Chapter 3: Research Design

3.1 INTRODUCTION

From the previous chapters it is clear that the problem of sizing and fit is not a simple problem. This study is approached from the view that if population measurements are not current and accurate, all the other aspects cannot contribute to the achievement of an acceptable or proper fit. Since little information is known about measurements and sizing systems used in the South African clothing industry and keeping in mind the conceptual framework in **Figure 1.1**, the following objectives are set for this study:

1. To compile a comprehensive list of all body measurements required by South African apparel manufacturers and retailers, covering the garments in the following categories:
   - ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the full body;
   - ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the upper body;
   - ✓ Men's/Boys'/Women's/Girls'/Babies' garments that cover the lower body;
   - ✓ Men's/Boys'/Women's/Girls'/Babies' headwear;
   - ✓ Men's/Boys'/Women's/Girls'/Babies' gloves;
   - ✓ Men's/Boys'/Women's/Girls'/Babies' footwear.

2. To compare international descriptions of the identified body measurements with the South African respondents' descriptions and evaluation of the identified body measurements.

3. To describe the problems experienced with body measurements by the South African manufacturers and/or retailers.

4. To describe currently used South African sizing systems.

5. To describe how block patterns are generated by the South African manufacturers and/or retailers.

6. To describe how fit testing is done by the South African manufacturers and retailers.

7. To describe how wear testing is done by the South African manufacturers and retailers.

These objectives will enable the researcher to identify problems and possible reasons for problems that are currently experienced in the South African clothing industry with regards to the size and fit of clothing items. The objectives of the study have definite implications for the execution of the study. In this chapter the choice of research strategy, sampling methods, data collection, data analysis and presentation, and validity and reliability of the study will be discussed.

3.2 RESEARCH STRATEGY

According to Babbie and Mouton (2001:75), studies that address “real-life” problems can be classified as empirical studies. This exploratory and descriptive study in the field of sizing and fit can therefore be classified as an empirical study.

The scope of the objectives of this study necessitates a quantitative research paradigm. Quantitative data collection techniques have been applied to adequately address the research problem and objectives. To identify the body measurements required by South African apparel and footwear manufacturers and retailers, a representative postal survey was conducted. To define the measurements identified by the above survey, interviews were conducted with selected manufacturers and

retailers individually. An interview is also an appropriate technique to gain information regarding currently used South African sizing systems and procedures regarding fit and wear testing. The research problem was resolved by collecting new or primary data and by analysing existing or secondary data.

3.3 SAMPLING

The target population for this study was South African apparel and footwear manufacturers and retailers. The sampling frame is defined as clothing manufacturers and retailers listed in the Clothing Federation of South Africa Handbook. For footwear and accessories the Shoes and Views' Directory was consulted. These lists of manufacturers were chosen because they give an indication of which type of garment or shoe is manufactured and also included the name of a contact person.

In South Africa, as elsewhere in the world, product development is retail driven. Because of the prescriptive relationship existing between retailers and manufacturers, the major retail chains were included in the target population. Chain stores are a group of stores that sell essentially the same merchandise and are centrally owned, operated and merchandised (Frings, 1999:362). It is assumed that the smaller chains and boutiques are too small to influence the sizing systems used by manufacturers. Furthermore it is assumed that smaller retailers will have to follow the lead of the major chains to survive in the competitive clothing and footwear retail environment. This view is supported in a report by Dunne (2000:11). A combined list of retailers was obtained from the Clofed Handbook and Shoes and Views' Directory. For this study, only national retailers of both clothing and footwear products were included. Last manufacturers for the footwear industry and figure form manufacturers for the clothing industry are important users of body measurements and therefore also formed part of the target population for this study.

After consultation with the statistician it was decided to include the entire target population in the study. This is mainly due to the fact that a postal survey was conducted and the response rate for postal surveys is often poor.

The lists of manufacturers and retailers were consolidated and a total number of 472 respondents were identified. A breakdown of the respondents is given in **Table 3.1**.

TABLE 3.1: COMPOSITION OF SAMPLE FOR POSTAL SURVEY

Category	Quantity
Clothing manufacturers	264
Footwear manufacturers	169
Headwear manufacturers	20
Hat & Glove manufacturers	1
Last manufacturers	2
Figure form manufacturers	1
Retailers	15
Total	**472**

From the manufacturers and retailers that responded to the postal survey and returned a completed questionnaire, a purposive or judgemental sample was taken for the interviews. This means that the sample was selected based on the researcher's judgement and the purpose of the study. Since the number of responses to a postal survey may be low, this sampling technique ensured a representative sample for the interviews. According to Kvale (1996:102), the number of interviews in current interview studies tend to be around 10 to 15. For this study, 12 companies were chosen for the interviews. Parameters for selection of this second sample included the following:

- ✓ geographical area;
- ✓ manufacturers and retailers covering the whole spectrum of garment categories;
- ✓ manufacturers and retailers catering for specific figure requirements;
- ✓ manufacturers and retailers that indicated problems with specific measurements;
- ✓ involvement in the development of sizing systems;

✓ number of years in business.

Table 3.2 and **Table 3.3** reflect some results from the postal survey that were required for the purposive sampling of the interviews.

TABLE 3.2: PROVISION FOR SPECIAL FIGURE REQUIREMENTS

Special requirements	Number	%*	Interviewed
Short, Regular, Long	14	25,93	6
Disabled people in wheelchairs	2	3,7	0
Disabled people missing limbs	2	3,7	0
Petite figures	10	18,52	4
Outsizes / Plus sizes	26	48,15	9
Different body shapes	10	18,52	4
Narrow, medium, wide fitting shoes	2	3,7	0
Posture	1	1,85	0
Customised garments	1	1,85	1

* Respondents could choose more than one option therefore the percentage column does not add up to 100%.

Of the 12 companies selected for the interviews, nine claimed to provide for outsizes. Of the 12 companies selected for the interviews, six claimed to provide for different lengths, four companies claimed to provide for petite figures and different body shapes, and one company claimed to provide customised garments.

TABLE 3.3: INVOLVEMENT IN THE DEVELOPMENT OF SIZING SYSTEMS

	MEN		WOMEN		BOYS		GIRLS		INFANTS	
Garment type	Number	Interviewed	Number	Interviewed	Number	Interviewed	Number	Interviewed	Number	Interviewed
OUTERWEAR	6	4	9	5	9	5	8	5	4	2
UNDERWEAR	3	3	7	4	5	3	5	3	4	3
PROTECTIVE WEAR	3	1	5	0	1	0	1	0	0	0
FOOTWEAR	4	2	5	3	3	2	3	2	2	1
HEADWEAR	3	2	5	3	5	3	5	3	5	3
GLOVES	0	0	1	0	1	0	1	0	1	0

Companies involved in the development of sizing systems for most of the garment types, were included in the sample for the interviews. Protective wear and gloves were not represented well in the interviews since there were a limited number of respondents to choose from in these categories.

3.4 DATA COLLECTION METHODS

The data collection techniques included a structured questionnaire and individual interviews. The questionnaire consisted of closed questions and is included in **ADDENDUM A**. Closed questions consist of the question and the response options (Fink, 1995:35). The individual interview was an open interview where the person being interviewed was allowed to speak freely (Babbie & Mouton, 2001:289). A structured interview schedule was used to guide the interview and is included in **ADDENDUM B**.

3.4.1 Questionnaire for postal survey

Since the objective with the postal survey was to identify body measurements that are used by the clothing industry, the closed question questionnaire seemed appropriate. According to Neuman (2000:261), closed questions are also easier and quicker for respondents to answer. This is an important consideration as time is of the essence in the clothing and footwear industries.

Response rates is a big concern in postal survey research (Neuman, 2000:266). Because the survey was followed by an interview, the researcher kept a complete and accurate record of questionnaires posted and returned. Confidentiality was guaranteed, although the survey was not anonymous. The questionnaire included a cover letter and an addressed, postage-paid return envelope. Non-responses were followed-up with phone calls and where necessary a second questionnaire was sent, either by post or in most cases by e-mail. The above strategies were followed to

achieve a better response rate. Although the response rate was still poor (17,5%), it was better than expected according to the statistician's prediction (10%).

The questionnaire was developed by identifying measurements from existing documents and previous anthropometric surveys. Existing documents that were consulted included:

- ✓ American Society for Testing and Materials (ASTM) D5219-99 Standard terminology relating to body dimensions for apparel sizing;
- ✓ ASTM D4910-99 Standard tables of body measurements for infants, sizes 0 to 24;
- ✓ ASTM D5585-95 Standard tables of body measurements for adult female misses figure type, sizes 2 to 20;
- ✓ ASTM D5586-95 Standard tables of body measurements for women aged 55 and older (all figure types);
- ✓ ASTM D5826-95 Standard tables of body measurements for children, sizes 2 to 6x/7;
- ✓ ASTM D6192-98 Standard tables of body measurements for girls, sizes 7 to 16;
- ✓ ASTM D6240-98 Standard tables of body measurements for men sizes thirty-four to sixty (34 to 60) regular;
- ✓ ASTM D6458-99 Standard tables of body measurements for boys, sizes 8 to 20 regular;
- ✓ British Standard – Size designation of clothes part 1: Terms, definitions and body measurement procedure (BS EN 13402-1:2001);
- ✓ Ergotech internal document;
- ✓ Fort Knox Foot Survey (Freedman, Huntington, Davis, Magee, Milstead & Kirkpatrick, 1946);
- ✓ International Standard – Basic human body measurements for technological design (ISO 7250:1996);
- ✓ International Standard – Garment construction and anthropometric surveys – body dimensions (ISO 8559:1989);
- ✓ International Standard – Size designation of clothes – definitions and body measurement procedure (ISO 3635-1981);
- ✓ South African Standard – Code of practice for definitions for and measurement of body dimensions (SABS 0184-1982);

- ✓ Voluntary Product Standard PS 42-70: Body measurements for the sizing of women's patterns and apparel;
- ✓ Voluntary Product Standard PS 45-71: Body measurements for the sizing of apparel for young men (students);
- ✓ Voluntary Product Standard PS 54-72: Body measurements for the sizing of girls' apparel;
- ✓ Voluntary Product Standard PS 36-70: Body measurements for the sizing of boys' apparel.

Body dimensions that were included in the Nedscan (Dutch part of the CAESAR project) and SizeUK anthropometric surveys were also considered for inclusion in the questionnaire.

To ensure quick and easy completion of the questionnaire, the questionnaires for the different categories of manufacturers contained only relevant body measurements. The comprehensive questionnaire included all the possible measurements and was sent to the clothing manufacturers and retailers. The questionnaires for headwear, gloves and footwear included only measurements concerning these specific areas of the body. The questionnaire was reviewed by an expert in the clothing industry as recommended by Fink (1995:25). Following this expert's recommendation, figures indicating the positions of the body dimensions were included in the questionnaire to enhance the clarity and understandability of the questionnaire. Copies of the questionnaires are included in **ADDENDUM A**.

Following the survey it was necessary to describe the identified measurements. For this purpose the individual interview seemed an appropriate technique.

3.4.2 Individual interviews

In order to ensure accurate definitions of the identified measurements the individual interview was identified as an appropriate technique. To ensure reliability of the data, the interviews were conducted with the following people: four production managers, one quality assurance manager, six fit/garment technologists, and two

designers/pattern makers. These were also the same people who completed the questionnaire for the postal survey. It was estimated that one interview per respondent would be sufficient. A structured interview schedule was used to ensure that all the topics were covered during the interview. The topics to be discussed during the interview were chosen in accordance with the conceptual framework and the objectives of the study. A copy of the interview schedule is included in **ADDENDUM B**. Babbie and Mouton (2001:289) state that the interview schedule is a general plan and not a questionnaire, serving as a guide according to which the interviewer can structure the interview.

In the industry, taking measurements are in most cases not based on theoretical knowledge of the definitions of the measurements but on years of experience. It is not always easy to describe or explain how and where measurements are taken. The interview technique provided the respondent with the opportunity to demonstrate rather than describe measurements. The interviewer was then able to observe how and where a specific measurement is taken. The definitions provided by the respondent were compared to international definitions extracted from the lists named in paragraph 3.4.1 above. This allowed for more accurate interpretation of information.

To prevent any information from being lost or missed during the interview, audiotapes were kept and notes were taken where possible during the interview. Audiotapes were made with the respondents' permission in order to preserve the original data and to confirm the credibility of the data.

Information regarding currently used South African sizing systems, as well as the use of block patterns and fit and wear testing, was gathered during interviews with manufacturers and retailers. It was also possible to discuss the problems that are experienced regarding body measurements.

3.5 DATA ANALYSIS

According to Mouton (2001:108), all data collection culminates in the analysis and interpretation of some set of data. Analysis of data involves separating the data into manageable themes, patterns, trends and relationships. The aim of analysis is to understand the various elements of one's data through an inspection of the relationships between concepts, constructs or variables, and to see whether there are any patterns or trends that may be identified or themes that may be established in the data (Mouton, 2001:108).

3.5.1 Analysis of postal survey

The data obtained from the postal survey was analysed to identify all the measurements needed for the different garment types, as well as to identify problematic measurements. This was done with the use of descriptive statistics in the form of frequency tables. It was possible to compile a list of all the body measurements that should be included in a South African anthropometrical database to ensure that it is representative of the clothing and footwear industries. The purpose was not to understand or explain the choice of body measurements by industry, but simply to identify all the measurements used. Frequency tables gave a complete overview of collected data and seemed sufficient for this stage of the research. It also assisted in the identification of respondents that have been in business for a longer period of time, who are involved in the development of sizing systems and provide for special figure requirements. These aspects were important considerations in the sampling for the interviews.

3.5.2 Analysis of individual interviews

Audiotapes from the interviews were transcribed. Only information directly relevant to the study was transcribed completely. Where a discussion was not related to the study, it was not transcribed in full but just listed as "discussion of …". Words or

phrases repeated in a sentence was not repeated in the transcriptions, unless it added to a better understanding of what was being said by the respondent. The transcriptions of the interviews, together with notes taken during the interview and documents regarding body measurements received from a few respondents, were analysed by means of content analysis. Since the data consists of interviews as well as existing documents, content analysis methods seemed appropriate because according to Babbie and Mouton (2001:383), content analysis methods may be applied to practically any form of communication. The classic question that is usually answered through content analysis and that Babbie and Mouton (2001:384) refer to (namely *Who says what, to whom…* etc) can for the purpose of this study be changed to: "Who does what, to whom, why, how, and with what effect?"

According to Krippendorff (2004) in Trochim (2005:127), content analysis is the systematic analysis of text. The analysis can be quantitative and/or qualitative and the main purpose is to identify patterns in the text (Trochim, 2005:128). Data analysis for this study included qualitative analysis such as thematical analysis, and quantitative analysis such as frequency distributions (Mouton, 1998:163). The steps followed in content analysis included sampling of documents, unitising, coding and quantitative or qualitative analysis (Trochim, 2005:128). Since all the transcribed interviews, notes and documents gathered during the interviews were included for analysis, there was no need for sampling of documents.

3.5.2.1 Unitising

Unitising, or separating the units of analysis, was done according to the main categories as identified in the conceptual framework for the study illustrated in **Figure 1.1**, namely block patterns, fit testing, wear testing, sizing systems, descriptions of body measurements and problems experienced with body measurements. These are the key variables of this study and refer to the individual units about which descriptive and explanatory statements are to be made (Babbie & Mouton, 2001:384). These units were further coded according to a specific plan which can be viewed in **Addendum C**.

3.5.2.2 Coding

Content analysis is essentially a coding operation (Babbie & Mouton, 2001:388). The themes and questions listed in the interview schedule (see **Addendum B**) served as the plan for coding of the data. The coding plan is listed in **Addendum C**. Additional themes uncovered during classification of the text were coded as they occurred. Since only one person, namely this researcher, did the coding, there should not be any question about the reliability and specificity of the analysis (Babbie & Mouton, 2001:388).

A quantitative analysis was then done to determine the frequency with, and the context in which the themes occurred. Frequency tables are a form of descriptive statistics concerned with organising and summarising the data, enabling the researcher to make sense from the data (Mouton, 1998:163). Descriptive statistics, such as frequency distributions, describe the basic features of the data in the study, in other words it describes what the data shows (Trochim, 2005:205). It seemed appropriate for this particular study because of its exploratory and descriptive nature.

3.6 VALIDITY AND RELIABILITY

The value and applicability of the results of any research study depend on the validity and reliability of the respective data collection techniques. Formulated in conventional terms, validity implies that a measuring instrument should reflect the real or true meaning of the concept measured (Babbie & Mouton, 2001:122). Validity implies truthfulness and refers to the match between a construct and a measure (Neuman, 2000:164).

Reliability on the other hand refers to consistency and dependability (Neuman, 2000:164). Emory and Cooper (1991:179) confirm that reliability has to do with the accuracy and precision of measurement procedures.

In the instance of this particular study, measurement of validity pertains to both a quantitative approach (postal survey) to identify body dimensions used in the clothing and footwear industries, and a qualitative technique (interview technique) to verify definitions of measurements, obtain information on sizing systems, block patterns and fit and wear testing currently in use.

Emory and Cooper (1991:178) point out that one can distinguish between two major forms of validity, namely external and internal validity. External validity is the ability to generalise findings from a specific setting and a small group to a broad range of settings and people (Neuman, 2000:172). In the instance of this particular study where it is important to collect the widest possible range of body dimensions needed by the clothing and footwear manufacturing and retail industries, external validity is very important.

Prerequisites for generalisation of findings are:

- ✓ using a representative sample of the target population; and
- ✓ ensuring a sizeable and representative response.

Steps to ensure the above were:

- ✓ inclusion of the entire population in the survey in order to accomplish a representative sample in the event of a low response rate;
- ✓ keeping record of the responses and following up non-responses by means of phone calls to encourage the respondents to participate.
- ✓ using purposive sampling to select the respondents to participate in the interview in order to maximise the range of specific information that can be obtained. Respondents that were different from one another were thus purposely selected according to the criteria set out earlier in this chapter.

Internal validity refers to the end results of a validation process. Procedures to ensure internal validity include face validity, content, construct and criterion-related validity. In the instance of this study, content and construct procedures are important to ensure valid results.

Content validity represents the degree to which the content contains the universe of all relevant items under investigation (Emory & Cooper, 1991:184). To support content validity, the following steps were taken in compiling the postal survey questionnaire:

- ✓ a wide variety of sources were consulted in order to identify the most representative list of measurements applicable to the clothing and footwear industries;
- ✓ the questionnaire was evaluated by an expert from the clothing retail and production industry for content as well as construct validity.

Construct validity refers to the extent to which a list of items measures the relevant construct and not something else (Mouton, 1998:168). To establish construct validity, the meaning of the construct must be understood and the relationship between constructs identified (De Vos, 1998:85). An understanding of the constructs and the relationship between constructs as proposed by the theory, has been achieved. To support construct validity the following steps were taken:

- ✓ a deductive approach was used by studying existing theory to clarify constructs tested in the questionnaire and the interview schedule;
- ✓ the questionnaire was evaluated by an expert;
- ✓ vagueness and ambiguity were avoided in the questionnaire by including graphic figures to indicate measurement positions;
- ✓ vagueness and ambiguity were avoided in the interview schedule by doing individual interviews personally.

Researchers also aim to produce reliable data. This means that if the same measures were used and conditions under which data were collected were held as constant as possible, the same data should be collected from situation to situation (Mouton, 1998:111). Mouton (1998:144,148) argues that the reliability of data is threatened by the following 'observation effects':

- ✓ the researchers, 'experimenters', 'interviewers' or 'observers' (researcher effects);
- ✓ the individuals or subjects who participate in the research project (participant effects);

- ✓ the measuring instruments such as questionnaires and interview schedules (measuring instrument effects); and
- ✓ the research context or circumstances under which the research is conducted (context effects).

To reduce error as a result of 'observation effects' with regard to the questionnaire, the following precautions were considered. A cover letter was included with the questionnaire to emphasise the importance of participation in the survey. In an effort to motivate respondents to answer questions seriously and truthfully, the letter also stated the researcher's affiliation and informed respondents that confidentiality would be guaranteed although the survey is not anonymous. The questionnaire was compiled in such a manner that it did not take too long to complete. The questions were easy to understand and were relevant to the topic. To avoid ambiguity or misunderstandings, figures indicating the location of dimensions on the body were included. To ensure that the questionnaire reached the person most competent to complete it, the letter was addressed to the contact person available in the address list with the request to pass it on if he/she was not the competent person. The above steps contributed to the accuracy and precision of information supplied by respondents, and therefore will enhance the reliability of data collected.

To reduce error as a result of 'observation effects' with regard to the interview, the following precautions were considered. The possibility existed that the researcher could be observed as being too young (not sufficiently knowledgeable), and that the respondents could feel threatened by the questions. The clothing industries are not known to share information readily. To limit these 'researcher and participant effects', the researcher explained the reasons for the study and confirmed confidentiality of any information disclosed.

The timing of the interviews was carefully considered, in order to reduce 'context effects' as the industry closes down between 16 December and approximately 10 January. Therefore the factories and even retailers are extremely busy from November onwards until the end of the year. The interviews were conducted during July. The interviews were conducted by appointment at the respondent's office. In this way respondents felt comfortable and at ease. Setting aside time specifically for

the interview also improved the accuracy of responses in the way that it ensured that the respondent was more relaxed. The researcher again assured respondents of the confidentiality of the study in order to ensure truthful responses.

The researcher recorded the interview by means of audiotapes (with the respondent's permission) together with notes of the responses. The researcher also noted any responses such as hesitation or unwillingness to disclose information. During the interview the researcher repeated the responses to ensure that it was accurately understood, recorded and interpreted (member checks). Guba and Lincoln (in Babbie and Mouton, 2001:211) suggest this procedure to enhance *credibility*. In this way responses could be verified, corrected if necessary and accurately recorded. It also gave the respondent the opportunity to provide additional information. It is believed that the above considerations did enhance the reliability of the data collected through the interview technique.

In the following chapter the results are presented using tables, pie charts and bar charts. Demographic information is given first and then the results are discussed and interpreted according to the objectives of the study.