Chapter 7

RESEARCH AND STATISTICAL METHODOLOGY

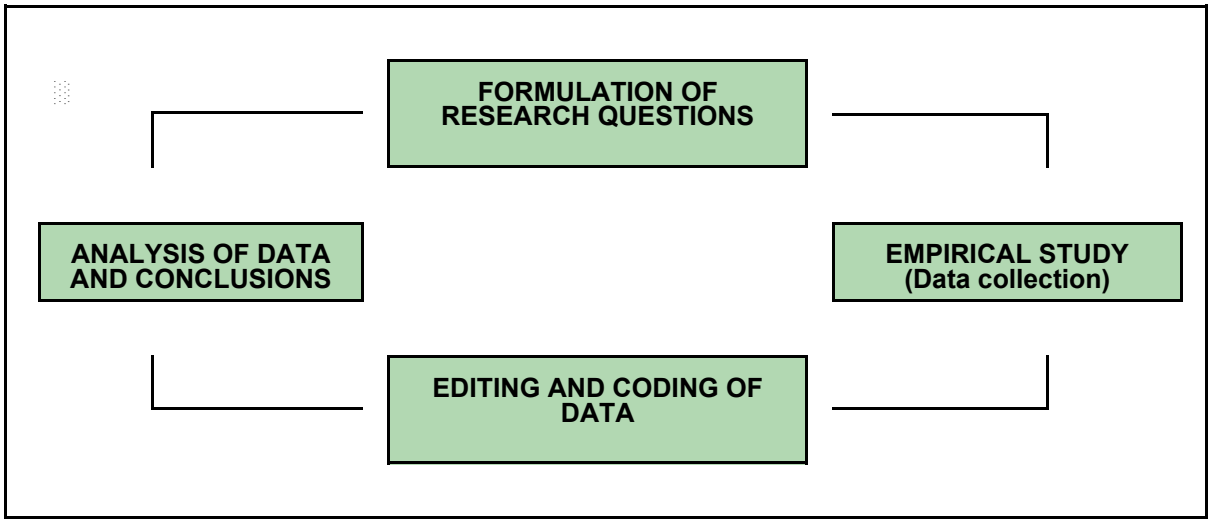
7.1 INTRODUCTION

The previous chapters provided a theoretical discussion of affirmative action, organisational justice and employee commitment. This chapter deals with the methods and instruments used to conduct the empirical research for the study, as well as the statistical methodology. The topics to be addressed include the design, layout and administration of the questionnaire, the collection of data, the population, the sampling method, the response rate, statistical methods, descriptive-, comparative-, and associational statistics, statistical significance and practical significance (effect size).

7.2 THE RESEARCH METHOD

According to Steyn, Smit, Du Toit and Strasheim (2003), a research project is a specific research investigation — a study that completes or is planned to follow stages in the research process. Figure 7.1 below depicts a research project and strategy.

FIGURE 7.1: THE RESEARCH PROCESS



Source: Adapted from Steyn et al (2003)

Different methods for the collection of primary data such as surveys, experiments, or observations are available for research (Diamantopoulos & Schlegelmilch, 1997). The type of data required will largely determine the most appropriate method to be used. In this study, the researcher decided to use the survey method.

The survey method is used for descriptive reporting and makes use of a questionnaire to identify individual differences and perceptions that cannot be observed. By means of the questionnaire, respondents provide information on their current and previous behaviour, attitudes and perceptions.

7.2.1 The questionnaire

A questionnaire is a document comprising a set of questions, which is sent to a large number of respondents with a view to obtaining their input and opinions on the topic of the research study. Researchers can use either structured or unstructured questionnaires. A structured questionnaire provides different options for each question, and the respondent is simply required to select and mark the applicable answer (Babbie, 1998). Unstructured questionnaires require far more cooperation on the part of the respondents since they are required to answer the questions in their own words. The use of unstructured questionnaires in a mail survey significantly reduces cooperation without providing much helpful information (Sudman & Blair, 1998). Since mail surveys tend to have the lowest response rates of all survey methods (Welman & Kruger, 1999) — it is not uncommon for them have a response rate of 10 percent — it is imperative to excersise caution in choosing questionnaires (Aaker, Kumar & Day,1995). Table 7.1 outlines the advantages and disadvantages of the questionnaire as a data collection method.

In this research, the main reasons why the questionnaire was used as the method for collecting primary data, included the following:

- It is a relatively cheap method.
- It is relatively easy to distribute and collect questionnaires when respondents are from a single organisation, as was the case in this study.
- The majority of respondents have a type of “pen-and-pencil” job in which they could complete the questionnaire during office hours.

7.2.1.1 Requirements for a good questionnaire

If a researcher succeeds in designing a good questionnaire, many of the shortcomings of a questionnaire can be overcome. An effective questionnaire must, however meet certain requirements. Table 7.2 lists a number of requirements for the *design* of a satisfactory questionnaire (Sudman & Blair, 1998).

TABLE 7.1: THE ADVANTAGES AND DISADVANTAGES OF QUESTIONNAIRES

ADVANTAGES	DISADVANTAGES
• Relatively cheap method • Saves time - a lot of information can be collected within a short period of time • Greater possibility of anonymity • Standardised questions simplify the coding of data • The answering of questions can be kept impersonal	• Possibility of a low response rate • Researcher has low control over the conditions under which the questionnaire is completed • The explanation and clarification of concepts are not possible • Anonymity complicates the following up of questionnaires • It can only be used for short surveys with mainly closed questions

Source: Adapted from Welman & Kruger (1999)

TABLE 7.2: REQUIREMENTS FOR THE DESIGN OF A GOOD QUESTIONNAIRE

- **Use a booklet format**

A booklet format is desirable because (1) it prevents pages from being lost, (2) it makes it easier to handle, (3) a double-page format can be used, and (4) it looks more professional.

- **Identify the questionnaire**

Questionnaires need a date, the title of the study, and the name of the person conducting the survey.

- **Do not crowd the questions**

Self-administered questionnaires should not be crowded because crowding makes the questionnaire appear more difficult.

- **Use a large, clear print**

Questionnaires can be made user-friendly by making use of a large and clear print. Too small print makes the questionnaire appear difficult and as a result discourages respondents to complete it.

- **Provide instructions for the completion of the questionnaire**

The ease with which a questionnaire can be completed plays a big role in a respondent's decision to complete the questionnaire. Specific instructions should appear on the questionnaire and be placed in the most useful location possible. Instructions should be easy to distinguish and therefore bold print, capital letters or italics can be used.

- **Do not split questions across pages**

Respondents find it confusing if a question is split over two pages, especially in respect of response categories for a closed question.

- **Precode all closed questions**

Precoding allows the respondent to simply circle the right answer.

- **End the questionnaire in a proper way**

Respondents should be thanked for their participation.

Source: Sudman & Blair (1998)

Although Leedy (1996) outlines *general* requirements for a good questionnaire, he emphasises the important role that questions play. Table 7.3 summarises the requirements which Leedy regards as essential to a good questionnaire.

TABLE 7.3: LEEDY'S REQUIREMENTS FOR A GOOD QUESTIONNAIRE

- Instructions must be clear and unambiguous.
- A cover letter must accompany the questionnaire and clearly state for what purposes the information is needed.
- Questions must be clear, understandable and objective.
- The questionnaire must be as short as possible.
- A logical flow of questions and sections must exist.
- The questionnaire must be directly related to the research problem.

Source: Leedy (1996)

7.2.1.2 The design of a questionnaire

The design of a questionnaire plays a crucial role in the success of the research. Saunders, Lewis and Thornhill (1997) regard the following as the principal steps in the design of a questionnaire:

- Determine information goals and identify the population.
- Decide which questions need to be asked.
- Identify the respondents' frame of reference.
- Formulate the questions.
- Pretest the questionnaire.
- Revise the questionnaire.
- Compile the final questionnaire.

The first step in the design of a questionnaire involves the translation of the research objectives into information goals for the formulation of specific questions. Once the list of questions has been finalised, it should cover all information goals and research objectives.

7.2.1.3 Creating an item pool (questions)

Once the scope and range of the content have been identified, the actual task of creating questions (items) can begin. No existing data-analytic technique can remedy serious deficiencies in an item pool. The creation of the initial pool of questions is thus a crucial stage in questionnaire development. The fundamental goal at this stage is to systematically sample all content that is potentially relevant to the topic under study. Two key implications of this principle are that the initial pool of questions (1) should be broader and more comprehensive than one's own theoretical view of the topic being researched, and (2) should include content that will ultimately be shown to be tangential or even unrelated to the research

topic. The logic underlying this principle is simple: Subsequent psychometric analyses can identify weak, unrelated items that should be excluded from the emerging scale but are powerless to detect content that should have been included but was not. Accordingly, in creating the item pool one always should err on the side of overinclusiveness (Clark & Watson, 1995).

Apart from asking the right questions, the following issues also need to be considered when formulating questions:

(a) *Closed and open questions*

Closed questions provide response categories whereas open questions do not. Various factors such as the purpose and method of the survey, and the respondents' profile determine which type of question is the most appropriate to use. According to Sudman and Blair (1998), closed questions are mainly used for the following reasons:

- They encourage response by making the completion of the questionnaire easy.
- They enable respondents to complete the questionnaire in a short time.
- They simplify coding for data analysis purposes.
- They reduce the amount of probing needed.

Although closed questions require more pretesting, limit the richness of data and may become boring for respondents, they work better in situations where there is a preference for inexpensive, structured information. Welman and Kruger (1999) recommend that even if a questionnaire comprises exclusively closed questions, it should conclude with an open question in case anything of importance to the respondent has been omitted.

(b) *Difficulty of questions*

Questionnaires provide few opportunities for probing — hence the different ways in which people could interpret questions merit careful consideration. Table 7.4 provides guidelines on minimising problems related to the understanding of questions.

TABLE 7.4: GUIDELINES ON FORMULATING GOOD QUESTIONS

• Questions must be specific.	• Use numbers to measure magnitudes.
• Use simple language.	• Ask questions one at a time.
• Use words with only one meaning.	

Source: Adapted from Sudman & Blair (1998)

Sudman and Blair (1998) believe that the formulation of questions should aim specifically at addressing the following three issues:

(1) Do the respondents **understand** the words in the question?

(2) Do all the respondents **interpret** the question in the **same way**?

(3) Do the respondents **interpret** the question in the way it is **intended**?

(c) *Scaling of questions*

Scaling is a process of creating a continuum on which objects are located according to the number of the measured characteristics they possess (Aaker et al, 1995). The Likert scale is presently the most popular type of scale used for this purpose. This scale consists of a collection of statements about the attitudinal object. For each statement, respondents have to indicate the degree to which they agree or disagree with its content on, say, a four-point scale (Welman & Kruger, 1999). The number of response categories that can be used for closed questions depends on the method of administration. By making use of an even number of response categories, the central tendency effect can be eliminated. According to Welman and Kruger (1999), the error of central tendency can further be eliminated by avoiding statements which reflect extreme positions (eg "I would ***never*** discriminate against a person from a previously disadvantaged group").

Possible answers were coded with numerical values and represented indefinite quantities, such as the extent to which employees agreed with the statements. According to Schepers (1991), the equal interval quality of a scale is lost if more than two points are anchored. It is therefore better to use an intensity response scale in which only the two extreme categories are labelled. An example of the scale used in this study is as follows:

6-point scale

Strongly disagree					**Strongly agree**
1	**2**	**3**	**4**	**5**	**6**

(d) *Ordering of questions*

Sudman and Blair (1998) regard the ordering of questions as important for three main reasons: (1) the order effects must be considered; (2) a logical flow for the questionnaire must be developed and (3) a rapport must be established with the respondents.

Questions should be arranged in a sequence that minimises order effects. An order effect occurs when the answer to a particular question is influenced by the context of previous questions. In order to create a logical flow of questions, the questions must be divided into sections, each with a specific purpose in mind. To elicit a favourable response for the completion of the questionnaire, the questionnaire must start with easy, nonthreatening questions for which there are no wrong answers. By establishing a rapport with respondents, one can obtain better cooperation.

With the aforementioned as background, the next section will discuss the design of the questionnaire used for the empirical research.

7.3 THE LAYOUT OF THE QUESTIONNAIRE USED IN THIS STUDY

7.3.1 Type of questionnaire used

It was decided to use a structured questionnaire for this study (see appendix B). A structured questionnaire provides alternatives to each question, and the respondent simply needs to select and mark the applicable answer.

For financial reasons, the cover letter (see appendix A) and the questionnaire (see appendix B) were drawn up in English only.

7.3.2 Layout of the questionnaire

Survey questionnaires are normally used to obtain the following types of information from respondents: biographical particulars (age, gender, ethnicity, and so on), typical behaviour, opinions and beliefs, and attitudes. For this study, the questionnaire was therefore developed for collecting information on employees' biographical details, their perceptions and attitudes towards AA fairness, their perceptions on the treatment of employees from designated groups in the workplace and their commitment. The questionnaire used in this study consisted mainly of closed questions because such questions are usually self-explanatory and can be answered with ease in a short period of time (see appendix B). The layout of the questionnaire is provided in table 7.5.

TABLE 7.5: LAYOUT OF THE QUESTIONNAIRE

SECTION	TOPIC OF SECTION	NO OF QUESTIONS
A	Personal particulars (biographical data)	13
B	Perceptions on the fairness of AA	40
C	Treatment of AA employees in the workplace	26
D	Commitment	37
Total number of questions		116

Section A consisted of questions related to the respondents' personal particulars and merely required the respondents to make an "x" in the appropriate block. These questions referred to respondents' gender, ethnicity, age, marital status, job position, number of years of service in current position, number of years

of service at the bank, staff category, highest educational level, monthly gross salary, and whether the appointment was on the basis of affirmative action.

The questions contained in section B of the questionnaire were related to the respondents' perceptions of what influences the fairness of affirmative action, and consisted of six-point Likert-type items with anchors ranging from 1 = "not at all" to 6 = "to a great extent".

Section C consisted of questions about the treatment of affirmative action employees in the workplace. For the measurement of affirmative action employees' treatment in the workplace, new items as well as existing items from questionnaires used in previous research, were used. The literature study provided the basis for the development of new items.

Section D consisted of questions about employees' work behaviour. The purpose of these questions was to determine their commitment level. As in the case of section C, new items as well as existing items from questionnaires used in previous research, were used.

7.3.3 Appearance of the questionnaire

The physical layout of the questionnaire plays a vital role in a respondent's decision whether or not to complete it. Aaker et al (1995) regard the quality of the paper, the clarity of reproduction and the appearance of crowding as important factors. For this study the questionnaire was printed on good quality green paper and bound in booklet format. Ample space was allowed between the questions as well as between the sections. Clear instructions on how to complete the questionnaire were also provided.

Time constraints also have a direct influence on respondents' willingness to complete the questionnaire. If the questions are too difficult or too time-consuming to complete, the respondents tend not to complete the questionnaire. Although this questionnaire consisted of 116 questions — which is a fairly large number of questions — the questions were formulated in a simple way which made it relatively easy for the respondents. Approximately 30 minutes were needed to complete the questionnaire for this study.

7.4 PRETESTING OF THE QUESTIONNAIRE

The purpose of pretesting is to ensure that the questionnaire meets the researcher's expectations in terms of the information that will be obtained from it. Questionnaire pretesting is one way of identifying and eliminating those questions that could pose problems. Only after all the deficiencies have been corrected, can the final questionnaire be compiled and distributed. The best way to test a questionnaire is to have as many people as possible look at it.

Because a pretest is a pilot run, the respondents should be reasonably representative of the sample population (Aaker et al, 1995). In this study, a formal pretest was not done but inputs were obtained from

human resource experts, trade union officials and employees from different ethnic groups and genders. The assistance of a statistician was also obtained. Once the inputs had been received, the final questionnaire was compiled and distributed.

7.5 DISTRIBUTION OF THE QUESTIONNAIRES

The next step involved the distribution of questionnaires to the employees selected. A cover letter explaining the purpose of the questionnaire and signed by the bank's human resource manager, accompanied each questionnaire. Appendix A provides an example of the cover letter.

Since the bank's employees work in branches all over the country, a detailed address list had to be obtained. Thereafter an envelope had to be addressed to each individual employee. The fact that the bank could not provide any assistance in terms of distributing the questionnaires via a centralised internal posted service, complicated the distribution of questionnaires and made it extremely time-consuming and expensive.

7.6 COMPUTERISATION AND CODING OF THE DATA

Data obtained from the questionnaires must undergo preliminary preparation before they can be analysed. Data preparation includes (1) data editing, (2) coding, and (3) statistical adjustment of the data (Aaker et al, 1995).

Upon receipt of the questionnaires, each questionnaire was edited to identify omissions, ambiguities and errors in the responses. Questionnaires that were completed in such a way that the results could be distorted were discarded. Illegible or missing answers were coded as "missing". This simplified the data analysis, but did not distort any interpretations of the data.

Coding the closed questions was fairly straightforward because the questionnaire made provision for response values and a column which were used for variable identification. Once the response values had been entered into a computer, a program, the *Statistical Package for the Social Sciences* (SPSS), was employed to generate diagnostic information.

7.7 POPULATION AND SAMPLING

The populations that interest human behavioural scientists are often so large that, from a practical point of view, it is simply impossible to conduct research on all of them. Consequently, researchers have to obtain data from a sample of the population.

The sample consisted of employees from a leading bank in South Africa. To obtain the sample, a letter requesting a list of all permanent employees, categorised according to ethnicity, gender and job category, was sent to the human resource manager at the bank.

A disproportionate, stratified sampling method was used. Stratified sampling involves separating the population into subgroups called "strata", and then randomly drawing a sample from each stratum (subgroup). In this study the subgroups were determined according to ethnicity, gender and staff category. With regard to ethnicity, employees from other population groups (blacks, coloureds and Asians) were treated as a single component of ethnicity. Regarding staff category, employees from top management, middle management and supervisory level were treated as a single component. Once this process had been completed, a list of employees was drawn from each group. Table 7.6 provides a representation of the grouping of employees, the population and sample size of each employee group as well as the response and response rate.

TABLE 7.6: POPULATION, SAMPLE AND RESPONSE RATE OF EACH GROUP

	POPULATION			SAMPLE	RESPONSE	RESPONSE RATE
ETHNICITY						
Blacks	12 007 (40%)			688	128	18,6%
Whites	17 681 (60%)		100%	1 032	221	21,4%
GENDER						
Men	10 088 (34%)			585	120	20,5%
Women	19 600 (66%)		100%	1 135	229	20,2%
STAFF CATEGORY						
Top management	253					
Middle management	5 975	29%		498	168	33,7%
Supervisory level	2 502					
Clerical staff	20 958	71%	100%	1 222	181	14,8%
TOTAL	29 688			1 720	349	20,3%

The general principles that need to be considered in determining the desirable sample size include

- the size of the population
- the variance (heterogeneity) of the variable being measured
- the homogeneity of each stratum
- the anticipated response rate

The size of the sample was mainly determined by the extent to which important cross-classifications had to be made. The need to compare the different employee strata (eg white, female, supervisors) with various perceptions of affirmative action fairness, necessitated the use of a larger sample size than normally required. According to Stoker (1981), the size of the sample should be in proportion to $\sqrt{N}$ with

N representing the size of the stratum. Table 7.7 can be used as a guideline on determining the sample size.

TABLE 7.7: DETERMINING THE SAMPLE SIZE

N			Relationship of sample	Sample size	
20			100%	20	
30	÷20 =	1,5	80%	√1,5	x 20 = 24
50	÷20 =	2,5	64%	√2,5	x 20 = 32
100	÷20 =	5,0	45%	√5	x 20 = 45
200	÷20 =	10	32%	√10	x 20 = 63
500	÷20 =	25	20%	√25	x 20 = 100
1000	÷20 =	50	14%	√50	x 20 = 141
10 000	÷20 =	500	4,5%	√500	x 20 = 447
100 000	÷20 =	5 000	1,4%	√5 000	x 20 = 1 414
200 000	÷20 =	10 000	1,0%	√10 000	x 20 = 2 000
29 688	÷20 =	1 484		√1 484	x 20 = 770

Source: Adapted from Stoker (1981)

According to Welman and Kruger (1999) no matter what size the population is, it is not necessary to use a sample size larger than 500 units of analysis. Since the bank has a total workforce of 29 688 employees, a sample size of 770 would therefore have been required according to the formula discussed above. In order to make provision for the possibility of a poor response rate, 1 720 questionnaires were distributed.

Regarding the low response rate (10%) of mail questionnaires, Aaker et al (1995), and Saunders et al (1997) state that the *representativity* of the population in the response is of greater significance than the general response percentage. This principle is especially important when a stratified sampling method is used. With reference to table 7.7, the response is in line with the composition of the sample — hence the response rate of 20,3 percent in this study is satisfactory. Table 7.8 provides a summary of the biographical information in the sample.

TABLE 7.8: BIOGRAPHICAL DATA OF RESPONDENTS

VARIABLE	FREQUENCY	PERCENT	AVERAGE
GENDER			
Male	120	34,4%	
Female	229	65,6%	
ETHNICITY			
Black, coloured & Asian	49 + 57 + 22 = 128	37,0%	
Whites	221	63,0%	
MARITAL STATUS			
Single	132	37,8%	
Married	216	61,9 % (missing = 1)	
AGE			
19 - 32 years	135	39,3%	
33 - 46 years	135	39,3%	37 years
47 - 62 years	73	21,4%	
YEARS IN CURRENT POSITION			
1 - 2 years	159	46,4%	4,49 years
> 3 years	184	53,6% (missing = 6)	
YEARS' SERVICE AT BANK			
1 - 7 years	182	52,0%	10,35 years
8 - 39 years	163	46,0% (missing = 4)	
STAFF CATEGORY			
Top/middle management & supervisors	13 + 98 + 57 = 168	48,0%	
Clerical staff	181	52,0%	
HIGHEST QUALIFICATION			
Grade 12 and lower	171	49,0%	3,11
Certificate/Diploma	110	31,5%	(certificate or
Degree	75	18,7% (missing = 3)	diploma)
MONTHLY GROSS SALARY			
R5 000 or less	159	45,6%	2,41
R5 001 - R15 000	112	32,1%	R8 830 pm
R15 001 and more	70	20,0% (missing = 8)	
EE APPOINTMENT			
Yes	44	12,6%	
No	226	64,8%	
Not sure	75	21,5% (missing = 4)	

(N = 349)

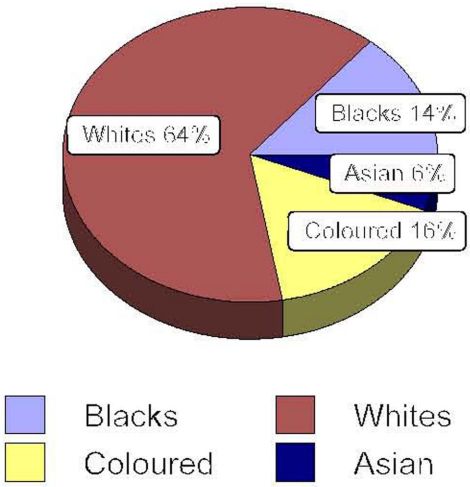
7.7.1 Gender

Since it was imperative to understand whether males and females have different opinions on affirmative action issues, it was significantly noteworthy that both genders responded to the study. According to table 6.1 in the previous chapter, the bank consists of 34 percent male and 66 percent female employees. From table 7.8, it is evident that both male and female employees are equally represented in the study.

7.7.2 Ethnicity

As in the case of gender, it was necessary to determine whether employees from different ethic groups have different opinions on affirmative action issues, how they believe affirmative action employees are treated in the workplace and their commitment. The bank's workforce consists of 29 688 employees of whom 60 percent are whites. According to the research results, 64 percent of the respondents were whites. It is thus clear that employees from all ethnic groups responded to the study and all the ethnicity groups are represented in the study. Figure 7.2 illustrates the composition of the respondents according to ethnicity.

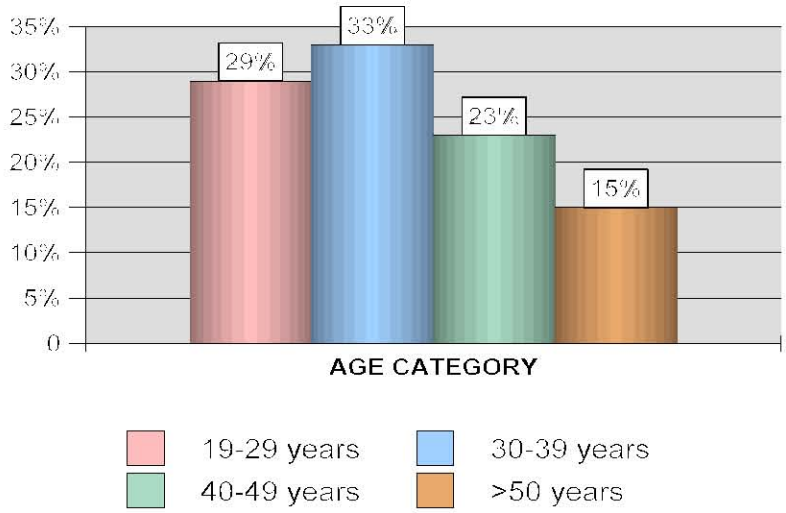
FIGURE 7.2: RESPONDENTS ACCORDING TO ETHNIC GROUP



7.7.3 Age

Since the respondents' ages ranged from 19 to 62 years (range of 42 years), it was decided to group the ages in three categories. As indicated in table 7.8, the age groups, 19 to 32 and 33 to 46, each represent 39,3 percent of the respondents and respondents in the age group, 47 to 62 years, represent only 21,4 percent. According to this information, the bank has a relatively young workforce. The average age of an employee is 37 years. Figure 7.3 illustrates the age groups of the respondents. It is interesting to note that a large portion of the bank's workforce (62%) is younger than 40 years of age.

FIGURE 7.3: RESPONDENTS ACCORDING TO AGE



7.7.4 Marital status

According to table 7.8, the majority of respondents in this study are married (62%). The majority of managers (77%) are married whereas the majority of clerical staff (52%) are single. This is quite understandable if one considers the fact the clerical staff are younger and probably receive lower salaries. It is interesting to note that 46 percent of blacks, compared to 71 percent of whites are married. The reason for this could be that whites hold higher positions, earn higher salaries and are generally older than blacks. According to the research results, the majority of employees younger than 32 years of age are blacks. A reason for this could be that most appointments take place at entry level and involve employees from designated groups.

7.7.5 Years in current position

Nearly half of the bank's employees have been occupying a position for less than two years. This could be the result of a large number of new appointments made during the past two years. As shown in table 7.8, the average period that employees have been occupying a position is 4,5 years.

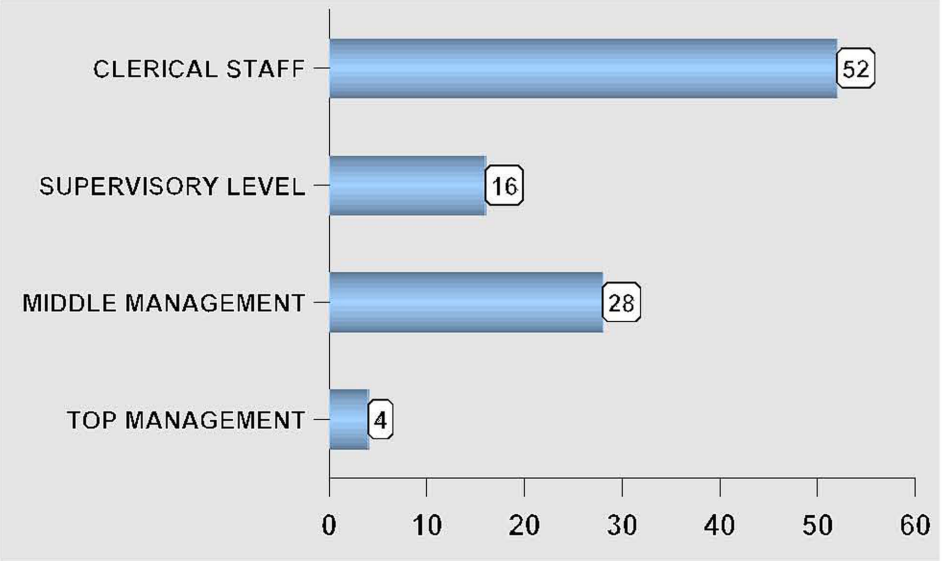
7.7.6 Years of service at the bank

The number of years that employees have been working at the bank ranges from 1 to 39 years. As indicated in table 7.8, the majority of employees (52%) have been working at the bank for less than 7 years. The bank thus has a young workforce in terms of years of service. It is interesting to note that 56,6 percent of the Blacks have been employed by the bank for less than 7 years. Blacks who have been employed by the bank for 8 years or more amount to 16,2 percent only. One could thus assume that affirmative action appointments occur mainly at entry-level positions. Overall, the average period for which employees have been working at the bank is 10,35 years.

7.7.7 Staff category

According to the number of respondents at top management, middle management and supervisory level, the bank appears to be somewhat "overmanaged". Clerical staff form 52 percent of the workforce, whereas management (top, middle and supervisors) form 48 percent. According to table 6.1 in chapter 6, blacks, coloureds and asians formed only 10 percent of management in 2002. According to this study, the representation of blacks, coloureds and asians has increased to 13,6 percent. It is hardly an improvement if one considers the fact that the bank aims to increase the representation of blacks, coloureds and asians in managerial positions to 26 percent in 2005. It is interesting to note that male and female employees are equally represented in managerial positions. Figure 7.4 illustrates the composition of the respondents according to staff category.

FIGURE 7.4: RESPONDENTS ACCORDING TO STAFF CATEGORY



7.7.8 Highest qualification

The educational qualifications of clerical staff do not seem to play a huge role at the bank since 68 percent have a grade 12 or lower qualification. Overall, 49 percent of employees have only a grade 12 or lower qualification. Employees at top and middle management level seem to be well qualified since 77 percent of top managers and 43 percent of middle managers have a degree or higher qualification (see table 7.9). The average qualification that employees have at the bank is a one-year certificate.

TABLE 7.9: EDUCATIONAL QUALIFICATIONS

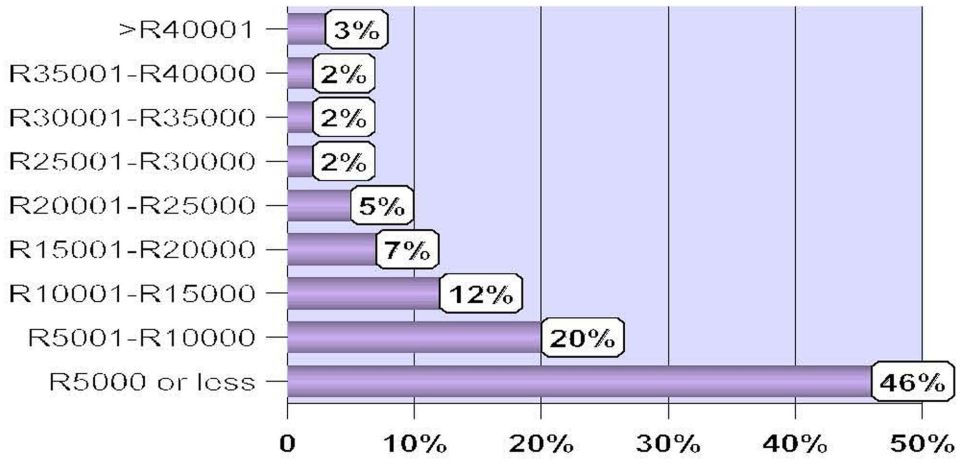
	< Grade 12	Grade 12	Certificate 1 year	Diploma 3 years	Degree	Hons degree	Master's degree	Doctor's degree
Top mngt	0	0	1	2	5	2	1	2
Middle mngt	0	18	12	26	24	11	7	0
Supervisor	4	33	9	7	1	2	0	0
Clerical	12	104	29	24	8	2	0	0
TOTAL	16	155	51	59	38	17	8	2

As mentioned earlier, the bank has made further contributions towards the realisation of the aims of South African education, training and development legislation by registering the first learnership in the banking sector.

7.7.9 Gross monthly salary

The salaries paid by the bank seem to be market related. Since 46 percent of the workforce consists of clerical staff, it makes sense that 45,6 percent of employees receive a salary of R5 000 or less per month. The reason for this could also be that the majority of employees are still young and have been working at the bank for a short period of time. The average salary of employees at the bank is R9 681 per month. Top managers receive salaries ranging from R30 000 to R40 000 and higher per month, while the salaries of middle managers range from R10 000 to R40 000 per month. Supervisors receive up to R15 000 per month. Owing to the poor representation of blacks, especially at managerial level, only 10 percent of blacks receive salaries higher than R10 000 per month. Figure 7.5 illustrates the different salary levels of respondents.

FIGURE 7.5: RESPONDENTS ACCORDING TO MONTHLY SALARY



7.7.10 Employment equity appointment

The respondents were asked to indicate whether they had been appointed on the strength of affirmative action initiatives. Their responses with regard to staff category (top, middle and supervisors), gender and ethnicity are depicted in table 7.10.

TABLE 7.10: EMPLOYMENT EQUITY APPOINTMENTS

EE APPOINTMENT	MANAGERS	FEMALE	BLACKS
YES	5,3%	15,5%	20,6%
NO	81,4%	59,1%	42,8%
NOT SURE	13,1%	25,3%	36,5%

Only a few managers (5,3%) believe that they have been appointed on the basis of affirmative action initiatives. Since the bank has not yet been that successful in appointing blacks in managerial positions, it makes sense that such a low percentage of managers feel that they have been appointed on the strength of affirmative action. Ethnicity appears to play a larger role than gender when it comes to affirmative action perceptions because blacks (20,6%) are more inclined to believe that they have been appointed on the basis of affirmative action rather than because they are females (15,5%).

7.8 LEVELS OF MEASUREMENT

Most measuring instruments in the human behavioural sciences yield measurements at the nominal and ordinal levels. For practical purposes, however, scores on, say, standardised tests, attitude scales and self-constructed questionnaires can probably be regarded as satisfactory approximations of interval measurement (Kerlinger, 1988). In nominal measurement, the numbers assigned to individuals only serve to distinguish them in terms of the attribute being measured, such as gender, age or ethnicity. The statistics that were used for nominal data included the mode, frequencies and coefficients of associations.

Since the purpose of this study was to determine employees' perceptions on and attitudes towards affirmative action fairness, and how these impact on their commitment, the study measured the employees' attitudes by means of interval scales. This study made use of a six-point Likert scale. The statistics that were used for interval data included the mean (average score for a group), frequencies, standard deviation and Pearson's product moment correlation (a statistic used to measure the degree of association between two interval or ratio variables). T-test statistics (for two groups) and one-way analysis of variance (for more than two groups) were used to measure any statistical significant difference between the means and distributions of samples. These tests determine whether an observed difference in the means of groups is sufficiently large to be attributed to a change in some variable or whether it could merely have occurred by chance (Welman & Kruger, 2001).

Most studies have treated organisational justice as a dependent variable, measuring the perceptions of organisational justice of some situation. One of the better uses of a measure of organisational justice would be to compare and distinguish between perceptions of fairness and related concepts, such as the treatment of affirmative action employees and employee commitment. Here perceptions of affirmative action fairness would act as a dependent variable and the treatment of affirmative action employees as the independent variables. In instances where the biographical factors of employees were used to determine their effect on the perceptions of and attitude towards affirmative action fairness, the biographical factors became the independent variables and the perceptions and attitudes of employees regarding affirmative action fairness and the treatment of affirmative action employees, the dependent variables. The research, for example, could indicate that women (independent variable) are more concerned about being treated with respect (dependent variable) than men.

7.9 STATISTICAL METHODS

Various factors have to be considered before an appropriate statistical method for data interpretation can be selected. In this research, the sample size and the number of variables that needed to be analysed simultaneously, were the determining factors. To address these issues properly, a number of statistical techniques were used as the basis for the interpretation of the data. These included univariate and multivariate data analysis, correlations and factor analysis. Issues such as means and standard deviations, as well as the level of statistical significance, were also considered. However, before the data could be interpreted, it was necessary to consider the question of parametric versus nonparametric statistics.

One of the issues that is often raised in survey research is whether the statistical technique used for the interpretation of the data, is the most suitable. Two types of statistics, namely parametric and nonparametric are available for research. According to Kerlinger (1988), a parametric statistical test depends on a number of assumptions about the population from which the samples used in the test are drawn. The best-known assumption is that the population scores are normally distributed, the variances of the groups are equal and the dependent variable is approximate interval scale (Morgan & Griego, 1998). A nonparametric or distribution-free statistical test depends on no assumptions about the form of the sample population or the values of the population parameters.

There is huge controversy about the use of the two types of statistics. Gardner (1975) has no objection to the use of parametric statistics, whereas Bradley (1972) advocates nonparametric methods — both viewpoints are compelling and valid. However, in the light of Kerlinger's (1988) remarks that the best advice is to use parametric statistics as well as the analysis of variance routinely but to keep a sharp eye on the data for gross departures from normality, the researcher decided to adopt this approach in this study.

7.10 STATISTICAL ANALYSIS

A complex research approach was followed. Descriptive, associational and comparative statistics were used to analyse the data. The appropriate statistical procedures were selected according to guidelines provided by various authors (Morgan & Griego,1988; Clark & Watson, 1995; Cooper & Emory, 1995; Kanji, 1999; Steyn, 1999, 2000). The SPSS for Windows Statistical Package, Release 11 and 12.5, was applied for all the statistical procedures.

The choice of statistical procedures was also based on the level of measurement achieved in the research. In this study, nominal and interval scales were used as the level of measurement in collecting the biographical data (independent variables). Biographical data involve a single variable and are usually the starting point in descriptive analysis. Descriptive data analysis makes use of averages (means), standard deviation, percentages, histograms and frequency distributions for each variable of interest. A frequency distribution shows in absolute or relative (percentage) terms how often (popular) the different values of a variable are among the units of analysis. Biographical and organisational questions are usually categorical — hence it is usual to give frequency distributions of the responses to such questions. Because descriptive statistics do not involve inferential statistics they merely describe or summarise data, and should therefore be analysed by nonparametric methods (Morgan & Griego, 1998).

A six-point Likert scale was used to measure the perceptions of employees towards affirmative action fairness, the treatment of affirmative action employees in the workplace and how employees behave in the workplace. Owing to the inherent limitation of scaling psychological measurements (ie equal intervals between successively higher numbers) the level of measurement can only be regarded as approximate equal intervals (Kerlinger, 1986; Morgan & Griego, 1998). Nevertheless it was deemed appropriate to use the more familiar and powerful parametric statistics such as analysis of variance, correlation and multiple regression analysis.

7.11 DESCRIPTIVE STATISTICS

7.11.1 Factor analysis[1]

In the behavioural sciences, factor analysis is frequently used to uncover the latent structure (dimensions) of a set of variables and to assess whether instruments measure substantive constructs (Cortina, 1993). Hatcher (1994) recommends that the exploratory factor analysis procedure should be used when attempting to determine the number and content of factors measured by an instrument. However exploratory factor analysis (EFA) looks to uncover the underlying structure of relatively large sets of variables. "It is based on *a priori* assumption that any variable in the questionnaire may be associated with

[1] *Although factor analysis is a complex associational technique, it is discussed as part of descriptive statistics because it describes the factors identified and helps the reader to understand the research results when reference is made to the various factors.*

any factor. There is no prior theory and one uses factor loadings to intuit the factor structure of the data" (www2.chass.ncsu.edu. 2002:2).

As mentioned previously, there are primarily two methods of extracting the factors from a set of data: *principal components analysis* or *principal factor analysis*. The method chosen will matter more to the extent that the sample is small, the variables are few, and/or the communality estimates of the variables differ. Principal components analysis is the more common method and seeks the set of factors which can account for all the common *and* unique variance in a set of variables. Principal factor analysis seeks the least number of factors which can account for the common variance (correlation) of a set of variables and thus do not consider unique variances. Principal factor analysis thus accounts for the covariation among variables whereas principal components analysis accounts for the total variance of variables.

In the present study, a principal factor analysis was done for each of the sections, namely: (1) the employees' perceptions of the fairness of affirmative action, (2) the treatment of AA employees in the workplace, and (3) behaviour in the workplace. The statistical software package SPSS for Windows was used for the majority of statistical procedures.

The steps followed in the factor analysis were as follows:

7.11.1.1 Computing of a matrix of correlations between the items

7.11.1.2 Subjecting the correlation matrix to a factor analysis

7.11.1.3 Deciding on the number of factors (dimensions) to be extracted

In the present study, the eigenvalues were plotted against the factor numbers and Catell's so-called "scree test" was performed which involved studying the slope of the plotted eigenvalues (Kimm & Mueller, 1978). The eigenvalue for a given factor measures the variance in all the variables which is accounted for by that factor. If a factor has a low eigenvalue, then it is contributing little to the explanation of variances in the variables and may be ignored. For the purposes of this study, all factors with eigenvalues lower than one were ignored. An inspection of the eigenvalues usually reveals a drop since the first factor provides the largest eigenvalue and thereafter the eigenvalues drop until they become insignificant (lower than one). The point at which the graph levels off indicates the number of factors to be extracted.

7.11.1.4 Extracting an x-number of factors

Criteria for determining the number of factors include the following:

- *Kaiser criterion.* Dropping all factors with eigenvalues under 1.

- *Scree plot.* The Cattell scree test plots the factors as the X axis and the corresponding eigenvalues as the Y axis. As one moves to the right, the eigenvalues drop. When the drop ceases and the

curve makes an elbow towards a less steep decline, Cattell's scree test recommends dropping all further factors after the one starting the elbow.

- *Variance explained criteria.* Some researchers simply use the rule of keeping enough factors to account for 90 percent (sometimes 80 percent) of the variation.

- *Comprehensibility.* Although not a strictly mathematical criterion, many researchers limit the number of factors to those whose dimension of meaning is readily comprehensible. Often this is the first two or three. This study made use of the Kaiser criterion, scree plot test and comprehensibility of factors to determine the number of factors to be extracted.

7.11.1.5 Rotating the factor solution to a more interpretable solution

Rotation serves to make the output more understandable and is usually necessary to facilitate the interpretation of factors. The sum of eigenvalues is not affected by rotation, but rotation will alter the eigenvalues of particular factors and will change the factor loadings. Since multiple rotations may explain the same variance but may have different factor loadings, and since factor loadings are used to intuit the meaning of factors, different meanings may be ascribed to the factors, depending on the rotation — a problem some cite as a drawback to factor analysis. The Varimax rotation is orthogonal, which means that the factors remain uncorrelated throughout the rotation process. In this study, the Varimax rotation was used because it is the most common rotation option and yields results which make it as easy as possible to identify each variable with a single factor (Morgan & Griego, 1998).

The Varimax rotation results in a factor matrix and the values in the matrix are called factor loadings. By studying all those items that have high loadings on a particular factor, and asking oneself what the common nature of these items is, one might be able to infer the nature of the factor. The challenge is to give such a factor a theoretical name that describes it as a dimension or factor. All significant factor loadings are typically used in the interpretation process, but variables with higher loadings influence to a greater extent the name selected to represent a factor.

This study considered as significant all factor loadings higher than or equal to 0,40. This cut-off point of 0.40 is largely arbitrary and cannot be applied mechanically. The researcher should also use judgement based on theoretical considerations. It may happen, for instance, that an item shows a high loading on two or more factors, in which case the researcher must decide to which factor the item should belong. The exclusion of relevant variables and the inclusion of irrelevant variables in the correlation matrix being factored will affect, often substantially, the factors which are uncovered. Knowing the factorial structure in advance helps one to select the variables to be included and yields the best analysis of factors. However, this is not simply a matter of including all relevant variables or deleting variables arbitrarily in order to have a "cleaner" factorial solution, because this will result in erroneous conclusions about the factor structure (Kim & Mueller, 1978). In order to determine which variables to keep, this study

considered the *factor loadings*, the *cross-loading of items* on more than one factor, and the *reliability* and *importance* of a variable according to the theory.

7.11.2 Reliability analysis

The internal consistency reliability test is of particular importance because it measures the degree to which all the items in a measurement/test measure the same attribute. Internal consistency thus implies a high degree of generalisability across the items within the test. Cronbach's alpha is the most common estimate of internal consistency of items in a scale.

The Cronbach alpha coefficient and inter-item correlation coefficients are used to assess the internal consistency of the measuring instrument (Clark & Watson, 1995). Coefficient alpha reflects important information on the proportion of error variance contained in a scale. Owing to the multiplicity of the items measuring the factors, the Cronbach coefficient alpha is often considered to be the most suitable since it has the most utility of multi-item scales at the internal level of measurement (Cooper & Emory, 1995).

In addition to estimating internal consistency from the average correlation, the formula for alpha also takes into account the number of items according to the theory that the more items there are, the more reliable a scale will be. The widely accepted social science cutoff is that alpha should be 0.70 or higher for a set of items to be considered a scale. That 0.70 is as low as one may wish to go is reflected in the fact that when alpha is 0.70, the standard error of measurement will be over half (0.55) a standard deviation (Morgan & Griego, 1998). Alpha is a sound measure of error variance, and can be used to confirm the unidimensionality of a scale, or to measure the strength of a dimension once the existence of a single factor has been determined (Cortina, 1993)

The internal consistency coefficient, cronbach alpha, was computed for each of the factors identified, and is discussed in the next chapter.

7.11.3 Analysis of item distribution

Descriptive statistics (eg means, standard deviations, skewness and kurtosis) were used to analyse the distribution of the values of each item included in the different factors. Measures of location (mean), spread (standard deviation), and shape (skewness and kurtosis) were calculated. According to Cooper and Schindler (2003), the mean and standard deviation are called dimensional measures (in other words, expressed in the same units as the measured quantities). By contrast, skewness (sk) and kurtosis (ku) are regarded as nondimensional measures. Skewness is an index that characterises only the shape of the distribution. When sk is approximately 0, a distribution approaches symmetry . Kurtosis is a measure of a distribution's "peakness/flatness". According to Cooper and Schindler (2003), there are three different types of kurtosis:

- peaked or leptokurtic distributions — scores cluster heavily in the centre (a positive ku value)
- flat or platykurtic distributions — evenly distributed scores and facts flatter than a normal distribution (a negative ku value)
- intermediate or mesokurtic distributions — neither too peaked nor too flat (a ku value close to 0)

As with skewness, the larger the absolute value of the index, the more extreme the characteristic of the index will be.

7.12 COMPARATIVE STATISTICS

7.12.1 Students' t-test

Comparative statistics test for differences between groups by making use of analysis of variance. Basic difference questions involve one independent and one dependent variable and use t-tests of ANOVA. The t-test is appropriate when one has an independent variable with two categories and a continuous dependent, and wishes to test the difference between the means of the various categories of the independent variable. In this study, Students' t-test was used to compare the mean scores for the dependent variables between two categories within six different biographical variables.

7.12.2 One-way analysis of variance

One-way analysis of variance (ANOVA) is used to uncover the main and interaction effects of categorical independent variables on an interval dependent variable and is used when there is a single interval dependent and one independent variable with three or more categories. The key statistic in ANOVA is the F-test of difference of group means, testing if the means of the groups formed by values of the independent variable are different enough not to have occured by chance. If the group means do not differ significantly then one can infer that the independent variable(s) did not have an effect on the dependent variable (www2.chass.ncsu.edu/garson/anova.htm). ANOVA assumes that the dependent variable is an approximate interval scale, normally distributed in the population, and the variances of the groups are equal. If the assumptions are not markedly violated, one should make use of parametric one-way ANOVA.

In this study, one-way ANOVA was used to determine the effect of *education, salary* and *employment equity appointments* on organisational justice and the other behavioural domains since all of these variables had three categories.

7.12.3 N-way univariate analysis of variance

The SPSS program help function provides the following description for n-way univariate analysis of variance:

> The General Linear Model (GLM) univariate procedure provides regression analysis and analysis of variance for one dependent variable by one or more factors and/or variables. The factor variables divide the population into groups. Using the General Linear Model procedure,

it is possible to test the effects of other variables on the means of various groupings of a single dependent variable. The interactions between factors as well as the effects of individual factors can be investigated.

In addition, after an overall F-test has shown significance between factors (groups), post hoc tests to evaluate differences between specific means can be applied. Estimated marginal means can be calculated to predict mean values for the cells in the model.

7.12.4 Multivariate analysis of variance

Multiple analysis of variance (MANOVA) is used to determine the main and interaction effects of categorical variables on multiple dependent interval variables. MANOVA, like ANOVA, makes use of one or more categorical independents as factor variables, but unlike ANOVA, there is more than one dependent variable. ANOVA tests the differences in the means of the interval dependent for various categories of the independent(s), while MANOVA tests the differences in the centroid (vector) of means of the multiple interval dependents, for various categories of the independent(s). Researchers may also perform intended comparison or post hoc comparisons in order to determine which values of a factor contribute most to the explanation of dependents (www2.chass.ncsu.edu).

According to the SPSS program help function, the GLM multivariate procedure provides analysis of variance for multiple dependent variables by means of one or more factor variables or covariates. The factor variables divide the population into groups. Using this general linear model procedure, it is possible to test the null hypotheses about the effects of factor variables on the means of various groupings of a joint distribution of dependent variables. Both interactions between factors and the effects of individual factors can thus be investigated. In addition, the effects of covariates and covariate interactions with factors can be included. After an overall F-test has shown significance, post hoc tests are used to evaluate differences between specific means. The post hoc multiple comparison tests are performed separately for each dependent variable.

7.13 ASSOCIATIONAL STATISTICS

7.13.1 Correlation analysis

Relationships or associations also play a vital role in data analysis. Whenever it is necessary to determine the relationship between two variables and, if there is one, the nature and strength thereof, measures of associations or correlation analysis must be employed. Correlation analysis is not only directed at discovering whether a *relationship* exists between two variables, but also analyses the *direction* and *magnitude* of the relationship (Diamantopoulos & Schlegelmilch, 1997).

Correlations estimate the extent to which changes in one variable are associated with changes in the other and are indicated by the correlation coefficient (r). Correlation coefficients can range from +1.00 to -1.00. A correlation of +1.00 indicates a perfect positive relationship, a correlation of 0.00 indicates no

relationship, and a correlation of -1.00 indicates a perfect negative relationship (Welman & Kruger, 1999). The magnitude of the relationship refers to the significance level of the relationship between two variables. The significance level is used to indicate the maximum risk one is willing to take in rejecting a true null hypothesis. Hence a significance level should always be associated with the probability of making a mistake. Thus when one selects the 5 percent significance level ($p \leq 0,05$) to conduct a hypothesis test, one is in fact saying that one will conduct the test in such a way that one will only reject the null hypothesis when in fact it is true — 5 times out of 100. Therefore, if the result of a test is such that the value obtained has a probability of occurrence of less than or equal to the specified significance level, then the test result is significant (http://www2.chass.ncsu.edu/garson/pa765/signif.thm). The level of significance used in this study is discussed in more detail later in this chapter.

According to Diamantopoulos and Schlegelmilch (1997), the fact that two variables are related does not prove causality. Since the influence of other variables cannot always be isolated in determining relationships, causal inferences on the basis of correlation results cannot be drawn. All that an association measure expresses is the degree of covariation between two variables. Since association refers to the strength of a relationship, high levels of association between independent variables may lead to misinterpretation of results and research inferences.

7.13.2 Multiple regression analysis

Multiple regression is a statistical technique that allows the researcher to predict the score on one variable on the basis of scores on several other variables. Many researchers use the term “independent variables” to identify those variables they think will influence some other so-called “dependent variable”. Independent variables are known as predictor variables and dependent variables as criterion variables.

If two variables are correlated, then knowing the score on one variable enables the researcher to predict the score on the other. The stronger the correlation, the closer the scores will fall to the regression line and therefore the more accurate the prediction will be. Multiple regression is simply an extension of this principle, where one variable is predicted on the basis of several others. In both ANOVA and multiple regression, the researcher seeks to determine what accounts for the variance in the scores observed. In ANOVA, he or she tries to determine how much of the variance is accounted for by the manipulation of the independent variables. In multiple regression the researcher does not directly manipulate the independent variables but instead, simply measures the naturally occurring levels of the variables to see if this helps to predict the score on the dependent variable.

When performing a multiple regression analysis, attention should be focused on the *beta value*. This value is a measure of how strongly each independent variable (predictor variable) influences the dependent variable (criterion variable). The beta is measured in units of standard deviation — thus the higher the beta value, the greater the impact of the predictor variable on the criterion variable will be.

Multiple correlation (R) is a measure of the correlation between the observed value and the predicted value of the criterion variable. The *R Square* (R^2) indicates the proportion of the variance in the criterion variable which is accounted for by the model. In essence, this is a measure of how well a prediction of the criterion variable can be made by knowing the predictor variables. However, R^2 tends to somewhat over-estimate the success of the model, and the *adjusted* R^2 value therefore gives the most useful measure of the success of the model.

When choosing a predictor variable, one should make sure that it correlates with the criterion variable, but not strongly with the other predictor variables. The term *"multicollinearity*" is used to describe the situation in which a high correlation is detected between two or more predictor variables. Such high correlations cause problems when trying to draw inferences about the relative contribution of each predictor variable to the success of the model. There are different ways to assess the relative contribution of each predictor variable. In the "simultaneous" method (enter method), the researcher specifies the set of predictor variables that make up the model. In the stepwise method, each predictor variable is entered in sequence and its value assessed. If adding the variable contributes to the model then it is retained, but all other variables in the model are then retested to see if they are still contributing to the success of the model. If they no longer contribute significantly they are removed. This method should thus ensure that the researcher ends up with the smallest possible set of predictor variables included in the model.

In this study, the researcher decided to use the "stepwise" multiple regression method because it results in the most parsimonious model. This could be particularly important to determine the minimum number of variables needed to measure and predict the criterion variable.

7.14 ANALYSIS OF COMPLIANCE WITH SPECIFIC ASSUMPTIONS

7.14.1 Sampling adequacy

The Kaiser-Meyer-Olkin test was conducted to establish whether the item intercorrelation would comply with the criterion of sample adequacy set for factor analysis. Kaiser-Meyer-Olkin statistics are based on partial correlation and the anti-image correlation of items. Linked to the anti-image correlation matrix is the measure of sampling adequacy (MSA). The scores of MSA can range from zero to one, but the overall score must be higher than 0.70 if the data are likely to factor well (Morgan & Griego, 1998). Hair, Anderson, Tatham and Black (1998) propose the following guidelines in interpreting the Kaiser-Meyer-Olkin's sampling adequacy:

Outstanding	:	MSA > 0.90 - 1
Metorius	:	MSA > 0.80 – 89
Middling	:	MSA > 0.70 – 79
Mediocre	:	MSA > 0.60 – 69
Miserable	:	MSA > 0.50 – 59
Unacceptable	:	MSA < 0.50

If the KMO score is less than 0.50 there is no systematic covariation in the data and the variables are essentially independent (bmj.bmjjournals.com/cgi, 13/03/2004).

7.14.2 Sphericity

Sphericity means that data are uncorrelated. Factor analysis, however, assumes that each of the variables in a set of variables are associated with one another. Moderate significant intercorrelations between items are required to uncover the latent structure of a set of variables. Bartlett's test of sphericity measures the absence of correlations between variables. Bartlett's statistics test whether a correlation matrix is an identity matrix — that is, that the items are unrelated. A high Chi-square value with a low p value ($p<0.001$) indicates a significant relationship between the items, which indicates that the data are suitable for factor analysis (Morgan & Griego, 1998).

7.14.3 Homogeneity of variance

ANOVA assumes equal variances across groups or samples. Levene's test of homogeneity of variance can be used to verify the assumption that the variances of groups are equal. Levene's test statistic is designed to test for equality of variance across groups against the alternative that variances are unequal for at least two groups. If Levene's F is statistically significant ($p<0.05$), then variances are significantly different and the assumption of equal variances is violated (Morgan & Griego, 1998).

7.14.4 Equality of covariance

The assumption for a multivariate approach is that the vector of the dependent variables follows a multivariate normal distribution, and the variance-covariance matrix is equal across the cells formed by the between–subject effects (SPSS help function).

The Box's M test tests MANOVA's assumption of homoskedasticity using the F distribution. If $p(M)<0,05$, the covariance is significantly different and the assumption of equality of covariance is violated (www2.chass.ncsu.edu, 2002).

7.15 STATISTICAL SIGNIFICANCE

Conventionally, most researchers use the levels 0.05 and 0.01 as levels of significance for statistical tests performed. These levels are quite severe and are used when the purpose is to limit the risk of incorrectly rejecting the null hypotheses, or concluding a significant result erroneously. Such errors are referred to as type-I errors. In the medical sciences, where an error could have severe consequences, such errors must be kept low. Often, however (eg in the human sciences), the consequences of a type-I error are not that severe and researchers are merely concerned with missing a significant result, known as a type-II error.

7.15.1 Practical significance

The reason for making use of samples is that they enable one to study the properties of a population within the limitations of time and money. In such cases the statistical significance tests are used to show that the results are significant. The p-value is a criterion of this, giving the probability that the obtained value or larger could be obtained under the assumption that the null hypothesis (eg no difference between the means) is true. A small p-value (eg smaller than 0.05) is considered as sufficient evidence that the result is statistically significant. However, statistical significance does not necessarily imply that the result is important in practice because these tests have a tendency to yield small p-values (indicating significance) as the size of the data sets increases.

Most researchers are compelled to consider the results they obtain as a subpopulation of the target population owing to the weak response of the planned random sample. These data should then be considered as small populations for which statistical inferences and p-values are not relevant. Statistical inference draws conclusions about the population from which a random sample was drawn, using the descriptive measures that have been calculated. Instead of only reporting descriptive statistics in these cases, effect sizes can be determined. Practical significance can be understood as a large enough difference to have an effect in practice.

7.15.1.1 Practical significance of differences between means

The following formula was used to determine the practical significance of differences (d) when t-tests were used (Steyn, 1999):

where

$Mean_A$ = mean of the first group

$Mean_B$ = mean of the second group

SD_{MAX} = highest standard deviation of the two groups

The following formula was used to determine the practical significance of the means of more than two groups (Steyn, 1999):

where

$Mean_A$ = mean of the first group

$Mean_B$ = mean of the second group

Root MSE = root mean square error

Cohen (1988) recommends the following cutoff points for the practical significance of differences between means.

d = 0.20	small effect
d = 0.50	medium effect
d = 0.80	large effect

A cutoff point of d = 0.50 (medium effect) was set for the practical significance of differences between means.

7.15.1.2 Practical significance for univariate and multivariate analysis

N-way ANOVAs and MANOVAs were used to determine the effect of the biographical characteristics (independent variables) on the perceptions of the sample with regard to the behavioural domains. Where statistical significant main and interaction effects were found, partial eta squared was calculated to determine the practical effect size.

Partial eta squared (η_p^2) is the proportion of the effect + error variance attributable to the effect, and is calculated by means of the following formula:

$$\eta_p^2 = SS_{effect} / (SS_{effect} + SS_{error})$$

The SPSS calculates the partial eta squared values, which indicates the contribution (effect size) of each factor, independently of the number of variables included in the model. According to Cohen's effect sizes, the following cutoff points apply if partial eta squared is to be of practical significance:

$\eta_p^2 = 0.01$	small effect
$\eta_p^2 = 0.06$	medium effect
$\eta_p^2 = 0.14$	large effect

A cutoff point of 0.06 (medium effect) was used to report on the practical significance of the results.

7.15.1.3 Practical significance (effect size) for correlation between variables

In many cases it is necessary to know whether a relationship between two variables is practically significant — for example, between the treatment of AA employees in the workplace and perceptions of affirmative action fairness. The statistical significance of such relationships is determined with correlation coefficients (r), but one actually wants to know whether the relationship is large enough to be important. In this case, the effect size is determined by using the absolute value of r and relating it to the cutoff points for practical significance recommended by Cohen (1988).

r = 0.10	small effect
r = 0.30	medium effect
r = 0.50	large effect

A cutoff point of r = 0.30 (medium effect) was set to decide on the practical significance of correlations between variables.

7.15.1.4 Practical significance (effect size) for multiple regression

Stepwise multiple regression analysis was conducted to determine the portion of variance in affirmative action justice perception that is predicted by the treatment of AA employees. According to Cohen (1988), the effect size (which indicates practical significance) in the case of multiple regression is determined by applying the following formula:

$f^2 = R^2/(1-R^2)$

Cohen (1988) recommends the following values of f^2 to assess the effect size of R^2:

$f^2 = 0.02$	small effect
$f^2 = 0.15$	medium effect
$f^2 = 0.35$	large effect

A cutoff point of 0.35 (large effect) was set for the practical significance of f^2.

7.16 SUMMARY

This chapter focused mainly on the statistical applications involved in determining the fairness of affirmative action, the treatment of affirmative action employees and how employees behave in the workplace. The discussion dealt with the population, method of sampling, the design and layout of the questionnaire, the type of questionnaire used, the design of questions, the pretesting of the questionnaire and the correlations and factor analysis methods used in the study. Statistics such as factor analysis, reliability analysis, analysis of item distribution, analysis of variance (t-test, ANOVAs, MANOVAs) and correlation and multiple regression analysis were utilised in this study to provide a basis for discussion of the results as set out in chapter 8. Practical significance and effect sizes were discussed and specific cutoff points recommended as guidelines to determine if the results were of practical significance. The reporting of effect sizes is encouraged by the American Psychological Association (APA) in their Publication Manual (APA, 1994).

Chapter 8 will discuss the results and their interpretation, and provide conclusions of the research proposals as formulated in chapter 1.