

CHAPTER 7

DATA COLLECTING METHODOLOGY

7.1 INTRODUCTION

The choice to undertake any kind of empirical research always presupposes the careful choice and design of appropriate research methodology. After having studied the theoretical perspectives on TQM in great detail and formulating a framework for the implementation of TQM, the results of this process have been used as the basis for designing and conducting the empirical research. Moreover, this is done within the sketched context of the aim and functions, as well as the method followed by the SA Air Force to implement TQM as provided in the previous chapter.

The aim of this chapter is to define the method followed for collecting data for the empirical research. Close attention is paid to the method chosen for processing the data to test the applicability of the suggested total quality framework (as discussed in chapter 3, figure 3.1, paragraph 3.4) as a framework for the SA Air Force. The data required for the study was collected by means of a structured questionnaire survey. The prerequisites for a successful questionnaire are examined, before providing details about the design and development of the questionnaires in question, the contents and the process of distribution followed in getting them completed. There is a particular focus in the discussion on reliability analysis and validity, as well as on the confidentiality of respondents.

7.2 METHOD OF DATA COLLECTING

For the purposes of this study a literature study and empirical research were used for data collection. When following this method of data collecting, it is essential to distinguish between primary and secondary data. According to Kothari (1985:11) primary data is original information collected for the first time. On the other hand secondary data is information that has been collected previously and that has been put through the statistical process. The latter is typically data that has been obtained by means of literature studies, as for example those in chapters 2 and 3 of this thesis.

The secondary data for the thesis has been obtained by studying manuals, magazines, journals, dissertations and theses as already discussed in chapter 1, paragraph 1.9.1, that addresses aspects of quality and achievement, especially in the milieu of service-rendering institutions. As far as primary data is concerned, Drew (1980:11) distinguishes further between experimental and non-experimental research. As this study is clearly of a non-experimental nature, the focus will be on methods of data collection. Both Drew (1980:12) and Kothari (1985:12) regard questionnaires, interviews and direct observations as the most important means of data collecting. The measuring instrument used in this thesis is in the form of a questionnaire. Although more than one type of questionnaire exists, Mulder (1989:39) regard the questionnaire as a data collecting method in general as “a purposeful, structured set of questions that can be used to obtain the opinions of a large number of respondents in writing, without necessarily making contact with the target group”. The reason why questionnaires have been used as data collecting method in this study will now be discussed in more detail.

7.3 APPLYING THE QUESTIONNAIRE METHOD

The questionnaire method was selected as research method for the thesis as it makes the quantification of information possible. The reason for using a questionnaire is that the opinions of respondents can be obtained in a structured manner. According to Van Dyk (1991:278) questionnaires are the most common method applied to diagnose the functioning of institutions. Although construing a questionnaire seems to be quite simple, it is a complex and taxing process. Information (items/questions) must be formulated and selected carefully and the aim of the research must continuously be borne in mind.

Using a quality framework (framework) as the reference framework within which the problem is researched, as depicted in chapter 3 (paragraph 3.4, figure 3.1), ensures completeness and demarcation when compiling questionnaires. However, the effective development of a reference framework requires an equally important scientific lead that should preferably be based on theoretical and empirical research. By using a theoretical framework of TQM, together with empirically based information, a sound basis is provided for the establishment of a reference framework, unique to the problem

being researched, and the development of a questionnaire with applicable questions that are based on the variables contained in the framework (Van Dyk 1991:286).

Oppenheim (1978:3) is of the opinion that research is often conducted without the necessary planning and scientific design of measuring instruments. However, by its very nature, a questionnaire as measuring instrument implicitly requires planning and a scientific approach.

Oppenheim (1978:4) explains the importance of the research design as follows: "Survey design attempts to answer such questions as: Which variables should be measured? What kind of sample will be drawn? Are control groups needed? Who will be questioned, and how often? What scales may have to be built or adapted?" Van Dyk (1991:273) continues and states that a questionnaire is designed with a specific aim in mind, containing relevant items (questions) to determine the connection, cause or consequence between various aspects/variables in order to determine the current or potential state of affairs in respect of the uniqueness of the subject being researched. Good & Hatt (1962:133) define a questionnaire as follows: "In general the word questionnaire refers to a device for securing answers to questions by using a form which the respondent fills in himself." This general definition of a questionnaire concurs with most opinions in this regard.

For the purposes of this study structured questions were used as these simplify the statistical process. The degree of structure of questionnaires may vary from questionnaire to questionnaire. Structured questions force respondents to choose from a list of alternatives. The potential advantages of structured questions are amongst others that it is relatively time- and cost-effective, that it facilitates wide geographical coverage and that respondents can complete it at their own pace. It therefore simplifies the collection of relatively more information on a condensed basis. Furthermore, most respondents are familiar with questionnaires and all are confronted with exactly the same questionnaire items. In addition, questionnaire information can be processed relatively easy as it elicits relatively uniform responses. Computer processing is therefore simplified. Questionnaires can also ensure anonymity and as a result respondents are more inclined to be honest, which usually assists in obtaining more accurate and valid research information. The chances of the researcher creating

biasness are also lessened as a result of the impersonal nature of questionnaires. Answers obtained in this manner are easily quantified, which make statistical analysis by means of computer possible. It is also more probable that respondents will be willing to complete this type of questionnaire rather than open questions, owing to the time and mental exhaustion of the latter. Computer processing of the information obtained also occurs more quickly and accurately.

The potential disadvantages of a questionnaire with structured questions are the restrictions placed on a respondent. He or she does not have the freedom to move outside the boundaries set by the choices. A further disadvantage is that questionnaires are commonly used and that low response rates are usually a problem as a degree of 'resistance' to questionnaires exist. Poorly designed questionnaires may also lead to unsatisfactorily completed questionnaires. There is also no control over the external circumstances under which the questionnaires are being completed. For this reason the design and administration of questionnaires require thoroughness, patience and competence from the researcher. Another potential disadvantage is that strongly structured questionnaires can at times make in-depth analysis very difficult. All information obtained by means of questionnaires is also based clearly on verbal conduct, therefore certain scientists regard it as a relatively rigid method with little space for personal interaction. A further problem is that there is hardly any control over on the date on which or time within which the responses were obtained. Questionnaires are also restricted to the respondents' level of literacy and questionnaires as such can do very little to motivate respondents to participate in the research. However, these potential disadvantages can largely be overcome by a well-founded design and administration process and questionnaires are therefore generally accepted as a research method (Leedy 1974:82).

7.3.1 Prerequisites for a successfully designed questionnaire

According to Berdie & Anderson (1974:48), Kothari (1985:21), Drew (1980:9) and Smit (1991:72) the following are of importance when designing a questionnaire for research purposes:

- Always bear the aim of the research in mind and structure questions accordingly, in other words only include questions that support the research.
- Provide clear directions and instructions on how to complete the questionnaire and provide examples for each section, if necessary.
- Keep the format of the questionnaire neat and clear and include a brief covering letter containing clear instructions on how to complete the questionnaire.
- Keep all instructions simple and easy to understand.
- To increase the response rate, the questionnaire should contain an element of motivation.
- Research of the questionnaire should be done in order to ensure that it is clear and to determine how long it will take to complete.
- Questionnaire items should be easy to read, be in simple, understandable language and each item should be specific and not confusing.
- Questionnaires should be structured and standardised as far as possible. The structure of questions refers to the setting of items and the fact that responses are limited to the alternatives. Standardisation refers to the same wording and the same order of questioning being used in all questionnaires.
- The questions should be attractive and in a logical order.
- Do not ask more than one question within a question.
- Avoid terms and concepts that are biased.
- Questionnaire items should not embarrass the respondent.
- Questionnaire items must reflect objectivity.
- Avoid questions that will lead the respondent to a specific answer.
- Questions should as far as possible ensure accurate feedback from the respondent.
- Anticipate questions that could possibly be asked by the respondents and deal with these in the instruction phase.
- Avoid the use of unfamiliar abbreviations in questions.
- Within the boundaries set by the research problem, the questionnaire should be kept short in order to avoid respondent exhaustion.
- Respondents should be given enough time to complete the questionnaire.
- A pre-test of some or other nature should be used to determine problems and to improve the quality of the questionnaire.

- Questionnaires should be logically structured and designed and the pages of the questionnaire should be numbered clearly.

If these guidelines are followed as far as possible, it can increase the value and success of questionnaire research. When designing questionnaires it is essential not only to keep to the requirements as set out above, but also to follow a systematic approach. A questionnaire must be designed in such a way that it directly supports the research problem being investigated. All questionnaire items must be directly related to the set problem. The aim of any questionnaire should be to research and explain the set problem. Once this has been decided on, one should decide on the type of information that has to be collected in order to explain the problem setting. It then has to be decided what type of questionnaire will be appropriate for collecting the type of information required. A decision also has to be made in respect of the scaling of the questionnaire. On the basis thereof the specific questionnaire items can be developed. Each item has to be developed with sensitivity for the respondents' reference frameworks. Once questionnaire items have been construed, scaled and set in a logical structured questionnaire format, some type of pre-test has to be conducted. Based on the resulting recommendations, the required corrections or adaptations have to be made in order to improve the quality of the final questionnaire.

These practical guidelines were followed when compiling the questionnaires attached as Appendices B and C to the thesis. The information that was finally gathered in respect of the TQM philosophy was quite vast and it would have been difficult to be formulated in any other way than a questionnaire for assessment purposes. Conducting interviews on the identified eight dimensions, as discussed in chapter 3, would for example have been time-consuming and external variables would not have been easy to control. Another reason for choosing the questionnaire as measuring instrument is that questionnaires are scaled so that each respondent can provide his or her personal view. In this way information is obtained in an orderly manner, which facilitates processing.

7.3.2 Developing the questionnaire

Questionnaires must in the first instance be developed in such a manner that they directly support the specific research problem. All questionnaire items should be directly linked to the set problem. The purpose of any questionnaire should be to research and elucidate the set problem. As no specific questionnaire was available for the study, a questionnaire had to be compiled that could be used for the purposes of the study. On studying the literature it became clear that a number of factors have to be taken into consideration when designing a questionnaire. According to Bailey (1987:107) attention should be paid to:

- the relevance of the objectives of the study to practice;
- the relevance of the questions to the objectives of the study; and
- the relevance of the questions to the individual respondent.

In chapter 1 it was already indicated that the study is relevant to practice. The items (questions) contained in the evaluating questionnaire are all relevant to the objectives of the study, as the contents thereof have been deduced from those requirements in respect of which uniformity exists in theory and practice. Although a large number of items could have been included in the questionnaire, only those items that came to the fore whilst researching the two literature study chapters were included, for the sake of conciseness and relevance. Items applicable to TQM were selected.

The aim of the questionnaire was to determine how individuals experienced TQM at the time of the survey. This was done to determine how TQM is applied in the eight SA Air Force Bases. The researcher designed and compiled the questionnaire himself, based on the theoretical study. An industrial psychometrist also worked through the questionnaire to ensure that the questions form an integral part of the study, as well as that the right perceptual aspects were tested. As a pre-test control measure the questionnaire was distributed amongst ten sample members employed at the headquarters of the SA Air Force in order to determine whether the questionnaire would be able to measure those characteristics that it is suppose to measure. The ten questionnaires were given to a number of experts to check for clearness and correctness. The target group who were to be asked to complete the questionnaire

would consist of a representative part of the uniformed personnel and the civilian personnel working at the air force bases. This group would further consist of personnel employed at all levels in the organisational structure of the institution, including the officer commanding. The result was that 210 structured questions were compiled. In the opinion of the researcher the questionnaire appears neat and is technically well prepared. On 18 January 2004 the questionnaire was discussed with the student leader for final adaptations, before being completed.

Answering the questionnaire is based on a five-point scale, as illustrated in table 7.1. Each scale has its own characteristics, as well as advantages and disadvantages. For the purposes of this study and the type of questionnaire used, the summed scale was considered to be the most appropriate scale. A summed scale consists of a number of statements representing a favourable or unfavourable opinion to which a respondent has to respond by indicating whether he or she agrees or disagrees, as well as the degrees thereof (Kothari 1985:121). By using this scale the same answering categories could be used continuously. On the basis of the construction of the questions, the scale points vary between scale codes ranging from “not true” to “absolutely true”. Numerical values varying from 1 to 5 were linked to the scale codes. The respondents’ understanding of the aim and contents of the questionnaire was improved as it was accompanied by an explanatory letter and each section was preceded by a definition of the specific dimension (see Appendix B and C).

Table 7.1: Representation of the scale code

Do not know	Not true at all	Slightly true	True in most cases	Absolutely true
1	2	3	4	5

The scale codes for this study are explained in table 7.2. The numerical values 1 and 2 are regarded as negative, 3 as neutral and 4 and 5 as positive.

Table 7.2: Scale codes and description

Scale code	Scale description
1 Negative	<u>Do not know</u> . Indicates that the respondent has no knowledge of the element that is evaluated.
2 Negative	<u>Not true at all</u> . Indicates that the element of the dimension plays no role within the dimension
3 Neutral	<u>Slightly true</u> . Indicates that the element of the dimension does play a role in the dimension.
4 Positive	<u>True in most cases</u> . Indicates that the element of the dimension is important to the dimension and that it should be part of the dimension.
5 Positive	<u>Absolutely true</u> . Indicates that the element of the dimension plays an active role in the dimension and that it is essential and should definitely be included in the dimension.

The advantages of using the above scale are the effective utilisation of space, quick assessment of questionnaires and the facilitation of comparisons between answers. When asked to complete the questionnaire, respondents were provided with a letter explaining to them the purpose of the survey. Completing the questionnaire was also facilitated by the fact that the researcher gave eight presentations (eight air force bases) of ten minutes to all 543 respondents on how to complete the questionnaire. The researcher was also continuously present during the completion of the questionnaire, which facilitated questionnaire application. The advantage of this method was that the researcher could answer any questions and could eliminate any misunderstandings or misinterpretations, should there be any. The fact that the researcher was employed at different air force bases for 17 years prior to 2004 and was therefore known to the respondents also facilitated questionnaire application.

Although the questionnaire method does not require personal contact, it soon became clear that the presence of the researcher was effective (see reliability analysis paragraph 7.4.1). No time limit was attached to completing the questionnaire. Respondents could answer at their own pace, as quickly or as slowly as they desired. The confidentiality with which information would be dealt with was also emphasised

continuously. According to Van Dyk (1991:282) one of the main disadvantages of using a questionnaire is the fact that the target group often does not return a representative percentage of questionnaires. This problem was eliminated by the fact that the researcher was present all the time and personally collected the completed questionnaires.

7.3.3 Contents of the questionnaire

In the opinion of the researcher the questionnaire was properly structured and standardised. All respondents who completed the questionnaire survey received the same questionnaire, in the same format and with the same instructions, whether at top management, middle management or operational worker level. The questionnaire consists of two parts, namely questionnaire one and questionnaire two. The first questionnaire (see Appendix B) deals with the biographical information and the second questionnaire (see Appendix C) deals with the 14 TQM dimensions (see paragraph 3.4, figure 3.1). The variety of questions based on the 14 dimensions discussed in chapter 4 and 5 was used to ensure a more complete profile of the questionnaire. The questionnaire, consisting of 210 questions (including questionnaire one dealing with biographical information), was used to obtain data on the subject of research. The numbering of the two questionnaires appears in the column marked “for office use only” on the questionnaires. The contents of the two questionnaires can be summarised as follows (see Appendices B and C for more particulars):

- Page 1: Cover page for questionnaire one containing the title of the thesis and the title of the questionnaire, namely questionnaire one for biographical information. The questionnaire was compiled in English due to the fact that the official language of the SA Air Force is English.
- Page 2: Consisting of the “Biographical particulars”. This part consists of eight questions focussing on the relevant biographical particulars of the respondent. The following aspects were covered:
 - Management Level. The aim of the question on the management level is to determine the respondent’s position in the hierarchy, that is top management,

middle management or worker. The management levels and their involvement play an important role in the implementation of the TQM philosophy. The three groupings are therefore important for the analysis of the data. The assumption was made that top management and middle management have the best knowledge, insight and experience and therefore all managers were involved.

- Qualification of respondent. The qualifications of respondents were required to determine who possess tertiary qualifications.
 - Rank of the respondent. The rank of the respondent was used to make rank groupings for the analysis of the data.
 - Name of air force base. The name of the air force bases was required to determine the number of respondents at each air force base.
 - The functional group (mustering) of the respondent. The data on the functional groupings of the respondent was used to determine the distribution of the respondents at the air force bases.
 - Number of years employed by the SA Air Force at air force bases. The aim of the question on the respondents' number of service years was to distinguish between respondents who have two years' or less service, respondents who have between two and five years' service, respondents who have between six and ten years' service and respondents who have more than ten years' service. This distinction could assist with determining whether different opinions exist between the various groups at air force bases in respect of TQM. The reason is that members who have ten years' or longer service at air force bases were involved in the first total quality efforts of the SA Air Force in the 1990s, as discussed in chapter 6 and that these respondents were exposed to all the changes in the SA Air Force up to and including the implementation of the SAEF framework. Respondents who have between six and ten years' service at air force bases had more exposure to total quality efforts after 1994 when the SA Air Force became more focused on quality. Respondents who have less than two years' service most probably did not experience the same changes.
-
- Page 3: Cover page for questionnaire two consisting of the title of the thesis and the total quality framework based on the 14 TQM dimensions on which the questions in sections A to M are based.

- Page 4: Two definitions of TQM were provided, as well as brief completion instructions and an example on how to complete the questionnaire.

- Pages 5 – 17: A questionnaire consisting of 210 questions was compiled based on the 14 dimensions of the total quality framework as indicated on page one of Appendix C. Structured response questions were used where respondents were asked to select one answer in respect of a specific question. These structured response questions were divided into 13 sections, namely leadership and top management' commitment towards TQM, strategic planning, empowerment, teamwork, continuous improvement, customer and employee satisfaction, communication, training, cultural forming and change management (both dimensions culture forming and change management covered in section I), support structures, systems and resources, systems thinking, self-assessment and processes in order to group items dealing with the same topic together. All the structured response questions were expressed in positive statements. The division of questions is as follows:
 - Section A: Leadership and top management's attitude towards TQM – 11 questions.
 - Section B: Strategic planning – 13 questions.
 - Section C: Empowerment – 16 questions.
 - Section D: Teamwork – 13 questions.
 - Section E: Continuous improvement – 13 questions.
 - Section F: Customer and employee satisfaction – 13 questions.
 - Section G: Communication – 13 questions.
 - Section H: Training - 10 questions.
 - Section I: Cultural forming and change management – 10 questions.
 - Section J: Support structures, systems and resources - 14 questions.
 - Section K: Systems thinking - 8 questions.
 - Section L: Self-assessment – 10 questions.
 - Section M: Processes – 12 questions.

- Pages 18 – 20: The questionnaire concerned was supplemented by statements that the respondents had to prioritise, namely:

- Section N: The most important reasons or motivation for the implementation of TQM.
- Section O: This section was subdivided into 3 sections, namely:
 - Which elements have a positive effect on the implementation of TQM at air force bases;
 - Which elements have a negative effect on the implementation of TQM at air force bases; and
 - What quality factors are the most difficult to deal with at air force bases.
- Section P: This section was subdivided into two subsections, namely:
 - Which internal changes at air force bases, associated with the TQM philosophy, are the most important to air force bases; and
 - Which external changes at air force bases, associated with the TQM philosophy, are the most important to air force bases?
- Section Q was divided into one question where respondents had to indicate whether TQM is acceptable at air force bases or not. In this section there was one open question, where the respondents had to provide their own answer if they had answered 'no' to the preceding question. This type of question provides more freedom and in-depth answers are possible. Open questions provide respondents with the opportunity to describe their feelings in respect of the various aspects of their work. It also provides more insight as to the reasons why a respondent likes or dislikes his or her work. It is also easier to discover misinterpretation of the question by the respondent. The disadvantage of an open question is the amount of time that the collecting and analysing of data consumes. A general remark is that a questionnaire can obtain the advantage of both types of questions (structured questions and open questions) by using a combination of structured response questions and open questions.

The questions in section Q were included in the questionnaire in order to obtain more facts and also to find possible explanations for and confirmation of tendencies in respect of the previous 209 questions.

7.3.4 Distribution of copies of the questionnaire

The questionnaires were completed between 8 March 2004 and 26 March 2004 with the aid of the technical personnel at air force bases. The process was planned in such a way that it would ensure the highest possible response rate and that respondents would understand the aim and contents of the questionnaire. The distribution of copies of the questionnaire occurred centrally in a lecture room at air force bases during normal working hours, and the researcher was personally responsible for the distribution of and briefing on the questionnaires. Each questionnaire contained a covering letter (Appendix A). The covering letter emphasised the respondent's anonymity and the confidentiality of the process, as the questionnaire deals with the performance of personnel members. The approach of central distribution of the questionnaire and presence of the researcher was to the advantage of the research process and therefore all 543 copies of the questionnaire were returned directly on completion for processing and analysis. In this manner a response rate of 100% was obtained.

Personnel from all levels of the hierarchy were present to complete the questionnaire. The serving personnel include both uniformed and civilian (referred to as Public Service Act personnel) personnel members. Public Service Act personnel form the demilitarised component of the SANDF and are employed at various sections at air force bases. On completion of the questionnaire each respondent had to complete a comments page. There were no negative comments on the understandability and clearness of the questionnaire.

7.3.5 Data processing and interpretation

Once the respondents had returned the completed questionnaires, they were prepared for processing by UNISA's Data Capturing Department Computer Services. The data was captured in the Statistical Analysis System (SAS) (data processing program) Version 8.2 (SAS Institute Cary, North Carolina NC: 27513, USA) for statistical processing and analysing. All data was coded from the completed questionnaires on standard capturing forms where after it was captured. The information required was also discussed with a consultant from the department, so that the department could do

the correct interpretation and knew exactly what the researcher wanted. The consultant also provided advice on the use of the electronic mail system, spreadsheets and other data capturing analysis methods. Once the department had processed the questionnaires, a data set was obtained. Specific uncertainties were cleared with the consultant during four contact interview sessions. The results of the answers to all the questions were integrated with one another and analysed. The SAS statistical packet included the frequency analysis, correlation matrices, multiple regression analysis and residu analysis. The results from the empirical survey are discussed in chapter 8.

7.4 RELIABILITY ANALYSIS AND VALIDITY

Questions that often arise during questionnaire design are the following: Will the set questions provide the required information? Will the answers given by respondents on a specific day, correlate with answers provided by the same respondents at a later date? These answers are linked to the aspects of reliability and validity, as well as representivity that are often questioned by people. In many cases this criticism is justifiable. A well-designed questionnaire in a well-defined research design will limit negative criticism in this regard to a large extent. However, in the personal experience of the researcher questionnaire design, questionnaire application and questionnaire results always elicit criticism irrespective of the scientific approach followed (Van Dyk 1991:276).

To be scientifically accountable a questionnaire has to comply with two basic requirements, namely it has to be reliable and it has to be valid.

7.4.1 Reliability

According to Smit (1991:104), the question as to what can be regarded, as a reliable questionnaire will always arise when a reliability analysis is at stake. Berdie & Anderson (1974:13) are of the opinion that reliability is linked to stability over the cause of time. A reliable questionnaire item is an item that will constantly convey the same meaning. Dressler (1981:156) states that reliability refers to consistency and describes a reliable questionnaire as a questionnaire that consists of reliable items. He regards a reliable item as an item that consistently conveys the same meaning to the persons

involved in the survey. The internal consistency of a questionnaire is especially applicable in questionnaire context. With this he means the correlation between responses on the same type of dimension that is asked by means of a question. As an example it can be said that in order to test the reliability, two or more questions can be asked in respect of the same aspect (dimension) and the similarity of answering (positive or negative correlation) can be determined (Van Dyk 1991:277).

Van Dyk (1991:277) states that the reliability of an instrument refers to the degree to which the repeated application of the instrument on the same object will continuously deliver the same results. Smit (1991:104) states that if a questionnaire is reliable, a person can rely on it. He further states that various approaches to the defining and determination of questionnaire reliability exist. The most practical and extensive approach to reliability is the approach that defines reliability in terms of the relative absence of measuring errors in a measuring instrument. Reliability is therefore the relation of error variation to the total variation as obtained by the measuring instrument deducted from 1,00. The index 1,00 indicates perfect reliability (Smit 1991:105).

As it can be accepted that it is probably humanly impossible to develop a measuring instrument with perfect reliability, a further question arises: What then can be regarded as an acceptable reliability coefficient for items in a test? In this regard Smit (1978:42) points out that test reliability is not based on an all-or-nothing principle, but that it is a degree phenomenon and that arbitrary principles cannot be determined according to which the reliability of a measuring instrument as being impractical low or satisfactory for use can be evaluated. However, he does indicate that one method according to which reliability indexes can be interpreted is in terms of the aim of the test. For the evaluation of the performance of a group, as is the case in this survey, Smit (1991:105) is of the opinion that the minimum value of the reliability coefficient should be 0.60.

For the purposes of this study a computer reliability analysis (Alpha Cronbach) was conducted for the test as a whole, as well as for the various sections of the test. The reliability coefficient for the test as a whole was 0,907. The reliability coefficients in respect of the various sections of the questionnaire are reflected in table 7.3.

Table 7.3: Reliability analysis: Various section A to M of the questionnaire

Section of questionnaire	Reliability coefficient
A: Leadership and top management commitment	0.889
B: Strategic Planning	0.933
C: Empowerment	0.915
D: Teamwork	0.913
E: Continuous improvement	0.948
F: Customer and employee satisfaction	0.939
G: Communication	0.918
H: Training	0.945
I: Cultural forming and change management	0.916
J: Support structures, systems and resources	0.931
K: Systems thinking	0.737
L: Self -assessment	0.868
M: Processes	0.946

It can be deduced from the table that not one of the sections has rendered a relative low reliability coefficient – in fact all can be regarded as being above average. However, the most important coefficient is the one for the questionnaire as a whole – that can be regarded as being extremely high if taking into consideration the fact that the questionnaire actually represents an opinion survey. It therefore appears that the precautions that were taken during construction and administration have indeed borne fruit.

7.4.2 Validity

Validity on the other hand refers to the degree to which a test measures that which it is suppose to measure. Berdie & Andersen (1974:13) state the following in respect of validity: “The validity of a questionnaire item is concerned with whether or not the item actually elicits the intended information. Questionnaire items are valid if they are successful in eliciting true responses relevant to the information desired.” In other words it is essential that respondents attach the same meaning to the set questions than the compilers thereof. According to Mouton & Marais (1989:79) the central validity

consideration in the process of data collection is linked to reliability, in other words whether applying a (valid) measuring instrument on various survey group in various circumstances will lead to the same observations. Dressler (1981:155) and Downie & Heath (1983:45) distinguishes between four types of validity, namely empirical validity, content validity, face validity and construct validity.

- **Empirical validity** refers to the accuracy with which a test forecasts a certain degree of performance.
- **Content validity**, that is especially applicable to questionnaire design, refers to the degree to which items are an unbiased version of the characteristic that is measured.
- **Face validity** is closely linked to content validity and refers to the question whether a test appears to measure that which it is suppose to measure.
- **Construct validity** is the most difficult to understand, to measure and to determine and refers to the degree in which a measuring instrument succeeds in measuring the psychological or abstract aspects that it is suppose to measure.

According to the researcher, the content validity is the best criterion for validity for the purposes of this study, as the questionnaire is focused on the attitude of certain individuals in respect of TQM. This implies that the test has content validity for a specific aim with a specific group (Smith 1981:49). According to research done by the compiler, similar questionnaires with which a comparison can be made, do not exist and can the test therefore be regarded as being valid based on the test for reliability.

7.5 QUESTIONNAIRE CONFIDENTIALITY

Owing to the nature of the research, it was important to ensure respondents of the confidentiality with which answers would be treated as it could drastically influence the accuracy of results. This aspect therefore enjoyed a high priority during the instruction phase. Confidentiality was also increased by the fact that the researcher was continuously present during the completion of the questionnaires. Questionnaires were also handed to the researcher personally once completed. On completion of the questionnaire session, a large number of respondents expressed their satisfaction with

this fact, as it eradicated fears that section heads would have access to completed tests. This approach increased the sense of confidentiality.

7.6 SUMMARY

The aim of the discussion in this chapter was to provide clarity about the methodology that was used in the empirical section of this study. The utilisation of questionnaires as a data collection method was examined in detail, before providing an exposition of the actual design and contents of the questionnaires. Indications were also given of the precautions taken to ensure reliable and valid information.

The next chapter will analyse and interpret the results of the empirical research on TQM at SA Air Force Bases. The discussion of the results of the questionnaire is based on the proposed quality framework (figure 3.1 in chapter 3 of the thesis). The discussion commences with an analysis of biographic details, before moving on to an item analysis of the dimensions tested in the questionnaires, the drawing up of a list of priorities, and concluding with the deficiencies identified in the research.