 relate to personal job satisfaction, and satisfaction with the work environment in terms of equitable practices, growth opportunities, and relationships. The questions classified under Factor 2 relate to social and esteem needs through constructive conflict management, development opportunities, and recognition. The questions classified under Factor 3 relate to coaching for development. The questions classified under Factor 4

relate to individual-centred leadership, and the questions classified under Factor 5 relate to team spirit. The information in Table 8.2 confirms the construct validity of the Motivation Questionnaire.

8.6.2 VALIDITY OF THE LOCUS OF CONTROL INVENTORY

The construct validity of the Locus of Control Inventory was also determined by means of a factor analysis. A KMO value of 0,92 was obtained, and the significant level of the Bartlett's test of sphericity was small (p = 0,000). The categorizing of the items of the Locus of Control Inventory is as follows:

- Factor 1, namely internal control: Items 2, 3, 4, 6, 7, 10, 11, 12, 17, 20, 21, 23, 24, 25, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 45, 49, 51, 53, 54, 55, 57, 59, 60, 62, 63, 64, 65, 67, 70, 71, 72, 73, 74, 77, 78, 79, and 80;
- Factor 2, namely external control: Items 13, 14, 16, 18,19, 22, 25, 26, 27, 28, 44, 46, 48, 54, 60, 61, 66, 68, 69, and 75;
- Factor 3, namely autonomy: Items 1,12, 15, 43, 47, 50, 52, 53, 56, 57, and 76.

The eigenvalues of the three factors are presented in Table 8.3.

TABLE 8.3: EIGENVALUES: EXTRACTED FACTORS - LOCUS OF CONTROL INVENTORY.

Factor	Eigenvalue	Percentage of variance	Cumulative percentage
1	43,14	53,9	53,9
2	7,27	9,1	63,0
3	5,40	6,7	69,7

From Table 8.3 it is clear that 69,8% of the total variance is attributable to the first three factors. The remaining eight factors together account for 30,2% of the variance. Therefore a model of three factors should be adequate to represent the data. The rotated factor matrix with the three factors is presented in Table 8.4.

TABLE 8.4: ROTATED FACTOR MATRIX: LOCUS OF CONTROL INVENTORY.

Variable	Description	Score: Factor 1	Score: Factor 2	Score: Factor 3
Q64		0,94		
Q42		0,92		
Q78		0,92		
Q72		-0,91		
Q45		-0,91		
Q74		0,89		
Q4		-0,88		
Q34		-0,88		
Q2		0,86		
Q41		-0,85		
Q23		-0,84		
Q17		0,83		
Q59		-0,82		
Q35		-0,82		
Q29		0,81		
Q62		0,79		
Q24		0,79		
Q65		-0,79		
Q21		-0,78		
Q38		-0,78		
Q51		-0,75		
Q49		0,73		
Q30		0,72		
Q70		0,72		
Q6		0,71		
Q36		-0,71		
Q7		0,71		
Q31		0,71		
Q63		0,71		

TABLE 8.4: (CONTINUED)

Variable	Description	Score: Factor 1	Score: Factor 2	Score: Factor 3
Q10		0,70		
Q11		-0,69		
Q73		-0,69		
Q67		0,68		
Q20		-0,67		
Q40		0,66		
Q12		-0,66		0,57
Q71		-0,64		
Q3		0,62		-0,63
Q33		0,62		
Q1		-0,61		0,56
Q80		-0,61		
Q37		0,61		
Q54		0,61	0,53	
Q55		0,59		
Q52		-0,59		0,57
Q60		0,54	0,51	
Q39		-0,53		
Q77		-0,51		
Q61			0,81	
Q75			0,81	
Q66			0,75	
Q26			0,73	
Q16			0,72	
Q27			0.70	
Q48			0,69	
Q22			0,68	
Q14			0,67	
Q25		0,51	0,64	
Q46			0,64	

TABLE 8.4: (CONTINUED)

Variable	Description	Score: Factor 1	Score: Factor 2	Score: Factor 3
Q69			0,63	
Q68			0,62	
Q28		0,59	0,60	
Q18			0,59	
Q13			0,59	
Q19			0,52	
Q44			0,51	
Q50				0,86
Q56				0,83
Q15				-0,81
Q47				0,78
Q53				0,77
Q43				0,67
Q57				0,65
Q76				-0,61

The information in Table 8.4 shows that in general, the content of the questions classified under Factor 1 relate to internal control. The questions classified under Factor 2 relate to external control. The questions classified under Factor 3 relate to autonomy. The information in Table 8.4 confirmed the construct validity of the Locus of Control Inventory.

8.6.3 VALIDITY OF THE TRANSFORMATION QUESTIONNAIRE

The construct validity of the Transformation Questionnaire was also pursued by means of a factor analysis. The KMO value of 0,80 indicates that a factor analysis is applicable on the data. Bartlett's test of sphericity did not produce meaningful statistics, therefore the hypothesis that the correlation matrix is an identity matrix, could not be determined. The negative of the partial correlation coefficient that should be close to 0 if all the assumptions of a factor analysis are met, could not be determined. The final statistics identified 24 factors with eigenvalues greater than 1, but no meaningful statistics could be drawn from the rotated factor matrix as the variables and the scores were not allocated to the factors identified. The reason for this outcome could be that the Transformation Questionnaire consists of various smaller questionnaires (with rating scales that differ), viz. the objectives

of the organization, the objectives of the participant's own work, job satisfaction, the transformation process, feelings about management and decisions made, perceptions on competence, conflict handling, communication, etc.

8.7 RELIABILITY

Reliability goes hand in hand with validity and involves the consistency or stability of a test score when the test is repeated or replicated. If a particular test, applied repeatedly to the same object, yields the same results each time, it is reliable (Smit, 1983:28-29).

Mason et al.(1989:420) view reliability as "the consistency or dependability of a test" and proceed to define reliability statistically as "the ratio of variance in the scores to variance in observed scores" (1989:266). They offer the formula:

$$r_{xx} = \frac{T^2_t}{T^2_o} = \frac{T^2_t}{T^2_t + T^2_e}$$ where

r_{xx} = reliability
T^2_t = variance in true scores
T^2_o = variance in observed scores
T^2_e = variance of error.

8.7.1 COMPUTING RELIABILITY

Smit (1983) discerns three approaches to estimate reliability, i.e. test-retest reliability, alternate forms reliability and internal consistency. The reliablility estimate is determined by means of a correlation coefficient. The higher the numerical value of the obtained coefficient, the less the possibility of the effect of change upon a test. The lower the obtained coefficient, the more the measure reflects chance factors (Mason et al., 1989:267).

8.7.1.1 TEST-RETEST RELIABILITY

Test-retest reliability boils down to two repeated administrations of the same test to the same group after a lapse of time. The two test scores obtained in this way are compared by means of correlation statistics. This procedure yields a reliability coefficient of stability. The length of time between the two evaluations may turn out to be a major problem. If the lapse of the time is too short, carry-over effects like exercise and memory may affect the

reliability. If the period is too long, maturation (biological, psychological and emotional processes that change subjects over time) may influence reliability (Smit, 1983:29; Dane, 1990:254).

8.7.1.2 ALTERNATE FORMS RELIABILITY

Alternate forms reliability involves comparing performances by the same group on two different but equivalent forms of the same test. Two equivalent forms of the test are administered to the same sample. A lapse of time between the two evaluations is not necessary because two equivalent forms of the test are used (Smit, 1983:30). According to Smit (1983:30) the two equivalent forms must comply with certain requirements:

- Both forms must be of equal length;
- The same procedures for marking must apply to both forms;
- Item homogeneity must be the same for both forms, and
- Items must be uniform in regard to content, representativeness and degree of difficulty.

If the time period between the two evaluations is short, the reliability estimate is known as the coefficient of equivalence. If there is a long lapse of time, the reliability estimate is known as the coefficient of stability and equivalence (Smit, 1983:31).

8.7.1.3 INTERNAL CONSISTENCY

There are many methods for computing internal consistency, viz. split-half reliability and the Kuder Richardson method, amongst other approaches. The split-half reliability technique can be used to assess the reliability of a questionnaire, by dividing the test into equivalent halves and computing the correlation between the halves. A measure is usually divided by separating the odd and even numbered items (Smit, 1983:33). The division of the test in two halves shortens the measure, which in turn affects reliability. A correction to the reliability estimate has to be done to compensate for the shortened halves. Spearman-Brown advances a formula (Mason et al., 1989:268) to effect this correction:

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

r_{tt} = corrected reliability

r_{oe} = the reliability estimate of the split-half.

Guttman also offers a formula to effect the correction (Smit, 1983:24-35). This formula is independent of the requirements to calculate the correction between the two halves.

$$r_{tt} = 2\left(1 - \frac{O_A^2 + O_B^2}{O_t^2}\right) \text{ where}$$

O_A^2 = variance of form A

O_B^2 = variance of form B

O_t^2 = variance of total group.

The Kuder-Richardson method, which usually yields higher reliability estimates because the measure is not split into two halves, is also employed to calculate internal consistency. The Kuder-Richardson Formula 20 provides an estimate of the average split-half reliability:

$$r_{xx} = \frac{k}{k-1}\left(1 - \frac{\Sigma pq}{S_O^2}\right) \text{ where}$$

r_{xx} = reliability estimate

k = number of items in the test

p = the portion of people who respond correctly to each item

q = 1 - p

S_O^2 = Observed score variance (Mason et al., 1989:269).

The Kuder-Richardson Formula 20 is usually applied to obtain reliability coefficients when tests consists of dichotomously scored items. However, the Kuder-Richardson Formula 20 may also be applied to tests comprising items that elicit more than two categories of response such as attitude scales. In this case of an item with more than two response categories, the individual item variances are calculated and their sum substituted in the Kuder-Richardson Formula 20 for:

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

The Kuder-Richardson Formula 20 used in the case of items that elicit more than two categories of response such as the case in hand, the formula is (Ferguson, 1981:439):

$$\sum_{i=1}^{n} p_i \quad q_I = \sum_{i=1}^{n} S_I^2$$

8.7.1.4 **ITEM TOTAL RELIABILITY**

Item total reliability is "an estimate of the consistency of one item in respect to other items on the measure" (Mason et al., 1989:256). Calculating an item total reliability involves correlating the score on one item with the total score on the rest of the items. The Kuder-Richardson Formula 20 may be employed. A high correlation coefficient may be an indication of the entire instrument being reliable (Mason et al., 1989:256).

8.7.2 **RELIABILITY OF THE MOTIVATION QUESTIONNAIRE**

Split-half and alpha reliability estimates were calculated by means of computer packages available on the main frame of the University of Pretoria. A split-half reliability estimate for unequal length of 0,27 was obtained. Because the partitioning of the questionnaire into two halves shortens the measure that in turn affects reliability, the Spearman-Brown correction to the reliability estimate was done to compensate for the shortened halves (Mason et al., 1989:268; Smit, 1991:40). The Spearman-Brown correction yielded a reliability coefficient for unequal length of 0,29. An alpha coefficient of 0,57 was obtained for the Motivation Questionnaire.

8.7.3 **RELIABILITY OF THE LOCUS OF CONTROL INVENTORY**

Split-half and alpha reliability estimates were also calculated for the Locus of Control Inventory. A split-half reliability estimate for unequal length of 0,70 was obtained. The Spearman-Brown correction yielded a reliability coefficient for unequal length of 0,71. An alpha coefficient of 0,50 was obtained for the Locus of Control Inventory.

8.7.4 **RELIABILITY OF THE TRANSFORMATION QUESTIONNAIRE**

Split-half and alpha reliability estimates were also calculated for the Transformation Questionnaire. A split-half reliability estimate for unequal length of 0,31 was obtained. The Spearman-Brown correction also yielded a reliability coefficient for unequal length of 0,36. An alpha coefficient of 0,76 was obtained for the Transformation Questionnaire.

The Transformation Questionnaire is a lengthy survey with 182 questions on various transformation factors. Split-half and alpha reliability estimates were also calculated for the different factors studied ("mini questionnaires") in the Transformation Questionnaire. Table 8.5 summarizes these reliability estimates.

TABLE 8.5: RELIABILITY ESTIMATES FOR THE DIFFERENT FACTORS - TRANSFORMATION QUESTIONNAIRE.

Factor	Split-half reliability estimate for unequal length	Spearman-Brown correction reliability coefficient for unequal length	Alpha coefficient
Objectives of the organization (3 items)	-0,06	0,13	0,71
Job satisfaction (28 items)	0,57	0,65	0,87
Transformation process (10 items)	0,64	0,65	0,57
Work environment (11 items)	-0,56	0,37	0,60
Competence (2 items)	0,16	0,18	-
Feelings about management (5 items)	-0,50	0,60	0,83
Feelings about decisions (4 items)	-0,68	0,41	0,13
Conflict handling (6 items)	0,05	0,05	-0,26
Change (6 items)	-0,30	0,23	-0,22
Past 2 years in the job (3 items)	0,41	0,43	-

TABLE 8.5: (CONTINUED)

Factor	Split-half reliability estimate for unequal length	Spearman-Brown correction reliability coefficient for unequal length	Alpha coefficient
Communication (4 items)	-0,02	0,02	0,46
Climate in the organization (20 items)	0,74	0,71	0,70
Attitudes towards work and life (20 items)	0,87	0,88	0,86
Team building (3 items)	0,38	0,47	0,67
Personal feelings (15 items)	0,56	0,56	0,77
Future and stress (10 items)	0,94	0,95	0,89
Personal needs (12 items)	0,76	0,80	0,70
Diversity (8 items)	0,92	0,93	0,92
Sharing of work and life issues (6 items)	-0,63	0,41	0,65
Proposals for the transformation process (8 items)	0,92	0,93	0,92

From Table 8.5 it is clear that some areas (factors studied) of the Transformation Questionnaire yielded better reliability estimates than others, especially where the factor studied had more than 6 items. These aspects need to be addressed in terms of future research.

8.8 CONCLUSION

In this chapter the questionnaires used in the study were discussed. Attention was given to the construction and development of the Motivation Questionnaire, Locus of Control Inventory, and the Transformation Questionnaire. The different approaches to determine validity and reliability estimates were discussed in some detail. Split-half and alpha reliability estimates were calculated for all the questionnaires.