

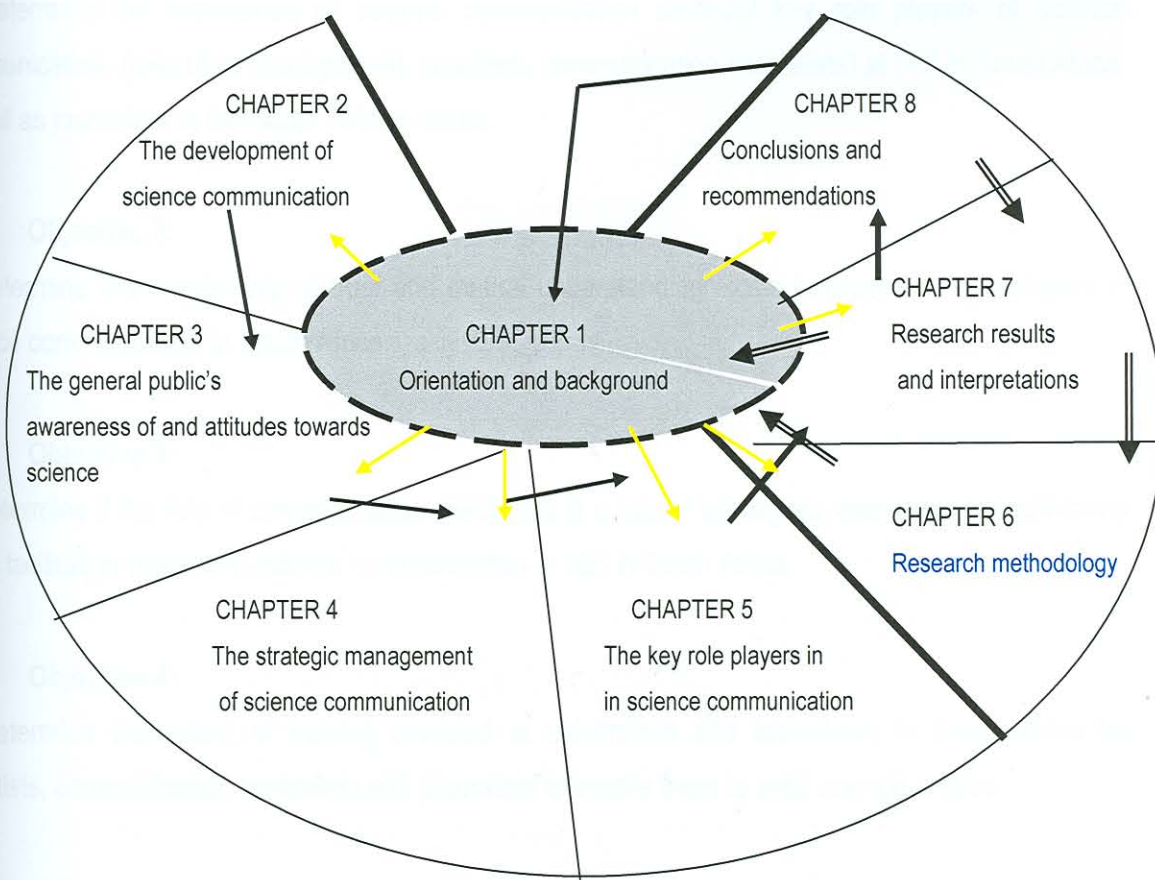
## Chapter 6

### Research methodology

#### 6.1 INTRODUCTION

This chapter focuses on the research methodology used in this study. Figure 6.1 illustrates the positioning of this chapter in relation to the theoretical and empirical phases. Chapter 6 is the first of the three components of the empirical phase and is central to enhancing the internal validity of the findings. Furthermore, there is a constant interplay between Chapters 1 and 6, as well as between Chapters 6, 7 and 8.

Figure 6.1: Chapter 6 in relation to the theory and empirical phases



Mouton (1996:39) makes it clear that the choice of methodology depends on the research problem and research objectives. It is therefore appropriate to restate the general research aim and research objectives that guide this study, as stated earlier in Chapter 1.

**General research aim:**

The general research aim of this study is to investigate the relationship between key role players in science communication and to determine the role of the key role players in science communication. The key role players refer to executive management, scientists and communication specialists at HEI as well as South African journalists.

**Research objectives:**

- **Objective 1:**

To determine the importance of science communication amongst key role players of science communication, (executive management, scientists, communication specialists) at HEI in South Africa, as well as journalists in the South African media.

- **Objective 2:**

To determine if a relationship of trust and mutual understanding exists between key role players in science communication in South Africa.

- **Objective 3:**

To determine if the role of communication specialists is a role of strategists, managers or technicians in the facilitation process in science communication at HEI in South Africa.

- **Objective 4:**

To determine the extent of training provided at universities and technikons in South Africa for scientists, communication specialists and journalists to enable them to write science articles.

- **Objective 5:**

To investigate the coverage of scientific topics in articles in the South African mass media.

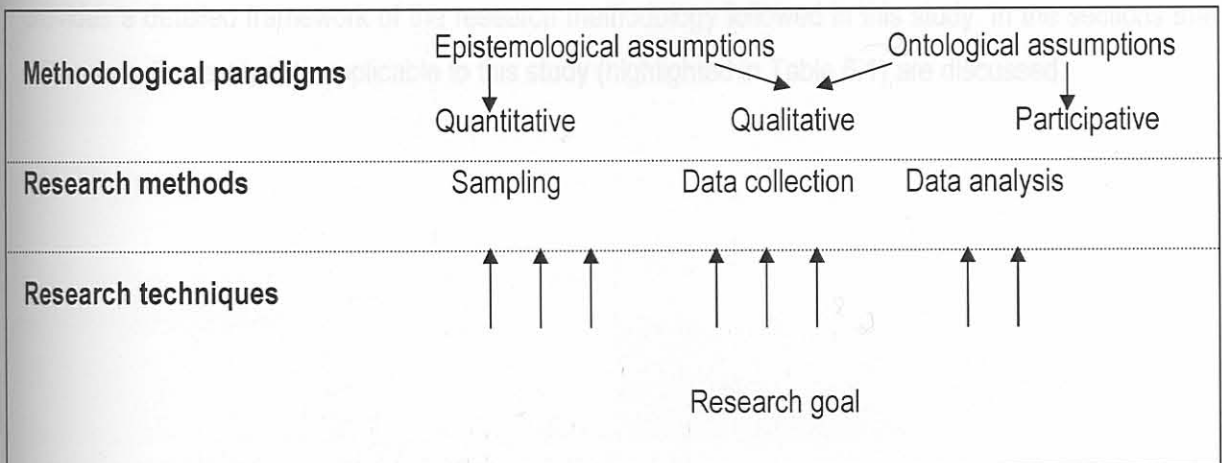
- **Objective 6:**

To analyse the content of articles on science in selected South African media from 1 March to 31 May 2004 and to compare the results of this study with Van Rooyen's study conducted in 2002.

## 6.2 PERSPECTIVES ON RESEARCH METHODOLOGY

The methodological dimension of research is distinguished on three levels, namely methodological paradigms, research methods and research techniques (Mouton, 1996:37). Methodological paradigms, the most abstract level, include the distinction between qualitative, quantitative and participatory research. Research methods are those that are used in certain stages of the research process, for example sampling, data collection and data analysis. Research techniques represent the most concrete level of the methodological dimension to execute specific tasks and include specific techniques related to sampling, data collection and data analysis. This distinction between paradigms, methods and techniques is helpful in forming a better understanding of the concept 'research methodology' (Schoonraad, 2003:129). The three levels as described by Mouton (1996:37) are demonstrated in Figure 6.2.

Figure 6.2: Levels in the methodological dimension



Source: Mouton (1996:37)

Du Plooy (2001:20,21) suggests that the ontological, epistemological and theoretical assumptions about communication should be considered in deciding which methodological assumptions would govern a study. In this study the assumptions of Du Plooy (2001:27), namely that the epistemological assumption guides the way in which researchers acquire knowledge (epistemology), are accepted.

Research strategy and research design are two other terms related to research methodology. Research strategy guides the research effort by defining the context within which it is conducted and provides the link between research objectives and research activities. Research strategy is partly

derived from the methodological paradigm – qualitative or quantitative – that fits a particular research problem. Du Plooy (2001:81), on the other hand, describes research design as a plan of how a research project is conducted, specifying who or what is involved, and where and when it is taking place. In other words, research strategy indicates which ‘direction’ is taken, while research design indicates what needs to be done while heading in that specific direction (Schoonraad, 2003:130).

Du Plooy (2001:49) further states that research strategy refers to qualitative versus quantitative, exploratory versus formal, descriptive versus causal research. Cooper and Schindler (2001:135) describe the research design as control over variables, time dimension, research environment and perceptions of participants. The methods and techniques used to collect, analyse and interpret data are discussed under one heading, because according to Mouton (1996:36) the distinction between methods and techniques is one of degree and scope.

This study is following two methods and techniques to collect, analyse and interpret data. The first data collection technique is a *survey method* and the second technique is *content analysis*. Table 6.1 provides a detailed framework of the research methodology followed in this study. In the sections that follow, only those aspects applicable to this study (highlighted in Table 6.1) are discussed.

Excerpted from: Cooper and Schindler (2001:135), Mouton (2001:165), Du Plooy (2001:197) and Schoonraad (2003:131).

### 1.3 RESEARCH STRATEGY

According to Mouton (1996:37), the research strategy that is partly derived from the methodological paradigm (qualitative or quantitative) fits the research question. The research strategy is further described as exploratory or formal, descriptive or causal. In this study a qualitative, exploratory and descriptive research strategy was followed.

Table 6.1: A framework of the levels and aspects of the research methodology

RESEARCH STRATEGY	RESEARCH DESIGN	RESEARCH METHODS AND TECHNIQUES	
Qualitative or <b>quantitative</b> (both Phase 1: survey and Phase 2: content analysis)	Control over variables <ul style="list-style-type: none"> <li>• Experimental</li> <li>• <b>Ex post facto</b></li> </ul>	Sampling design <ul style="list-style-type: none"> <li>• Unit of analysis</li> <li>• Population</li> <li>• Target population</li> <li>• Sampling frame</li> </ul>	Sampling techniques <ul style="list-style-type: none"> <li>• Probability (simple random; systematic; stratified; cluster; sequential or multiphase)</li> <li>• <b>Nonprobability</b> (convenience; <b>purposive</b>, snowball)</li> </ul>
Exploratory or formal research	Time dimension <ul style="list-style-type: none"> <li>• <b>Cross-sectional</b></li> <li>• Longitudinal</li> </ul>	Data collection	Data collection techniques <ul style="list-style-type: none"> <li>• <b>Quantitative</b> data collection (e.g. experimental; <b>survey</b>; <b>content analysis</b>)</li> <li>• Qualitative data collection (e.g. field observation; historical research; content analysis)</li> </ul>
Descriptive or causal research	Research environment <ul style="list-style-type: none"> <li>• <b>Field</b></li> <li>• Laboratory</li> <li>• Simulation</li> </ul>	Data analysis	Data analysis techniques <ul style="list-style-type: none"> <li>• <b>Quantitative</b> data analysis (<b>descriptive statistics</b>; inferential statistics)</li> <li>• Qualitative data analysis (e.g. grounded theory; discourse analysis; conversation analysis)</li> </ul>
	Perceptions of participants <ul style="list-style-type: none"> <li>• Actual routine</li> <li>• <b>Modified routine</b></li> </ul>		

Compiled from: Cooper and Schindler (2001:135), Mouton (2001:166), Du Plooy (2001:191) and Schoonraad (2003:131).

### 6.3 RESEARCH STRATEGY

According to Mouton (1996:37), the research strategy that is partly derived from the methodological paradigm (qualitative or quantitative) fits the research question. The research strategy is further described as exploratory or formal; descriptive or causal. In this study a quantitative, exploratory and descriptive research strategy was followed.

### 6.3.1 Quantitative research

Cooper and Schindler (2001:139) note that the objectives of exploration may be accomplished with different techniques. Both qualitative and quantitative techniques are applicable, although exploration relies more on qualitative techniques. The objectives of the empirical component of this study are not to obtain in-depth information, but rather to gain a wide range of perspectives from the key role players (executive management, scientists, communication specialists and journalists) in science communication. Thus, a quantitative strategy, rather than a qualitative one, is used.

### 6.3.2 Exploratory research

Exploratory studies tend toward loose structures with the objective of discovering future research tasks. The immediate purpose of exploration is usually to develop hypotheses or questions for further research (Cooper & Schindler, 2001:134). According to Mouton (1996:102) exploratory studies are typically used when very little previous research has been conducted on a specific topic.

Science communication is a new phenomenon in South Africa and very few research studies have been conducted, especially on the role of key role players in science communication (Joubert, 2001). Two of the objectives of this study are to describe the role of role players in science communication and to establish the level of training required for role players to be effective in science communication. A natural result of these is the identification of shortcomings in the current situation in order to identify priorities for future research.

### 6.3.3 Descriptive research

Cooper and Schindler (2001:136) distinguish between descriptive or causal research in the objectives of the research study. Descriptive research attempts to answer questions such as who, what, where, when or how much. Causal research on the other hand focuses on why – in other words, how one variable produces change in another.

The objectives, as noted in the introduction of this chapter, attempt to describe the current role of communication specialists, the relationship between key role players in science communication, the training provided to role players in science communication and the media coverage that science receives in the media. Therefore, the objectives of this study attempt to answer questions of 'what' and 'how much'. The study is thus descriptive.

## 6.4 RESEARCH DESIGN

As mentioned earlier and illustrated in Table 6.1, the research design encompasses factors such as researcher control of variables, time dimensions, research environment and participant's perceptions (Cooper & Schindler, 2001:135). The factors as applicable to this study are discussed in the following sections.

### 6.4.1 Control of variables

An *ex post facto* research design aims to study a specific situation or phenomenon *as it is* (Leedy, 1997:189). It does not attempt to manipulate any of the variables in the situation. According to Cooper and Schindler (2001:136), researchers should avoid manipulating variables by adhering strictly to sampling procedures, otherwise bias might be introduced. This is in contrast to experimental design, where variables are deliberately manipulated in order to observe cause and effect relationships. The main objective of this study is to describe the current role of role players in science communication. It is therefore based on an *ex post facto* research design.

### 6.4.2 Time dimensions

Within the time dimensions of the design, two possibilities exist: Cross-sectional studies and longitudinal studies. Cross-sectional studies are carried out once and represent a snapshot of one point in time, while longitudinal studies are repeated over an extended period (Cooper & Schindler, 2001:136). As the objectives of this study are to describe a current situation, not to observe trends or changes, a cross-sectional time dimension is appropriate.

### 6.4.3 Research environment

Research can be conducted either under actual environmental, laboratory or simulated conditions. According to Mouton (2001:157), field experiments distinguish themselves from 'true' or 'classical' experiments by the fact that they occur in natural settings. This study is conducted under actual environmental conditions (in the field/natural environment) and can therefore be classified as field research.

### 6.4.4 Perceptions of participants

Cooper and Schindler (2001:139) warn that when people involved in a research study perceive that research is being conducted, they may behave less naturally. The following three levels of perception are identified:

- No deviation from everyday routines
- Deviations, but unrelated to the researcher
- Deviations as induced by the researcher

The last level illustrated in Table 6.1 is referred to as 'modified routine'. Du Plooy (2001:85) suggests that when performing a cross-sectional study, the unobtrusiveness of the measuring instrument and/or the researcher's behaviour can contribute to internal validity. However, in the case of questionnaire surveys, this is not possible. Respondents or subjects are aware that research is being conducted. When analysing the data and discussing the results, it is therefore important to make provision for the possibility that respondents' responses might have been influenced by this awareness. A self-administered questionnaire was used in this study and the level of respondents' awareness can therefore be described as 'modified routine'.

## 6.5 RESEARCH METHODS AND TECHNIQUES

This section devotes time to the more concrete levels of the research methodology, which include sampling, data collection and data analysis methods and techniques (Mouton, 1996:37). Two methods were used in this study to conduct the empirical research. **Phase 1** makes use of the survey method, while in **Phase 2** a content analysis is conducted. First, in Phase 1 of the study, the sampling, data collection and data analysis methods are described, followed by a discussion of the questionnaire design and pilot test. Thereafter, in Phase 2, a description of the content analysis is provided.

### 6.5.1 Phase 1: Sampling design

The basic idea of sampling is to identify the unit of analysis, the target population and sampling frame, as well as the appropriate sampling technique(s).

- **Unit of analysis**

The unit of analysis is the person or object from whom the researcher collects data (Mouton, 1996:91). Such data can only describe the specific unit from which data is collected, but when combined with similar data collected from a group of similar units, provides an accurate picture of the group to which that unit belongs (Du Plooy, 1996:39; Cooper & Emory, 1994:114). Units of analysis fall into broad categories such as individuals, groups, organisations, time periods and social artefacts (Mouton, 1996:48). He further observes that in some cases the unit of analysis and data source are identical, while they differ in other cases (Mouton, 1996:92). One way to distinguish between the two is to remember that the unit of analysis is that to which a researcher's conclusions ought to apply, while the



data source is that which has to be explored or investigated in order to gather information about the unit of analysis. In Phase 1 of this study the unit of analysis and data source are identical, that is, the key role players in science communication in South Africa. The key role players include executive management, scientists, communication specialists at HEI and journalists in South Africa.

- **Target population**

Defining the population involves two steps: identification of the target population and construction of the sampling frame (Mouton, 1996:135). According to Dane (1990:336) and Du Plooy (2001:100), there is a distinction between the population and the target population: the population is all possible units of analysis, while the target population is the population to which the findings can be generalised. In this study the population includes all South African universities, technikons and media. The target population only includes executive management, scientists and communication specialists at universities and technikons (also referred to as HEI in this study) and daily newspapers, weekly newspapers and family magazines (targeted at the whole family and not only at women or men).

The numbers of the selected target populations for the HEI and journalists were obtained from various sources. The membership of executive managements was obtained telephonically and via the Internet. These numbers may however not be absolutely correct, since the information on the Internet might be outdated. The target population of scientists was obtained from the 2003 (2004 was not available yet) National Research Foundation database, which includes only rated scientists and cover all sciences, including human sciences, which are outside the scope of this study. The communication specialists were obtained from the Practitioners in Marketing and Communication, trading as UNITECH database, which is also very outdated. UNITECH is a membership-based organisation that promotes the interests of practitioners in the intergraded marketing, communication and development fields at the various HEI in Southern Africa. The media that was selected for this study focused on the South African media, since it has often been criticised for its lack of SET coverage. The media that was included in this study focused on weekly and daily newspapers and family magazines. These newspapers and magazines were contacted and their number of journalists was obtained telephonically. The South African newspapers and magazines do not have journalists who report specifically on science (Van Rooyen, 2001:15). Journalists are reporting on four main categories and science would have to fall into one of these categories, depending on the field of the science news. The four categories are environment, health/medical, technology and education. Table 6.2 illustrates the number of respondents from the four target populations as defined above.

Table 6.2: Target populations

TARGET POPULATION	TOTAL NUMBER
Executive management	62
Scientists	1 110
Communication specialists	234
Journalists	68
<b>TOTAL</b>	<b>1 474</b>

The objective of this study is not to generalise the findings to the target population. Although the empirical component of the study is quantitative in nature, the study as a whole is exploratory in nature. This is not necessarily problematic in terms of the definition of the concept 'target population'. For the purposes of this study, 'target population' is understood as those units of analysis that are applicable in terms of the research problem and objectives.

- **Sampling frame**

The sampling frame is closely related to the population. The sampling frame is the list of elements from which the sample is actually drawn (Cooper & Schindler, 2001:170). Although the sampling frame should ideally include all members of the target population, it is not always practically possible. For example, existing or available lists of members of the target population might be outdated.

It has been noted that the target population for Phase 1 of this study consists of executive management members, scientists and communication specialists at universities and technikons, as well as journalists at daily newspapers, weekly newspapers and family magazines. During the course of this study some universities and technikons merged or are in the process of merging, and some of the executive management and communication specialists are no longer in their previous employment positions. Technikons *per se* are no longer in existence, but for the purposes of this study, they remain as they were previously known. Restructuring of the institutions influenced the designations of previous executive management members and communication specialists. Therefore, some of the institutions included in this study will no longer be in existence at the conclusion of the study. However, it was possible to include almost all institutions as had originally been anticipated.

Journalists at the daily newspapers included a representation of all the provinces, while journalists at the weekly newspapers included those papers with the highest number of readers. The journalists at magazines that were selected are journalists reporting for family magazines with the highest likelihood of publishing science articles. Magazines such as *Sarie* and *Fair Lady* were not included because they focus mainly on women, while *Farmers Weekly* and *Landbouweekblad*, etc., were also not included since they focus on a specific reader group that may tend to be biased in terms of agriculture. Gender-focused and specific reader groups fall outside the scope of this study. Therefore, the sampling framework is constructed from the following sources:

- Executive management, scientists and communication specialists from the following universities: – Cape Town, Witwatersrand, Stellenbosch, Port Elizabeth, Rhodes, Western Cape, Free State, Potchefstroom, North West (Potchefstroom and North West were in the process of merging when the research was conducted), Rand Afrikaans, Witwatersrand, Pretoria, South Africa, KwaZulu-Natal (Durban, Pietermaritzburg and Durban-Westville already merged), Venda, Transkei and the North.
- Executive management, scientists and communication specialists from the following technikons: – the Cape, Free State, Eastern Cape, ML Sultan, Mangosuthu, Northern Gauteng, Natal, Peninsula, North West, Pretoria, Port Elizabeth, Vaal Triangle, South Africa and Witwatersrand. Since the research was conducted, some of these technikons have merged with universities or undergone a name change.
- South African journalists at the following daily newspapers, weekly newspapers and magazines: Daily newspapers – *The Pretoria News*, *Beeld*, *Die Burger*, *Die Volksblad*, *Sowetan*, *The Mercury*, *The Argus*, *This Day* and *Star*. Weekly newspapers – *Mail & Guardian*, *Sunday Times* and *Rapport*. Family magazines – *Financial Mail*, *Finansies & Tegniek*, *De Kat*, *Huisgenoot* and *You*.

The information on the selected target populations was carefully scrutinised and outdated information was removed. After cleaning the data on the target populations, the sampling frame consisted of the numbers as displayed in Table 6.3.

Table 6.3: Sampling frame

SAMPLING	NUMBER OF POPULATION
Executive management	46
Scientists	234
Communication specialists	58
Journalists	51
<b>TOTAL</b>	<b>389</b>

- **Sampling technique**

Sampling, according to Du Plooy (2001:100) is described as a rigorous procedure of selecting units of analysis from a larger population. There are several reasons why samples are drawn, rather than to investigate the whole population (Cooper & Schindler, 2001:163). These reasons include lower cost of the research, greater accuracy of results, greater speed of data collection and availability of population elements.

Sampling techniques can be divided into two broad categories, namely probability and non-probability samples. Probability samples are distinguished by the fact that each population element has a known, non-zero chance of being included in the sample. Non-probability samples rely on personal judgement somewhere in the element-selection process and therefore prohibit estimating the probability that any given population element is included in the sample (Cooper & Schindler, 2001:166). If the objective of a research study is to generalise the findings to the population, probability sampling is the logical choice. However, if the study is exploratory in nature, with less concern about the sample's representativeness of the population, non-probability sampling is appropriate.

This study is exploratory in nature, therefore the emphasis is not so much on generalisation, but rather on gathering preliminary information about how the key role players (executive management, scientists and communication specialists at South African HEI, as well as journalists) in science communication interact and what roles they are playing. Non-probability sampling was therefore the choice and purposive sampling (more specifically judgement sampling) was chosen as the sampling technique. In purposive sampling the researcher selects elements of the population with a specific purpose in mind. The elements, or characteristics, are usually especially informative (Zikmund, 2003:382). Furthermore, using judgement sampling, the researcher selects sample members in order to conform to a certain criterion (Cooper & Schindler, 2001:192).

The sample size constitutes roughly 26% of the target population. It was hoped that a larger sample could be drawn, seeing that the data collection method used in Phase 1 of this study (electronic questionnaire survey) is characterised by low response rates. However, many e-mail addresses of the target population were no longer valid.

### 6.5.2 Phase 1: Data collection

There are various methods of collecting primary research data, for example by means of mail-based self-administered questionnaires, telephonic interviews, personal interviews (face-to-face) and focus groups (Malhotra, 1996:198). When undertaking a survey in communication research, the researcher collects information from a group of people to describe their abilities, opinions, attitudes, beliefs and/or knowledge with regard to a particular topic or issue. Generally, the purpose of using survey research in communication is to explore and describe what is, rather than to evaluate why an observed distribution (or attitude) exists (Cooper & Schindler, 2001:295).

The communication approach involves questioning or surveying people and recording their responses for analysis. The great strength of questioning (or conducting a survey) is its versatility. It does not require any visual or other objective perception of the information sought by the researcher. Abstract information of all types, opinions, attitudes, intentions and expectations can be gathered by questioning others (Cooper & Schindler, 2001:295). Questioning is more efficient and economical than observation. However, questioning has its shortcomings. The major weakness is that the quality and quantity of the information secured depend heavily on the ability and willingness of respondents to cooperate. Even if respondents do participate, they may not have the knowledge sought or even an opinion on the topic of concern. Too often, respondents feel obliged to express some opinion, even if they do not have one. Respondents may also interpret a question or concept differently from what was intended by the researcher (Cooper & Schindler, 2001:295).

The largest constraint when using a self-administered questionnaire is a low rate of return. The data collection time is also long. Dillon *et al.* (1993:157) sees survey research as a process of social exchange: "... an interpersonal relationship in which an individual's willingness to enter or remain in the relationship depends on expectations of rewards and costs". The researcher can therefore increase the rate of return by making the completion of the questionnaire worthwhile for the respondent, thus ensuring an acceptable rate of return for the e-mailed and/or faxed questionnaire.

According to Dillon *et al.* (1993:158-172), versatility, quantity of data, sample control, quality of data, response rate, speed, cost and uses, influence the choice of a survey method. After considering all the advantages and disadvantages of the various methods (shopping mall intercept, personal interview, mail, telephone and e-mail), a decision was taken to make use of a self-administered questionnaire sent via e-mail to potential respondents as the measurement instrument. E-mail is fast and cost-effective, and the questionnaires would be completed in the respondents' own homes or at work, requiring only a few minutes of their time.

- **Compiling a database**

Successful data collection depends on a reliable database. Already during construction of the sampling frame the available databases for the four target populations were compiled and existing databases were revised. Possible respondents who were no longer at the various institutions and printed media were removed from the databases. As a second step, the websites of institutions and printed media in the sampling frame were visited to obtain the e-mail addresses of respondents. However, not all the institutions had websites and not all of the printed media listed their journalists. All the available information on executive management members, scientists, communication specialists and journalists was recorded.

As an alternative method, the institutions and printed media applicable to this study were contacted telephonically to obtain information. Unfortunately, this strategy yielded less successful results. A large number of institutions, newspaper and magazine offices were not prepared to provide e-mail addresses of executive management members, scientists, communication specialists or journalists. However, some were cooperative and provided the e-mail addresses as requested.

- **Distribution of questionnaires**

Due to the four target populations identified for the purpose of this study, four separate questionnaires were distributed. They were targeted specifically at each member of the executive managements, scientists, communication specialists and journalists. This phase was implemented in January 2004. E-mails were sent directly to the respondents. The e-mail message included an explanation of the process behind submission of responses and an offer was made to send the respondent the results of the study. The e-mails were not personalised, but a different e-mail was sent to each of the four target populations, since the number of questions in each questionnaire differed.

The respondents all had extremely busy schedules and would not have time to read lengthy e-mails. The most essential information was therefore placed right at the beginning of the e-mail message. The subject line and introductory sections were formulated to immediately grab respondents' attention. The research study was introduced in the introductory section. (See Appendix 1 for an example of the e-mail message that was sent to respondents.) The questionnaires were attached to the e-mail and were accompanied by a cover letter addressed to each of the four target populations. The covering letter explained the purpose of the study, indicated how the information would be used and motivated why the individual's participation was important. The letter identified the person undertaking the survey and was aimed at persuading the respondent to complete and return the questionnaire by the closing date. The address to which the questionnaire had to be returned was clearly indicated so as to facilitate its return. (See Appendix 2 for the cover letter.)

Step-by-step instructions were provided in the questionnaire to facilitate its completion. On the last page a space was provided to fill in an address, should the respondent require a copy of the results, or should the researcher require further information from the respondent. (See Appendices 3, 4, 5 and 6 for the questionnaires developed for executive management, scientists, communication specialists and journalists respectively.)

The response (in terms of submitted questionnaires) was extremely poor. However, quite a number of replies on the e-mail messages were received. Surprisingly, most principals returned the questionnaire, or indicated that a vice-principal would reply on behalf of the institution. However, hardly any vice-principal returned the questionnaire, except for the ones who were requested to reply on behalf of the institution. In many cases, the scientists apologised for being too busy to be able to complete the questionnaire, and some declined to participate in the survey. At some institutions communication specialists also declined to participate, since the institution does not participate in any science communication activities. Most journalists did not reply to the e-mail at all. Two weeks before the initial closing date of 31 March 2004 reminders were sent to those respondents from whom no response had been received. The response was slightly better.

In a final attempt to increase the response rate, e-mail messages were again sent to members of executive managements, scientists and communication specialists. In the case of journalists, an e-mail was sent to the newsdesk editor with the request to hand the questionnaire to the journalists. Some newspapers required a fax copy of the questionnaire, which was sent immediately after the request.

This strategy was more successful in terms of the number of responses received. However, it was necessary to postpone the deadline of submission to the end of April 2004.

- **Recording of data**

All responses received from respondents were immediately printed. To prevent any loss of data, the contents of all e-mails were saved in a folder on Outlook Express. Thereafter data was captured in a Microsoft Excel spreadsheet.

### 6.5.3 Phase 1: Data analysis

There are two types of questions, open-ended and close-ended questions, which require different types of data analysis. Since the questionnaire contained only structured or close-ended questions, the researcher coded all responses.

- **Coding**

Coding means assigning a code, usually a number, to each possible response to each question. The code includes an indication of the column position and the data record it would occupy. For example, the gender of respondents can be coded as 1 for males, and 2 for females (Malhotra, 1996:475). Assigning numerical symbols permits the transfer of data from the survey to the computer (Zikmund, 2003:458). The respondent code and record number also appeared on each record in the data.

- **Statistical procedures used**

Date was captured and stored in a Microsoft Excel spreadsheet. The data was also subjected to a verification process in order to eliminate non-response and data-capturing mistakes. The Excel file was prepared for data processing using the SAS computer statistical software package.

- **Descriptive statistics**

Descriptive analysis refers to the transformation of the raw data into a form that is easy to understand and interpret (Zikmund, 2003:473). Describing responses or observations is typically the first form of analysis. The calculation of averages, frequency distributions and percentage distributions constitute the most common form of summarising data. The following are the main statistical procedures that were considered for use in the data analysis of Phase 1 of this study.



### Frequency distributions

In a frequency distribution, one variable is considered at a time. The objective is to obtain a count of the number of responses associated with different values of the variable. A frequency distribution for a variable produces a table of frequency counts, percentages and cumulative percentages for all the values associated with that variable (Malhotra, 1996:504). The most commonly used statistics associated with frequencies are the mean, mode, median and standard deviation.

### Mean

According to Cooper and Schindler (2001:442), the mean is a measure of *location* or central tendency. The measurement scales used in the questionnaire consisted of five points. The mean values for each variable therefore indicate whether most responses are located to the left or to the right of the centre of the scale. However, it must be remembered that the mean is an *average*, and does not indicate how individual responses are spread across the five-point scale.

### Standard deviation

This limitation is addressed by the most commonly used measure of the standard deviation. The standard deviation is the positive square root of the variance (Malhotra, 1996:508). When compared with the mean calculated for each variable, the researcher could establish how far away from the average the data values are (Cooper & Schindler, 2001:444). Standard deviations can be used to determine whether mean differences between groups can be regarded as significantly different or not.

The mean values for the variables in each question are presented in table format and in the cases of high standard deviation separate bar charts were drawn for each variable in order to compare values between the population groups.

## 6.5.4 Phase 1: Questionnaire design

In Chapter 1, the conceptual framework that forms the basis of this study is set out. The framework includes two concepts and their related constructs. In the following paragraphs an explanation is provided as to how this conceptual framework guided the formulation of questions in developing the questionnaire that was used as measuring instrument for Phase 1 of the study. It is important to note that the discussion that follows applies to the final version of the questionnaire. For the purpose of this study four questionnaires had to be developed to appropriately address the four target populations selected. The four populations that were included are executive management, scientists, communication specialists and journalists. The questions are not different for each of the populations,

but certain questions were not applicable to all four populations and therefore were not included in all four populations' questionnaires (see Appendices 3,4,5 and 6 for the four questionnaires). However, since the role of communication specialists in science communication is one of the main concepts, the questionnaire developed for communication specialists included all the questions, because all questions are applicable to them. The pilot test and subsequent changes to the original questionnaire are discussed in section 6.5.5.

- **Formulation of questions**

The questionnaires have been formally divided into different sections according to the concepts. The relationship between the general research aim, the six research objectives and the questions in the questionnaires is best illustrated by means of a table (Table 6.4). Since the questionnaire for communication specialists contained all questions asked to the other three populations as well, the table below refers to the questions in the communication specialists' questionnaire. Objective 6 relates to Phase 2 of the study, in other words the content analysis, and was therefore not included in the questionnaire.

**Table 6.4: Research objectives in relation to the general research aim and questions**

Research objectives	Questions
<b>General research aim:</b> To investigate the relationship between key role players in science communication and to determine the role of the key role players in science communication.	1-58
<b>Objective 1:</b> To determine the importance of science communication amongst key role players of science communication, (executive management, scientists, communication specialists) at HEI in South Africa, as well as journalists in the South African media.	1-16
<b>Objective 2:</b> To determine if a relationship of trust and mutual understanding exists between key role players in science communication in South Africa.	17-27
<b>Objective 3:</b> To determine if the role of communication specialists is a role of strategists, managers or technicians in the facilitation process in science communication at HEI in South Africa.	28-44
<b>Objective 4:</b> To determine the extent of training provided at universities and technikons in South Africa for scientists, communication specialists and journalists to enable them to write science articles.	45-50
<b>Objective 5:</b> To investigate the coverage of scientific topics in articles in the South African mass media.	51-58
<b>Objective 6:</b> To analyse the content of articles on science in selected South African media from 1 March to 31 May 2004 and to compare the results of this study with Van Rooyen's study conducted in 2002.	Content analysis

The questionnaires included questions based on the theoretical framework as well as on general demographic information. They were divided into six sections:

- Section A: The importance of science communication

- Section B: The relationship between key role players in science communication
- Section C: The role of communication specialists in science communication
- Section D: Training in science communication
- Section E: Coverage of scientific topics in the mass media
- Section F: Demographic information

In the next section there is a discussion of the abovementioned sections in the questionnaires. Since the communication specialists' questionnaire includes all the questions, it was decided to discuss only this questionnaire.

#### *Section A: The importance of science communication*

The first section of the questionnaire (Questions 1-7 in the version for executive management, Questions 1-16 for scientists and communication specialists, and Questions 1-6 for journalists) contains the main constructs or dimensions designed to measure the importance of science communication to the four target populations. In Chapters 2 and 3 the theory of mass communication, information theory and the stakeholder theory were applied respectively to describe the development and importance of science communication and awareness, understanding of and attitudes towards science communication. Questions 1-11 referred to the importance of science communication for HEI and asked in which science communication activities the institution was participating. The purpose of Questions 12-16 was to determine the relationship with internal and external stakeholders.

#### *Section B: The relationship between key role players in science communication*

Relationship (Questions 8-14 in the version for executive management, Questions 17-21 for scientists, Questions 17-24 for communication specialists and Questions 7-9 for journalists) involves the constructs of Concept 1 regarding relationships between key role players in science communication. In Chapters 1 and 5 the theory of relationships amongst key role players were described. The questions in Section B were asked to determine whether there was a relationship of trust (Question 17 to 24) and whether there was a measure of mutual understanding (Questions 23, 24 and 32-25) among key role players.

#### *Section C: The role of communication specialists in science communication*

Section C (Questions 15-31 in the version for executive management, Questions 24-27 for scientists and Questions 28-44 for communication specialists) tested the role of communication specialists in science communication at HEI, specifically whether they are regarded as strategists, managers or

technicians. The theory of excellence as described in Chapter 4 was applied to this section's questions. These questions were derived from Concept 2 – management of the role of communication specialists. The purpose of Questions 28-30, 37, 40-44 was to determine to what extent communication specialists assumed the roles of strategist, manager or technician, as described by Steyn and Puth (2000:20-21). It also included questions about trust and empowerment. To summarise the discussion in Chapter 4 very briefly, the role of *strategist* is to determine the consequences of an institution's strategies and policies on its relationships with various stakeholders. The information gathered serves as input into an institution's strategic decision-making process. The role of the *manager* involves the development of a corporate communication strategy (deciding what should be communicated to stakeholders), while the *technician* role involves the implementation of communication plans and campaigns. The reasoning behind the inclusion of these questions is that, if communication specialists do have an important position and role in a HEI, chances are that they would be actively involved in the institution's planning and implementation of science communication activities.

#### *Section D: Training in science communication*

Training in science communication writing is important for scientists, communication specialists and journalists to ensure understanding amongst them and to ensure that the correct science messages are conveyed to stakeholders. Questions 28-30 in the version for scientists, Questions 45-50 for communication specialists and Questions 13-14 in the journalists' version of the questionnaire are derived from Concept 1.

#### *Section E: Coverage of scientific topics in the mass media*

Objective 5 refers to the contact of HEI with the various media, as well as the amount of coverage the media allocate to scientific articles or news. Questions 31-33 in the version for scientists, Questions 56-58 for communication specialists and Questions 17-21 in the journalists' version of the questionnaire address the media contact, while Questions 51-57 for communication specialists and Questions 15, 16, 22 and 23 for the journalists address the amount of coverage.

#### *Section F: Demographic information*

The purpose of the demographic information is to record the employer's name and whether the respondent has received any training in science writing or science journalism. Furthermore, it was important to include the employer's name in order to enable the researcher to keep track of who has responded and who has not. The question regarding science writing training was included to determine

how many of the respondents had in fact received any training in science writing or science journalism, since training in science communication is extremely important for the improvement of scientific articles in the media.

### • Levels of measurement

Measurement in research consists of assigning numbers to empirical events in compliance with a set of rules (Malhotra, 1996:271, Cooper & Schindler, 2001:203, Du Plooy, 2001:117). In other words, by assigning numbers to variables, people can observe what is otherwise invisible. The levels of measurement reflect the correspondence numbers assigned to the observations in question and the meaningfulness of performing mathematical operations on the numbers assigned. There are four levels of measurement, namely nominal, ordinal, interval and ratio (Malhotra, 1996:271-275). One can distinguish between these levels according to four characteristics, namely classification, order, distance and origin (Cooper & Schindler, 2001:204-205).

- A nominal scale is a figurative labeling scheme in which the numbers serve only as labels or tags for identifying or classifying objects, such as classifying the respondent as a male or female.
- An ordinal scale is a ranking scale in which numbers are assigned to objects to indicate the relative extent to which the objects possess certain characteristics.
- On an interval scale, numerically equal distances on the scale represent equal values in the characteristic being measured.
- A ratio scale possesses all the properties of the nominal, ordinal and interval scales, and in addition, an absolute zero point.

This study used nominal and interval scales. The nominal scales served to identify and classify respondents, whereas the interval scales represented the values of the attitudes being measured. Scaling is considered an extension of measurement and is discussed below.

### • Scaling techniques

According to Cooper and Schindler (2001:229) there are three types of measurement scales, namely rating, ranking and categorisation scales. In itemised rating scales, respondents are provided with a scale that has a number of brief descriptions associated with each category. The Likert scale, which is an example of itemised rating scales, was employed in this study. As a general rule, researchers should use the scaling technique that would yield the highest level of information feasible in a given situation and permit using the greatest variety of statistical analysis. Likert scales are mainly used to

measure attitudes, and since this study aimed to measure the attitudes (or opinions) of the key role players in science communication, the main part of the questionnaire consisted of Likert scales. The Likert scale is a widely used rating scale that requires the respondents to indicate a degree of agreement or disagreement with each of a series of statements about the objects (Cooper & Schindler, 2001:234). Each scale item has five response categories, ranging from 'strongly disagree' to 'strongly agree'. Each response is given a numerical score to reflect its degree of attitude favourableness, and the scores may be totaled to measure the respondent's opinion or attitude (Jordaan, 2003:177). The Likert scale was used here because it has several advantages. Likert scales assist researchers to compare one respondent's scores with the distribution of scores from a well-defined group; it is easy to construct and administer, and respondents readily understand how to use the scale (Cooper & Schindler, 2001:234). The main disadvantage of the Likert scale is that it takes long to complete because respondents have to read each statement.

### 6.5.5 Pilot test

A pilot test of the questionnaire is conducted to detect weaknesses in research design and instrumentation (Cooper & Schindler, 2001:81). An important purpose of the pilot test is to discover the respondents' reactions to questions and it also helps to discover repetitiveness or redundancy.

A pilot test was conducted in December 2003. As a first phase, the communication specialists' questionnaire was submitted to two senior communication specialists, one at the University of Pretoria and one at Pretoria Technikon, to evaluate the content and format of the questionnaire. Minor changes were made to the wording of the questions. In one of the questions 'social and ethical' implications of science were grouped together. Based on the opinion of the two communication specialists, it was decided to rather divide the question into two separate units (see Questions 15 and 16 in the communication specialists' questionnaire – Appendix 5). As a result, various questions were renumbered.

As a second phase, all four questionnaires were submitted to a sample of three respondents per population, drawn from the identified sampling frame. The respondents were from the University of Pretoria, Pretoria Technikon, *Sunday Times* and *Beeld*. At least two respondents from each population responded and the following responses were received:

- The Likert scale-type questions were initially worded in the "we" statement format. An example is: "Our institution regards science communication as a high priority". The subject was

changed to “I”. For example: “In my opinion science communication is regarded as a high priority”.

- Some respondents indicated that there seemed to be repetition in the questions. When measuring opinions, researchers often ask several similar (but not the same) questions for the purpose of reliability. As a result of these comments, a decision was made to group similar questions together. Grouping questions that dealt with similar topics together eliminated the sense of repetition and seemed to create a more logical sequence for the respondents (Jordaan, 2003:192).
- Overall, the survey questions proved to be understandable and meaningful to the target population.

### 6.5.6 Phase 2: Content analysis

Content analysis looks at the characteristics of communication messages. The purpose is to learn something about the content and those who produced the messages. The eventual interest of the researcher might lie with the effects the content might have on receivers. Therefore, it is preferable to link content analysis with another method such as survey or experimental research to address such effects (Rubin *et al.*, 2000:200). According to Cooper and Schindler (2001:428), content analysis has been described as “... a research technique for the objective, systematic, and quantitative description of the manifest content of a communication”. Because this definition is sometimes confused with simply counting obvious message aspects such as words or attributes, more recent interpretations have broadened the definition to include latent as well as manifest content, the symbolic meaning of messages and qualitative analysis (Cooper & Schindler, 2001:429). However, since Phase 2 of this study attempts to identify large-scale patterns and trends in the South African media, and as it is useful to monitor the content of mass media communication, the content analysis is quantitative in nature (Reinard, 2001:169).

Content analysis is a multistage process. First, titles that need to be sampled are selected, for example television comedy programmes, or headings in the media. Secondly, a sample of dates is selected. Thirdly, the units of analysis are selected and these units are subsequently assigned to predetermined categories. The categories must be mutually exclusive (i.e. all categories must differ from one another) and exhaustive (i.e. all possible categories are included in the analysis). Lastly, comparisons are made of the different findings (Rubin *et al.*, 2000:200). As can be seen from the above, content analysis is a very systematic process (Cooper & Schindler, 2001:429; Rubin *et al.*, 2000:200).

Content analysis was conducted in this study to determine the amount of coverage of scientific topics in articles in the media over a period of three months. The reasoning behind the decision to conduct content analysis was twofold: First, the researcher wanted to determine whether scientific articles are considered a priority by the media and secondly, to make a comparison with Van Rooyen's study conducted in 2002. Van Rooyen (2002:21) invited researchers to repeat the study she conducted in 2002 at regular intervals. Therefore, based on the invitation by Van Rooyen, Phase 2 of this study was conducted, using the same criteria, method and time frame as Van Rooyen. Comparisons of results of the two studies are provided in Chapter 8.

As mentioned earlier, content analysis is a multistage process. Following below is a description of each of the steps of this process:

#### • Sampling techniques

##### • Select the titles

In this study 16 South African publications were monitored over a period of three months. South African regional and national print media titles, which reflect a geographical and cultural diversity in its target markets and which are produced by South African-based companies, were selected.

##### • Dates to sample

The dates sampled in this study covered a period of three months, from 1 March to 31 May 2004.

##### • Units of analysis and sampling frame

A description of unit of analysis was provided in Phase 1 of this study. For the purposes of Phase 2 the unit of analysis is scientific articles in the South African media.

##### • Categories

The various categories identified are mutually exclusive and exhaustive, and they are discussed under the data analysis. The sampling frame and sampling technique for Phase 2 of this study are discussed next.

##### • Sampling frame

According to Cooper and Schindler (2001:170) the sampling frame is closely related to the population. It is the list of elements from which the sample is actually drawn. The South African media were divided into three groups, namely daily newspapers such as *The Pretoria News*, *Die Beeld*, *Die Burger*, *Die Volksblad*, *Sowetan*, *This Day*, *The Mercury* and *Cape Argus*; weekly national newspapers



such as the *Mail & Guardian*, *Sunday Times* and *Rapport*, and five family magazines, including *Financial Mail*, *Finansies & Tegniek*, *De Kat*, *Huisgenoot* and *You*.

## Phase 2: Data collection

The daily newspapers were selected to cover all regions in South Africa, while the weekly newspapers were selected because they have the largest reader numbers. The family magazines were selected because they focus on the whole family, are not gender orientated and do not focus on a specific target audience, such as agriculture or wildlife. *Financial Mail* and its Afrikaans equivalent, *Finansies & Tegniek* were selected since they were included in the Van Rooyen study and because they might cover articles on mathematics and new technological developments. Mathematicians and information technologists are, however, not their specific target markets.

### • Sampling technique

As described in Phase 1 of the study, the choice of a specific sampling technique is guided by the research problem and objectives. For Phase 2 of the study, the research problem is to determine the coverage of scientific topics in articles in the media. The sampling technique for the content analysis is consistent with Babbie and Mouton's (2001:387) statement that in content analysis any of the conventional sampling techniques are applicable. Babbie and Mouton (2001:287), as well as Cooper and Schindler (2001:192) describe a non-probability sample that conforms to certain criteria or categories that are theoretically defined as purposive sampling. In Phase 2 of the study judgement sampling is used, since the sample selected conforms to some criterion. The criteria that articles had to meet for inclusion in this study are the following:

- Articles that dealt either directly with an issue of science and technology or with a broad issue for which scientists could provide perspective. Any report or feature that had science as a main theme, focus or subject, was included.
- No articles that dealt exclusively with political or social issues linked to a science topic were included. An example of this was the Nevirapine debate. The South African government's role in the provision of this medication to pregnant HIV-positive women via clinics and state hospitals was widely debated. Although the benefits and risks of the medication came into play, the debate was, to a large extent, of a political nature. Articles about Nevirapine were only included if they revolved around the scientific development of the medication (Van Rooyen, 2002:9).
- Articles concerned with the political debate over the legislation of any medication were excluded, except if it dealt prominently with the benefits or risks of the specific medication.

The data collection for Phase 2 of the study is discussed next.

### 6.5.7 Phase 2: Data collection

Data was collected over a three-month period from 1 March to 31 May 2004. The researcher monitored the selected articles in the publications on a weekly basis and compiled a Microsoft Excel spreadsheet. The articles were collected according to the broad spectrum of science categories described earlier and 80 articles qualified.

The overall amount of coverage of science and technology was calculated by counting the overall amount of editorial space in the selection of publications and dividing it by the 80 science and technology articles. Average values for editorial space were calculated by using the average number of articles that appeared in six randomly selected issues and multiplying this value by the number of publications studied. Letters from readers or promotional features were not included.

### 6.5.8 Phase 2: Data analysis

Information on the variables pertaining to the articles was captured in a Microsoft Excel file and a statistician extracted the data from this file to do the analysis by means of the SAS software package.

The first step in content analysis is to decide which units to use to analyse the articles. Different types of units can be used. *Syntactical* units are words, phrases, sentences or sections. Examples of *referential* units are objects, events or persons referred to in the text. *Propositional* units include questions, answers, statements, assertions or arguments, while *thematic* units are repeating patterns of ideas or issues (Cooper & Schindler, 2001:429). Various syntactical units were identified, after which these units were used to identify specific categories:

- Articles were classified according to the source. A distinction was made between articles written by local journalists and articles that were obtained from wire services or foreign publications.
- Articles were further classified as either 'new discoveries' or 'feature' articles. New discoveries were identified by their current value and the use of the inverted pyramid structure, where the 'who, what, where, when, why and how' aspects of the science article received prominence. Feature articles were recognised by their longer format that contained a more detailed analysis of the issue.
- The evaluative tone of the articles was measured by classifying the articles as either 'negative' (a discourse of criticism) or 'positive' (a discourse of promise). The articles were monitored for

their evaluative tone, since according to Bauer *et al.* (1995:32) it is often claimed that media coverage of science and technology is “unduly negative”.

- The use of visuals and infographics was also studied. Visuals indicated an article that had been complemented by one or more photographs or graphic images. The term ‘infographics’ refers to any article accompanied by visual displays with accompanying labels and text. Articles that include visuals or infographics normally receive more prominence. Infographics are also known to be an extremely effective way to package information in an easy-to-read format (Van Rooyen, 2002:10).
- According to Bauer *et al.* (1995:23), “... a specific claim which relates to the general charge of negativism within media science coverage concerns the discourse of risks and benefits”. Since the discourse of risks and benefits only applied to science and technology as such, the discourse of articles in this study was monitored according to a categorical scale. These categories included ‘only benefits’, ‘only risks’, ‘equal proportions of benefits and risks’ and ‘not in question’. The last category was included because many articles did not deal with the benefits or risks of science *per se*.
- The prominence of articles was measured by the position of the article in the publication. A simple coding system was used that differed for newspapers and magazines respectively. Articles that appeared earlier in a publication was considered to have greater prominence than articles that appeared in the latter part of a publication. The same coding system that Van Rooyen (2002:11) applied was used again: A (p. 1-3); B (p. 4-6); C (p. 7-9); D (p. 10+) and E (supplements) for newspapers, whereas the coding system for magazines was as follows: A (p. 1-10); B (p. 11-30); C (p. 31-50) and D (p. 50+). For this study the length of the articles was not taken into consideration.
- The weight of the scientific fields covered by the articles was measured according to 19 sub-categories. These sub-categories were defined by using various sources to compile the definitions (Van Rooyen, 2002:11). However, Van Rooyen had *Botany* as a separate category, but in this study it is accommodated under the sub-category of *Environment and Ecology*. A new sub-category, namely *Sport Science* is included in this study. The categories are listed below:
  - **Anthropology and Archaeology:** The study of man’s nature and development. The study of the buried remains of ancient times
  - **Astronomy:** The science of space, the sun, the moon and the stars
  - **Behaviour:** Facts and theories about human behaviour

- **Biomedicine:** The science of clinical medicine, biochemistry and basic biology (including botany)
- **Cell and Molecular Biology:** The science of the microcosmos, including living cells and their properties
- **Chemistry:** The study of the elements, compounds and the behaviour of substances
- **Computers:** The science and technological developments pertaining to computers
- **Earth Science:** A broad term, which includes geology (the study of rocks and minerals)
- **Environment and Ecology:** The study of the relation of plants, animals and people to one another and their surroundings
- **Food Science and Nutrition:** The science of food and how the body utilises food (including agriculture)
- **HIV/Aids:** Scientific developments in the understanding of HIV/Aids and the combating of the disease
- **Mathematics:** The science of numbers
- **Paleobiology:** The study of fossils
- **Physics:** The study of matter and natural forces
- **Pseudo science:** Assertions that are incapable of being tested or refuted by evidence (e.g. for the purpose of this study astrology columns were excluded)
- **Sport:** The science of the human body pertaining to enhancing quality in sport
- **Technology:** The study of scientific and industrial methods and their use in society and industry
- **Zoology:** The study of animals
- **General science:** Science discussed as a general topic

### 6.5.9 Coding in content analysis

Content analysis is essentially a coding operation. Communications – oral, written or other – are coded or classified according to some conceptual framework (Babbie & Mouton, 2001:388). The theoretical framework, on which the content analysis is based, was discussed in Chapter 5.

According to Babbie and Mouton (2001:390), the coding operation must be amenable to data processing when evaluating content analysis data quantitatively. Firstly, the end product of the coding must be numerical. If the frequency of certain words, phrases, or other manifest content is counted, then the coding will necessarily be numerical. Even if the researcher is coding latent content on the basis of overall judgements, it is necessary to represent the coding decision numerically. Secondly,

record keeping must distinguish clearly between the units of analysis and the units of observation, especially if the two are different. The initial coding must relate to the units of observation. If science writers are the units of analysis, for example, and the researcher wishes to characterise them through a content analysis of their scientific articles, the primary records would represent scientific articles. The researcher may then combine the scoring of individual scientific articles to characterise each science writer. Thirdly, when counting, it would normally be important to record the base from which the counting is done. The issue of observational base is most easily resolved if every observation is coded in terms of one of the attributes that make up a variable (Babbie & Mouton, 2001:390). See Appendix 7 that demonstrates the coding used in Phase 2 of this study.

#### 6.5.10 Strengths and weaknesses of content analysis

According to Babbie and Mouton (2001:390) the economy in terms of both time and money is probably the greatest advantage of content analysis. Furthermore, there is no requirement for a large research staff and no special equipment is required. Also important is that content analysis permits the researcher to study processes occurring over long periods of time. Finally, content analysis has the advantage of being unobtrusive, in other words, the content analyst seldom has any effect on the subject being studied.

Content analysis unfortunately has disadvantages as well. For instance, it is limited to the examination of recorded communications. Such communications may be oral, written or graphic, but they must be recorded in some fashion to permit analysis. Another problem that is common to content analysis is the valid measure of values in the coding. On the other hand, the concreteness of materials studied in the content analysis strengthens the likelihood of reliability. The researcher can always code and recode and even recode again to make certain that the coding is consistent (Babbie & Mouton, 2001:393).

#### 6.5.11 Phase 2: Reporting statistics

It is typical for content analysis to report tables of results. Simple descriptive statistics tell much about the results by means of these data (Reinard, 2001:172). In Phase 2 of the study, descriptive statistics (as discussed in Phase 1) are provided in table format, as well as in pie and bar charts. In addition to the frequency distributions, mean and standard deviation, cross-tabulation is also used in Phase 2 of the study.

Cross-tabulation is the technique used to analyse results by groups, categories, or classes (Zikmund, 2000:439). The purpose of cross-tabulation is to allow the inspection of differences between groups and to make comparisons. According to Cooper and Schindler (2001:554), nominal measures are used to assess the strength of relationships in cross-classification tables. They are often used together with chi-square or may be used separately.

Lastly, the results are compared with the Van Rooyen study conducted in 2002.

## 6.6 CONCLUSION

This chapter introduces the empirical component of the study. It has provided a description of the research strategy, design, methods and techniques used to obtain results. The two phases of the research methodology were discussed, namely Phase 1 in which the survey method was used and Phase 2 where content analysis applied. Both methods were linked to the concepts and constructs as described in Chapters 2 to 5.

Subsequently the development of the questionnaire as the measurement instrument for Phase 1 of the study, as well as the procedure for the content analysis in Phase 2 of the study was described, followed by a discussion of the statistical procedures and data analysis for both Phase 1 and Phase 2.

The findings pertaining to Phase 1 and Phase 2 of this study are reported in Chapter 7 and they are interpreted in Chapter 8.