Chapter 3
The general public's awareness and attitudes towards science

3.1 INTRODUCTION

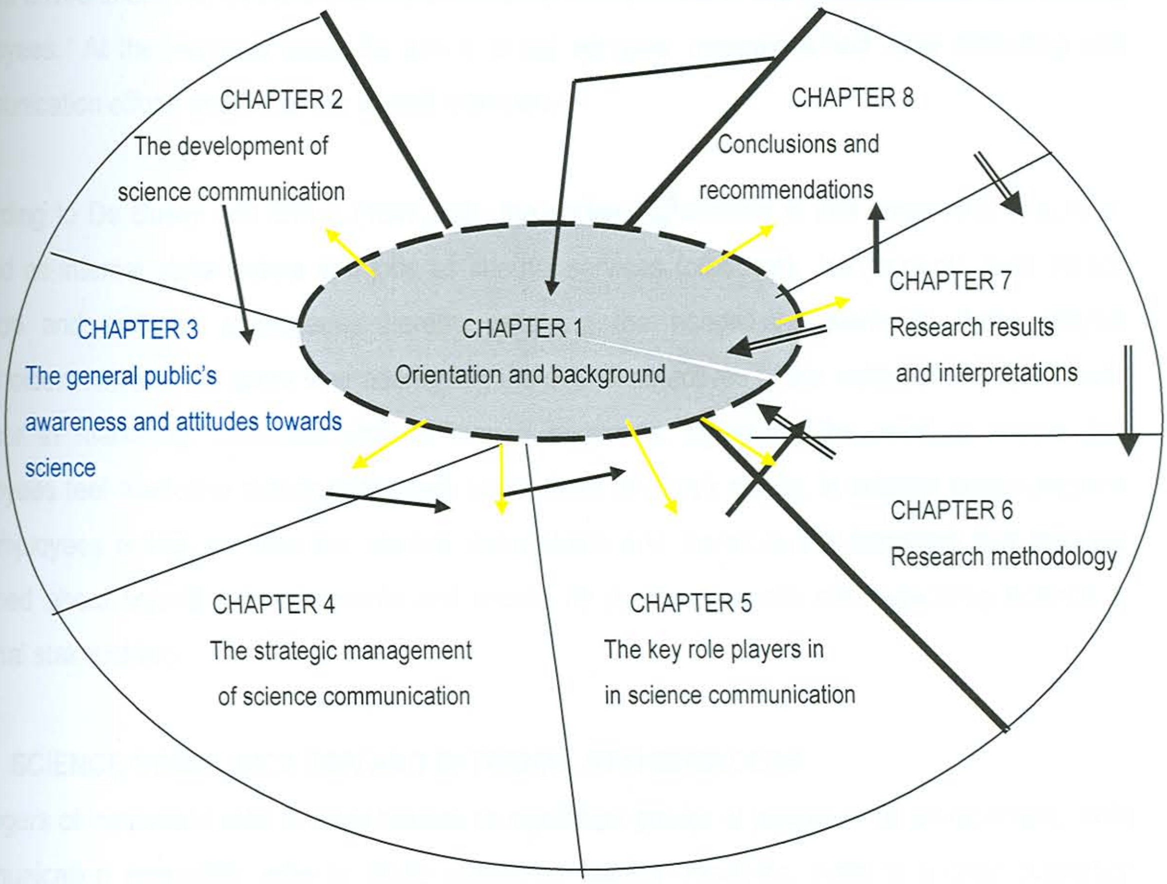
In Chapter 2 the information theory and mass communication theory were discussed and applied to the importance of science as information to be communicated to receivers by various communication mediums. Chapter 3 provides a broad overview of the general public's awareness and attitudes towards science. The stakeholder theory is discussed, since the stakeholders of HEI, including the general public, are the receivers of the message of science.

Science can be promoted and communicated by anyone in South Africa, but efforts at HEI, by the government and through media broadcasting and publishing will achieve very little if stakeholders' (especially the general public's) attitude towards science is not positive. Despite growing international awareness of the importance of public understanding of SET over the last two decades, there has been little agreement about the best methods to measure scientific literacy. Nationally representative surveys to gauge the public's understanding of science and their attitudes towards science have been undertaken in many developed countries. The value of using tried and tested instruments of this nature in developing countries can be contested. On the one hand, it is allowed to compare the profile of a developing country such as South Africa with other countries. On the other hand, there are invariably vast gaps in education levels between developing and developed countries, and many of the survey items used are pitched at a level that requires some familiarity with concepts normally learnt at secondary-school level in developed countries (Blankley & Arnold, 1999:2).

Given that science and technology policy falls within the realm of democratic policy formulation in most countries, including South Africa, citizens exercising their democratic rights and duties should be sufficiently knowledgeable about science matters to make informed judgements about major issues in science, engineering, health and technology. Moreover, the public should understand what it is buying with its multi-billion Rand investment of state funding in research and development. Civic scientific literacy has been defined as "... a level of understanding of scientific terms and constructs sufficient to read a daily newspaper or magazine and to understand the essence of competing arguments on a given dispute or controversy" (Blankley & Arnold, 1999:3).

This chapter investigates the research studies that have been performed on public attitudes towards this fenomena. The general public is a very important stakeholder of HEI and the stakeholder theory, on which the stakeholder relationship between the HEI and their stakeholders is based, is therefore discussed. But first, Figure 3.1 illustrates the location of Chapter 3 in relation to the other theoretical chapters. Chapter 2 provided theoretical perspectives on the development of science communication, but there is no sense in focusing on science communication if the attitude of stakeholders of HEI (the general public) is negative towards science. Chapter 3 therefore contains a discussion on the awareness of science, the results of previous studies to analyse attitudes towards science and the stakeholders who are the receivers of science communication.

Figure 3.1: Chapter 3 in relation to other theoretical chapters



3.2 SCIENCE COMMUNICATION AND INTERNAL STAKEHOLDERS

In terms of the stakeholder theory, there is no singular public; instead, there is layer upon layer of overlapping groups. These groups can be narrowed down, for example, into men and women, at home and at work, old and young, readers of particular magazines or newspapers, members of special interest or hobby groups, religious groups, political groups, or families. Such distinctions and groupings can also provide a means of reaching people, for example through talks or workshops at group meetings, articles in club newsletters, or hands-on displays at exhibitions, fairs and open days. People are defined as stakeholders when they are affected by decisions of an organisation or if their decisions affect the organisation. Stakeholders who are or become more aware and active can be described as publics (Steyn & Puth, 2000:64).

Steyn and Puth (2000:5) identify stakeholders as individuals or groups of individuals who are influenced by or who influence the organisation. These groups can be found inside an organisation (employees, unions, sub-groups such as gender, ethnic or age groups) or in the external environment. There can be little argument that employees are a key stakeholder group for any institution (De Bussy & Ewing, 1997:224). Gronroos (1990:34) distinguishes between the implementation of internal communication (marketing) at the strategic and technical level. At the strategic level it should create an internal environment that bolsters external stakeholder consciousness and service-mindedness among employees. At the technical level, the aim is to sell services, campaigns and other marketing and communication efforts and initiatives to staff members.

According to De Bussy and Ewing (1997:224), the underlying thinking is that employees should be viewed as internal stakeholders and jobs as internal services (products). Job products must attract, develop and motivate employees, thereby satisfying the needs and wants of these internal stakeholders while at the same time addressing the overall objectives of the institution. All specialists, whether in marketing, communication or human resources, agree on the need to ensure that employees feel executive management care about them and their needs. In science communication the employees at HEI are also the internal stakeholders and therefore it is important that they are informed about scientific developments and should be positive towards communicating science to external stakeholders.

3.3 SCIENCE COMMUNICATION AND EXTERNAL STAKEHOLDERS

Managers of institutions refer to stakeholders as significant groups of people in the environment, while communication specialists refer to these groups as publics. However, there is a clear distinction between these two concepts. According to Steyn and Puth (2000:199), publics form when stakeholders recognise the consequences of an institution's behaviour as a problem and organise to do something about it. The moment that a stakeholder group becomes aware of a potential problem caused by the behaviour of the institution, the stakeholder evolves into a public. Even groups of people never before recognised as stakeholders of the institution may form a public due to an issue in the macro environment. In this context, stakeholders and publics can be used synonymously. When Steyn and Puth (2000:196) outlined some of the stakeholder groups, the media were one of the groups that they identified. In this study, the media are the stakeholder group representing other external stakeholder groups of HEI.

The strategic-constituencies theories of organisational effectiveness explain why it is important for organisations to communicate messages, in this study specifically science, to their stakeholders. If the communication departments can identify the strategic publics (stakeholders) in the environment and manage the organisation's response to these interdependencies, these theories of effectiveness can assist to reduce uncertainty and conflict by stabilising relationships with key publics (Dozier, Grunig, Grunig, 1995:81).

Askew (1997:249) in his definition of the stakeholder theory, states that stakeholders have greater access to information and behaviour (and misbehaviour) of institutions. Institutions have become items of popular media content in a way they have never been in the past. As a result, stakeholders have become more knowing and even cynical about the strategies and tactics of HEI. At the same time, society at large has grown less deferential and less trusting of these institutions, which used to form its pillars. Whereas a stakeholder's assessment criteria of new products (new scientific developed products or technology) used to be limited to 'what can this product do for me?' and 'how much will it cost?' the questions that she/he is asking now include:

- Is this an institution whose values I share or respect?
- Do I want to be associated with them?
- Do they value my customs or are they taking me for granted?
- Can I trust them?

McDermott and Chan (1996) have a very simple message: stakeholder loyalty is obtained through trust, and institutions can only gain complete trust if they pay equal attention to all stakeholders. The flexible intelligent relationship management strategy (FIRMS) theory underwrites this message. The philosophical core of FIRMS is team work, based on principle-centred relationships of sincerity, integrity and trust. It therefore enables the enterprise (institution) to identify early on any deterioration in key relationships, and by acting quickly to avoid any adverse impact.

Communication professionals know that to be really effective they must know and understand the stakeholders, but many South African scientists and science communication specialists have yet to learn to meet their stakeholders halfway. Science communication is too often seen as a top-down flow from expert to ignoramus, with little regard for the requirements of those on the receiving end. The cultural and educational diversity of societies, however, requires one to replace this deficit model with a more participative approach in which mutual understanding is the ultimate goal. Scientists have to realise that they have to communicate with different audiences (stakeholders) for different reasons. Therefore, communication specialists in their capacity as facilitators should be acknowledged and included in situations where scientists are communicating with stakeholders. It is the role of communication specialists to ensure that scientists convey understandable and correct messages to stakeholders (Agunga, 1990:147). In Table 3.1 a selection of aims are lined up against four different types of audiences (stakeholders).

Table 3.1: Communicators' aims versus their audiences

AIMS OF COMMUNICATORS	AUDIENCE
Peer recognition Share concepts	Other scientists and the scientifically literate
Inform a policy issue Maintain funding levels Lobby	Decision makers Opinion formers
Create interest Demonstrate that funding is well-spent Whip up popular support for ideas Add to scientific literacy Convince audience scientists are normal people	The general public - adults
Create interest and educate Role of science in everyday life Encourage take-up of science Convince audience scientists are normal people	Children and young people

Source: National Environmental Research Council (2001)

The one mistake a scientist can make is to try and reach all these stakeholders with the same message in the same way. Different stakeholders need different approaches. In this regard, the role of communication specialists at HEI becomes very important. Communication specialists should be trusted and empowered with the correct training and expertise to assist scientists in compiling applicable material to present to the various stakeholders. However, if the public is not aware of science or has a negative attitude towards science, all efforts to promote science will be in vain. The next sections discuss these two issues.

3.4 PUBLIC AWARENESS OF SCIENCE

Currently the public school system fails to get people interested and maybe a bit excited about an intellectual process called science. But once their minds are ignited, people use their own initiative to look for more information. They can assess and judge the pros and cons of a particular research project, as well as its technological applications. These knowledge seekers might even get involved as active and concerned citizens in order to enhance, divert or even stop certain scientific developments (Goede, 2001:4).

Wynne (in Goede, 2001:4), the inventor of the deficit and democratic model of communication, argues that "... the communication from science to the public has been a one-way process in which scientists assumed that they could find answers say to the question of consequences of nuclear power or genetically modified (GM) agriculture, and then merely educate the public about the scientific determination of the issue". This in fact has provoked the crisis of lack of public confidence in science. He complains that scientists either do not know how to communicate or refuse to communicate their work, although many of them are funded by the public and accountable to it. According to Wynne (in Goede, 2001:5) "... recent experiments in public participation have falsified the idea that the public cannot be trusted to respond wisely". He refers to a citizens' jury conducted with poor and illiterate Indian farmers on the issue of GM crops in the state of Bangalore. The jury actually demonstrated a sophisticated knowledge of the way new types of crops can impact on their lives. They saw interlinkages that scientists often miss and proposed practical conditions for improving food security for their people (Goede, 2001:5).

A growing network of institutions and individuals is involved in raising the public awareness and understanding of science and technology. The South African Government's *White Paper on Science and Technology* (Department of Arts, Culture, Science and Technology, 1998) recognised the importance of network activities and this recognition was demonstrated by the science awareness campaign in 1998. More and more scientists become convinced of the merits of explaining their work to stakeholders. But indeed, the public's (stakeholders') attitude involves more than just understanding, and understanding is not the only term used in relation to public association. Leschner (2002:3) clarifies the terms used in communicating science as follows:

- Public understanding: getting the full detail

- Public appreciation: more than 'liking' the science
- Public awareness: around you
- Public participation: take part in activities to communicate science
- Public engagement: involvement with organising activities to enhance communication
- Public understanding of research: what research is about and how scientists perform their science. The nature of the evidence must be known. People must understand what a scientist is and does. They must know who to listen to, since science cannot advance in a vacuum.

In any successful relationship, all participants in the communication process are required to understand one another. In the science communication scenario, communication specialists have a valuable contribution to make in acting as gatekeepers to ensure that messages not prejudicial to HEI are conveyed to stakeholders.

3.5 A SCIENTIST'S UNDERSTANDING OF 'THE PUBLIC'

Most people will have had no formal science education since they were 16 years old. Their general impressions of science may stem from experiences at school, maybe long ago, and from the images reflected in the media, which might not always be positive experiences. It is important to realise that not being familiar with or fond of science does not mean that non-scientists are uninformed. Indeed, some non-scientists might know more about a particular subject than some science writers do. These groups of non-scientists may reflect the same range of perceptions and knowledge about science as they do about everything else. But although knowledge of straight scientific facts may be limited, there is no shortage of interest.

What scientists choose to communicate should depend entirely on the specific stakeholder. Unfortunately scientists do not always realise how important stakeholders are. Therefore, the role of communication specialists is to assist scientists by mediation, to convey the correct message to the right stakeholder by transforming scientific facts into simplified facts, which can be understood by the laymen. Some stakeholders, for example, might be hobby enthusiasts, computer buffs, gardeners or wind-surfers, and have considerable knowledge of their areas of special interest. However, they may not have thought of it in terms of science or technology before. It is important to address the needs and concerns of the stakeholder and not assume that they are responding to whatever is communicating. The content is just as important as the communication. On the downside, some individual scientists still think that popularising science in some way cheapens it and that their colleagues who take part in popularisation activities of science are neither serious nor committed.

Popularisation is not always given the credit it deserves, and some scientists are wary that communicating publicly may have damaging consequences for their careers or reputations (Stempra, 2001). Due to this apprehension from scientists about communicating science to the layman, it is also important to be aware of the attitudes of the general public who are the stakeholders of HEI and who receive the message of science.

Public awareness surveys show that stakeholders (general public) want to know more about scientific research and how it affects their lives. They are curious about what scientists' work tells them about their origins, behaviour, employment options, health and many other aspects of their well-being. Conversely, the public is rarely interested in the technical aspects of research. For that reason, when they are communicating their research to stakeholders, scientists must focus on the application of their research data as it relates to the daily lives of the general public. Applied research may lend itself more easily to this approach than theoretical research, since applied research can be seen in products that can be seen and touched. Nonetheless, all researchers, whatever their field should be able to express simple ideas about how science works and put research in a context that stakeholders understand (Stempra, 2001). To assist scientists to overcome the difficulty of expressing their scientific facts in laymen's language, communication specialists should act as facilitators to ensure that stakeholders receive the correct messages a scientist want to convey to stakeholders.

The next section displays results from two studies performed in the UK and Australia respectively and summarise briefly three other studies conducted in France, Brussels and Japan. However, these were not the only studies that were performed. Many related studies were done in various countries, but the results were inaccessible and are therefore not included in this study.

3.6 RESEARCH CONDUCTED ON PUBLIC ATTITUDES TOWARDS SCIENCE

3.6.1 Research study by the Wellcome Trust and Office of Science and Technology

The Wellcome Trust and the Office of Science and Technology (OST) believe that some scientific developments are so fundamental that there needs to be a public debate before politicians and scientists can make decisions about them. The Trust and the OST consequently sponsored two research projects in 2000: the one looked at existing science communication activities in the United Kingdom, the aims of these activities and their intended audiences. The second project explored public attitudes to science, engineering and technology in Britain (Office of Science and Technology and the Wellcome Trust, 2000).

The task team, which was identified by the OST, conducted interviews with sixteen convened groups to explore the public's attitudes towards science, engineering and technology. The groups were based on age, sex, social grade and area (demographical area). Participants talked about science, engineering and technology, and the relationship between them. Results of the group discussions indicated that attitudes towards science are defined (to some extent at least) by general attitudes towards life. The attitude statements can therefore be put into three broad groups:

- Statements designed to explore personal confidence in coping with change and new developments (attitude to life).
- Statements focused on perceived benefits of science, which seem to be strongly related to interest in science (attitude to science).
- Statements looking at trust in politicians and regulation (attitude to authority).

A national representative survey was also conducted by interviewing more than 1 200 people using a quota sample method - with quotas set on age, sex and social grade. Booster samples of 200 members of minority ethnic groups and of 400 in Scotland were also interviewed. Respondents were asked about their attitudes towards science, life and authority, and their leisure interests. Statistical analysis of the responses to the questions explored a number of cluster solutions: the six-attitudinal cluster solution provided the best fit with the data. Table 3.2 provides an overview of the results.

Table 3.2: Public's interest in topical issues regarding science

Subject	Very interested (%)	Moderately interested (%)	Not interested (%)
Health issues	52	39	9
New medical discoveries	46	41	13
Education	40	39	21
Environmental issues	36	47	17
Welfare and social exclusion	32	46	22
Sport	32	29	39
New inventions and technologies	24	50	26
New scientific discoveries	23	49	28
Economics	17	42	41
International affairs/foreign policy	16	46	38
Politics	15	40	45
Energy/nuclear power issues	13	36	51

Source: Office of Science and Technology and the Wellcome Trust (2000)

It was found that three-quarters of respondents were 'amazed' by the achievements of science. This is largely because they could see the benefits for themselves – two-thirds agreed that science and technology are making people's lives healthier, easier and more comfortable. Most respondents were at least moderately interested in health issues and new medical discoveries.

Only a fifth said that they were neither interested in science nor could see why they should be, and a partially overlapping fifth agreed that the achievements of science were overrated. Eight out of ten respondents agreed that Britain needed to develop science and technology in order to enhance its international competitiveness. The need to invest in basic research was also appreciated: Seventy-two per cent agreed that, even if it brought no immediate benefits, scientific research that advanced knowledge was necessary and should be supported by the government.

Concerns were raised over the use of science and the ability of society to control science. When asked whether they thought the benefits of science were greater than any harmful effects, the response was ambivalent: 43% agreed, 17% disagreed, and a third preferred to give no opinion. There is a similar degree of ambivalence about politicians' motives for supporting science. Just under half of the sample (43%) agreed that politicians support science for the good of the country; nearly a quarter expressed no opinion and another quarter disagreed. Government's ability to control science also raised concerns. Only three out of ten did not agree with the statement that the speed of development in science and technology meant that it could not be controlled properly by government, while four out of ten agreed, revealing some degree of ambivalence. Moreover, half (53%) of the respondents thought that the media swayed politicians and that they should take more of a lead.

There is also concern about what might go on 'behind closed doors' in research institutions. Over two-thirds agreed that rules were not going to stop researchers doing what they want behind closed doors and over half thought that scientists seem to be trying new things without stopping to think about the risks. Despite this concern, only 36% agreed that science was getting out of control and that nothing could be done to stop it.

In general, scientists are respected: 84% of the respondents were of the opinion that scientists and engineers make a valuable contribution to society, and three-quarters were of the opinion that science and engineering are good careers and that science, engineering and technology are providing more opportunities for the next generation. Two-thirds of the respondents agreed that scientists want to enhance the quality of life for the average person, while a similar proportion agreed that scientists should listen more to what non-scientists think.

3.6.2 Research conducted in Australia

In 1996 the Department of Industry, Science and Tourism in Australia published a document with background information on the public awareness of science and technology in Australia.

According to this publication, Australians have a high level of understanding of science concepts when compared with other nationalities. A comparative study conducted by the Bureau of Industry Economics in 1995 found that highly educated Australians are more aware of science concepts than highly educated Europeans.

Australians' understanding of science and technology is affected by their gender. Men have a slightly better understanding of most of the science areas tested, but women had a considerably better understanding of human biology. This reflects a more marked gender imbalance than is found in other nations. Middle-aged Australians have a greater understanding of science concepts than other age groups. For people less than 40 years of age, the older they are the better their understanding. For people over 40 years of age, the opposite is true: the younger the person, the better they understand science and technology. Education, however, has the greatest effect on an Australian's understanding of science. The higher the level of education, the better the person understands.

A 1991 study found that children in their final year of primary school (children around 10-12 years old) show varying levels of science understanding. A particular child could give advanced explanations for some common phenomena and at the same time show very basic, non-scientific understanding of other phenomena. A particular class could give excellent explanations for one phenomenon and poor explanations for others, showing the strong influence that teachings have on understanding. The children's skills at using scientific methods were as varied as their understanding of science. The students were good at measuring length, mass and temperature, as well as at classifying, but they did not do well in making inferences (Department of Industry, Science & Tourism, 1996).

Gender is a factor that affects a child's understanding of science phenomena. Boys outperformed girls in some areas, while girls outperformed boys in others. There was no difference in the level of science skill between the genders. The higher a child's socio-economic background, the better he or she performed. Children from homes where little English is spoken had lower levels of understanding and skill. Children in suburban schools have lower levels of science skill than children in urban and rural schools.

Gaps in science skill and knowledge are apparent in other segments of society. Most middle managers know very little about the process of research and development. Science and technology is the one area where business, government and union leaders know as little as workers. For people who have completed their education, most of their information on science and technology comes from the mass media and their understanding of it will be affected by the way in which it is presented by the mass media. A study of changes in science reporting since 1986 found that there was an increase in the coverage of science and technology. Most stories were on life science or medicine, and domination by these areas has increased. Coverage of astronomy, space and environmental science has dropped. Most stories were light, entertaining, and 'whiz-bang' style presentations of the products of research and ignored the process of research completely. The authors of the report on the study doubted that the increased coverage would raise the level of public understanding of science (Department of Industry, Science & Tourism, 1996).

3.6.3 Research conducted in various other countries

In a study conducted in France by the Centre National de la Recherche Française (CNRS) in 2001, results indicated that medical and environmental issues are regarded more important than other scientific fields. Participants in the study requested concrete evidence of science and indicated that a social need must be there, for example cell phones (De Cheveigne, 2002:14).

According to Claessens (2002:22), the European Commission published the results of a major survey on "Europeans, science and technology" in 2001. The survey offers a unique insight into how European citizens view science and technology. The results included the following:

- Two-thirds of participants in the survey agreed that they are badly informed on science and technology, although 45,3% declare that they are interested in science topics;
- science remains a very positive value in European societies – citizens expect a great deal from scientific progress and want political decisions to rely more on expert advice;
- the majority of Europeans call for more control of research activities, particularly in terms of stakeholder protection, employment and social issues, energy and science;
- although crises can strengthen the image and importance of research, scientists have an ambiguous image, especially as regards their assumed responsibility for the misuse of scientific discoveries by non-scientists;

- the survey also showed that, compared to 1992 when the previous survey was carried out, the level of Europeans' scientific literacy remained stable.

In 2001 the National Institute of Science and Technology Policy of the Japanese government also conducted a survey about public attitudes towards and understanding of science and technology. The results indicated that Japan's public understanding of basic sciences is relatively low compared to a significant number of European countries and the United States (Ishii, 2002:24).

3.7 RESEARCH ON PUBLIC ATTITUDES TOWARDS SCIENCE IN SOUTH AFRICA

3.7.1 Comparative research: Interests, public attitudes and sources of scientific information in South Africa

In South Africa a few studies were also conducted on the attitudes of the general public. The results of two previous studies are described below. The objectives of a survey conducted by Pouris (2001:1) were the following:

- To identify the level of interest of the public in selected issues;
- to examine the public attitudes towards science and technology;
- to analyse the sources of information used by citizens to improve and maintain their understanding of technological issues.

Pouris's study focused on a survey conducted among 1 000 households in the main South African metropolitan areas in 2000, namely Pretoria, East Rand, West Rand, Vaal, Port Elizabeth, Cape Town, Bloemfontein and Durban/Pietermaritzburg. A representative cluster sampling approach had been followed with face-to-face interviews. Apart from the questions relating to science and technology, information on the following had also been collected from the respondents: gender, age, household income, race, life stage, highest educational level achieved, highest educational level achieved in mathematics and science, home language and marital status (Pouris, 2001:2). Table 3.3 provides an indication of the percentage of respondents agreeing that they are 'very interested' in science and technology issues.

Table 3.3: Respondents agreeing that they are 'very interested 'in science and technology issues

Issue	Male	Female	Black	16-24 year old	TOTAL
Foreign policy	22%	13%	15%	13%	18%
New science discovery	39%	27%	34%	37%	33%
New technologies	48%	36%	47%	47%	42%
Space exploration	23%	13%	16%	25%	13%
Energy/Nuclear power	25%	16%	23%	27%	21%
Medical discoveries	57%	56%	61%	56%	57%
Environmental issues	52%	47%	51%	49%	49%
Economic policy	49%	38%	50%	40%	43%

Source: Pouris (2001:4)

The table indicates that the issues of highest interest were medical discoveries, environmental issues and new technologies. Women were less interested than men in all issues and the interest of respondents increased as their educational level in general and/or their level of science/mathematics education increased. Young respondents (16-24 years old) showed below average interest in economic and foreign policy, and above average interest in issues of science and technology.

Table 3.4 demonstrates the issue interest index scores for the European Union (EU), the United States (USA), Japan and South Africa (SA). Although the interests of South Africans appear to be within the boundaries of interests of the citizens of the industrialised world, they show less interest in space exploration, energy and foreign/international policy (Pouris, 2001:5).

Table 3.4: Issue interest index scores per country

Issue	EU (1992)	USA (1995)	Japan (1991)	SA (2000)
Foreign policy	61	67	50	56
New science discovery	59	66	53	63
New technologies	68	83	65	73
Space exploration	75	74	71	69
Energy/Nuclear power	-	50	45	35
Medical discoveries	-	54	59	38
Environmental issues	-	68	65	62
Economic policy	-	48	55	37

Source: Pouris (2001:5)

Linked to the issue of interest is the issue of informedness. Informedness denotes an individual's self-assessment of his or her level of understanding of a particular issue area (Pouris, 2001:5).

Table 3.5 illustrates that only 9% of the respondents agreed that they were 'very well informed' about space exploration, while 12% felt like this about foreign policy. Environmental issues fell on the other side of the scale, and 28% of respondents indicated that they were well informed on issues of environmental matters.

Young respondents indicated that, in their opinion, they were better informed than the average respondent, while fewer women than men considered themselves informed about issues. The level of informedness increased with the level of education and greater participation in science and mathematics education. When the gap between interest and informedness was examined, it was found that the largest gaps were in medical discoveries and new technologies. Similarly, the levels of self-reported understanding were significantly lower than the levels of interest in the same issues across all topics.

Table 3.5: Respondents agreeing that they are 'very well informed ' about issues

Issue	Male	Female	Black	16-24 year old	TOTAL
Foreign policy	17	7	14	13	12
New science discovery	20	10	16	20	15
New technologies	23	16	25	24	20
Space exploration	11	6	8	11	9
Energy/Nuclear power	15	11	15	21	13
Medical discoveries	27	25	29	32	26
Environmental issues	28	29	27	35	28
Economic policy	36	21	30	28	26

Source: Pouris (2001:6)

Further results indicated that South Africans believe strongly in the beneficial effects of science and technology. More than three quarters of the respondents agreed that science and technology contribute to an easier and more comfortable life; that scientists focus on the interests of the average person; that scientific work becomes more interesting; and that science and technology should create more opportunities for future generations (Pouris, 2001:6).

Respondents, however, expressed concerns and reservations about the adverse effects of science and technology. Fifty-eight per cent of the respondents felt that non-scientists depend too much on science and not enough on faith, and 69% agreed that science changes people's way of life too fast. According to Pouris (2001:6), these statements are probably the result and a reflection of a society experiencing a faster pace of social and economic change than earlier generations.

3.7.2 Public understanding of science in South Africa

In March 1999, a national survey that used items from international surveys as well as from locally developed items was commissioned by the Foundation for Research Development (FRD) and undertaken by the Human Research Council (HSRC) in South Africa. The sample population comprised 2 207 randomly selected adults distributed throughout South Africa. The data was weighted appropriately to match the demographics of the national adult population (Blankley & Arnold, 1999:1).

The survey produced some notable results, such as that over 30% of adults had never studied mathematics at school, 50% had never studied biological science, and 55% had never studied physical or chemical science. The low level of understanding of science in South Africa was revealed through an international 8-item index of promise and reservation about science.

At almost all levels, men had passed more science and mathematics courses than women. The gender differential was least pronounced in the biological sciences, with about 18% of both genders having passed matriculation biology and 4 to 5% of both genders having passed courses at higher level. In the case of physical and chemical science, the gender differential was most noticeable: over 17% of male respondents had passed the matriculation examination, compared to fewer than 11% of females. It is also worth noting that only 2% of women respondents had studied mathematics at higher level, compared with close to 6% of men (Blankley & Arnold, 1999:3).

Regarding respondents' attitude towards science, the following results were noticeable according to Blankley and Arnold (1999:6): 68% of respondents expressed the belief that science was changing people's way of life in an unacceptably fast manner. Perhaps this reflects the uncertainties of a population that has experienced enormous transformations (including political, social and technological changes) over the last decade.

At face value, as suggested by Blankley and Arnold (1999:7), it would appear that South Africans in general are highly optimistic about science. The levels of interest are also encouraging and suggest that public understanding of science interventions, if tackled with imagination, might find a receptive audience.

3.8 CONCLUSION

In Chapter 2 the information theory and mass communication theory were discussed as they form part of the links in the science communication chain. Chapter 3 described the stakeholder theory, which refers to the stakeholders of HEI and who are the receivers of the science communication. The stakeholders of HEI as receivers of the science message various from the media to the general public and are therefore important components in the theoretical framework of this study. How they perceive science communication and science as such, is thus important for the purpose of this study.

As can be seen from the results of studies conducted all over the world, the majority of non-scientists are interested in science. However, both uncertainty and a full understanding of science provide a barrier to the acceptance of new developments. In South Africa, specifically, public understanding of science interventions needs to take into consideration the general lack of scientific vocabulary or scientific constructs that forms the basis for the assimilation of scientific knowledge. Whatever means communicators and policy makers choose to promote the understanding of science among the general public, care and forethought are needed where levels of conceptual development regarding science appear to be extremely low.

In Chapter 3 the results pertaining to public attitudes in South Africa were positive towards science, engineering and technology. Yet, without the correct means to convey the message of science to the various stakeholders in South Africa, this message is doomed to failure.

Up to now science communication as information (information theory) that has to be communicated to stakeholders (stakeholder theory) through channels, such as mass communication (mass communication theory) was discussed. Communication specialists at HEI should have the imperative role of facilitator to play in the communication process. They are the spokespeople of HEI and should ensure that no messages that could be prejudicial to HEI are conveyed to stakeholders. However, to achieve science communication successfully and to equip communication specialists for their responsibility as facilitator, strategic communication planning is required. The theory and concept of strategic communication, as well as the importance thereof in science communication at HEI are discussed in detail in Chapter 4.