

MOTIVATIONAL FACTORS AFFECTING A STUDENT'S CHOICE BETWEEN
PRINT AND ON-LINE MODES OF DELIVERY IN DISTANCE EDUCATION

by

MARKO LABUSCHAGNE

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SUPERVISOR: PROF EO MASHILE

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Abstract

This study argues in favour of the distance education student as being a decision-maker and scrutinised his choice criteria against the 'open' education background. In particular, the study investigated the relative contribution of influential decision factors, as identified by previous research, in the choice students made when they chose between print-based and on-line modalities. A quantitative study, drawing data from 233 participants in two modules at the University of South Africa, was employed. The study showed that influential decision factors were transferable to a choice between printed or on-line instructional content, but their effects were less significant. Differences pertaining to previous experience with their delivery mode were apparent between students who selected the print-based option and students who selected the on-line option. The results also confirmed that of other research that a significant relationship exists between self-concept and optimal decision-making and self-concept and social environment.

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1 INTRODUCTION

The great aim of education is not knowledge, but action.

- H. Spencer (1820 – 1903)

1.1 INTRODUCTION

Distance education revolutionised the education industry. This is widely recognised by many different researchers of this phenomenon. Not only have economically diverse countries used it to instruct learners of all ages and backgrounds, but it also changed the face of education from a structured, traditional, classroom-based environment to an open learning system – a learning system that is not bound by the limitations of time, geographic boundaries or confined by traditional modes of delivering instructional material to its participants (Roberts, Brindley & Sponk, 1998). This last attribute of distance education formed the thesis of our study, namely the options that are available to students when selecting a specific mode of receiving his instructional material and more specifically, the motivation for selecting that particular modality.

This introductory chapter will orientate the reader to our research by providing a brief background sketching the theory of directly and tangentially related studies on delivery modes and decision theory, setting the stage for our problem statement. Once the research problem questions are articulated, we direct the reader's attention to the purpose of our research. This purpose is justified through a brief anecdote on why we surmise our study as significant based on the particular contributions this research will make towards education. We also comment on some of the anticipated limiting factors, which might influence validity and reliability.

The penultimate section describes the research design and methodology and finally, this chapter concludes with a brief synopsis of the content of each chapter contained in the dissertation.

1.2 BACKGROUND AND REVIEW OF RELATED LITERATURE

Despite the fact that the first e-mail message was sent back in 1962, it was not until after approximately 1980 that the way in which instructional material was delivered to students, changed (Syed, Baiocchi & Lasker, 1999). Before this date initial scepticism over the use of computer technology, partly because of a lack of knowledge over the potential applications of this device and secondly, limited access to computers in general,

resulted in the domination of a print-based mode of delivering material in distance education (Willis, 2002). It stands without reason that students did not have a great deal of choice in personalising their distance education experience. However, in the early eighties, educators realised the potential of utilising technology and generated new modes of delivering study material that allowed students to choose a preferred mode of accessing their course material (Syed *Et al.*, 1999).

A preliminary review of the literature indicated that the modes in which course material is delivered can be grouped into two categories. The first mode, normally referred to as the 'traditional' method, includes audio, video and print-based methods of delivery. Opposing these methods is the more information technology orientated means of the Internet and CD-ROM modes of delivery (Willis, 2002 and Roberts *Et al.*, 1998).

The outcome of studies conducted by the Human Resources Development of Canada (a branch of the Canadian Government specifically responsible for research into human resources development) correspond with other researchers that "*if used appropriately, technologies ranging from print to computers can be just as effective as classroom learning*" (Roberts *Et al.*, 1998). Yet, the reasons why students prefer one mode of delivery above the other, remains a topic open for debate.

The question arose as to the motivational factors that affect a student's choice when choosing between print-based and on-line delivery of learning material. Limited research material exists as to what factors affect a student's choice in this regard. Van den Aardweg and Van den Aardweg (1998: 37) describe choice in broad terms when they say "*the moment of choice is usually characterised by conflict*". In resolving this conflict, the learner's experience, attitude, values, norms and knowledge will come into play in the making of the final decision.

Kozielecki (1981) gives an in-depth account of the psychology involved in the decision-making process. According to Kozielecki (1981: 22), "*man as a decision-making system displays a set of relatively stable 'mental traits' which make up his personality structure*". Kozielecki is of the opinion that, as a decision-maker, man displays a certain number of mental characteristics which all play an important role in the process of choosing between various alternatives. These characteristics can be divided into two classes: invariant properties and variant properties. Edwards and Tversky (1967: 65-77) describe the invariant features as "*stable traits*", which are present in every decision-maker and affects the handling of any kind of decision task. The variant properties are the

individual personality differences that only affect the handling of certain decision-making tasks.

However, the process of making a choice was not the aim of this study. The factors that contributed to the specific choice made were the focus. Therefore, all factors in the human environment, personality and social group influences were taken into account in solving the initial problem that we state in more specific terms in the next section.

1.3 PROBLEM STATEMENT

This study investigated and assessed the motivational factors affecting a student's choice between print-based or on-line delivery modes of instructional material, within the context of distance education. In particular, this study looked at what choice students had in the past and how their choice alternatives changed with the development of new technology. In addition, favoured modes of delivery, as chosen by students, were assessed. Finally, this study dealt with determining the influential factors that affected a student's choice to prefer one mode of delivery above another.

The following articulate the specific research questions that was investigated:

1. What characteristic attributes of distance education distinguish this mode from its traditional 'classroom' variant?
2. What constitutes the choice alternatives of the distance education student?
 - 2.1 How are delivery modes different from technology tools?
 - 2.2 What is the difference between print-based and on-line delivery modes?
3. How do the social and physical decision environments of the distance education student differ from the traditional student?
4. What process is attributed to the making of choices?
 - 4.1 How is choice related to the process of decision-making?
 - 4.2 What is the relationship between the motivational decision factors and optimal decision-making?
5. Which motivational or decision factors describe a positive or negative choice preference towards either print or on-line modalities?

- 5.1 Which of the factors identified above will significantly distinguish between the sample means of print-based students and on-line students?
- 5.2 What is the relative contribution of each factor to a particular choice preference?
- 5.3 Do our data support previous research that a relationship exists between optimal decision-making and personality traits?

1.4 AIM OF THE STUDY

This study aimed at providing insight into the complexity of the motivational factors that plays a part in making a decision, specifically with regard to the selection of an appropriate means of instructional medium that optimises a student's learning experience and experience of success. In addition, the study sheds some light on the choices that are currently available in distance education with regard to instructional material and why some modes are more desirable than others.

1.5 MOTIVATING THE RESEARCH

1.5.1 THE IMPORTANCE OF THE STUDY

Was there a need for such a study? Yes. Since so little is known about the topic, the choice students make may undermine the successful learning engagement between student and content that is so critical for effective learning (Vrey, 1991). In order to increase access by learners to higher quality instructional material, an expanding array of delivery modes must be employed. However, the focus of research needs to change to the learner who utilises the tools, instead of concentrating on the tool itself. Only an understanding of *how* and *why* students utilise a specific tool will help researchers to develop better and user-friendlier modes of delivering course material.

1.5.2 CONTRIBUTION OF THE STUDY TO EDUCATION

This study sheds some light on the factors that affect a student's choice in selecting a mode of delivery for course material. Understanding the preferences of learners may assist in future research aimed at resolving limitations to the variety of students who may be served through the use of on-line delivery systems. Assessing the choices of students may reveal weaknesses of certain delivery tools, making these less desirable to students. These weaknesses must be addressed in future studies in order to ultimately provide

instructional material that truly extends over any boundaries of time, spatial limitations and obstacles challenging students who study over a distance.

This study indicates how course developers and curriculum planners can include the necessary support services for open and distance education students. Some students lack confidence in their ability as learners, while many adults experience anxiety about a degree program that is unconventional in its delivery or their lack of being accustomed to reading, writing and using study skills. This study provides valuable contributions that may lead to the improvement of student services or correspondence via audio cassettes, telephone or face-to-face meetings by showing which media tools students prefer, are comfortable with in using and have confidence in the results it delivers.

1.5.3 EXPECTED RESULTS

The results of this study include:

- a descriptive account of the delivery modes that were offered to students in the past, changes that took place and new developments in the technology that broaden the choices of modern distance education students;
- a comparison of delivery modes offered at various distance education centres, and
- an analyses and evaluative reflection on the motivational factors that influence a student's choice when making a decision between print and on-line delivery modes.

1.6 RESEARCH DESIGN AND METHODOLOGY

This research employed a combination of the document analysis, historical study and survey study. At the base of this research, the researcher acted as the key instrument in conducting an inquiry process that was aimed at building a holistic understanding of the problem set earlier (Best, 1981).

Data was collected by an in-depth review of selected literature relevant to solving the problem of student preference in selecting an appropriate delivery mode. In addition to this literature review, a questionnaire according to the guidelines of Anderson (1990) and other prominent researchers collected data regarding factors affecting student choice.

Finally, the data was analysed with the view of addressing the research questions of the study. A more comprehensive description of the empirical investigation is provided in chapter 6.

1.6.1 METHODOLOGY

The first part of the research project comprised of two activities: reviewing literature relevant to the set problem and designing a functional questionnaire that would effectively assess factors affecting student choice.

Data was collected by reviewing texts, documents and artefact collections that included written materials, films, photographs and the like. Permission was requested from various distance education institutions to access relevant databases with the aim of acquiring information on courses and modes of delivery utilised in those courses.

An important facet of the inquiry phase was the anticipated questionnaire to assess various aspects influential to making a choice between print or on-line delivery modes. Questionnaires were administered to targeted sample participants in accordance with electronic addresses obtained from educational institutions.

1.7 OVERVIEW OF CHAPTERS IN THIS DISSERTATION

Chapter 2 investigated the context in which the distance education student ultimately practices a choice. This context is presented in a format that separates the international scene of distance education from the specific experience of a South African distance education student. After defining the concept of distance education, this format of study is contrasted to that of traditional education.

As the decision to choose between delivery modes was central to our research problem, chapter 3 orientates the reader on the various modes that currently serves as decision alternatives. From this chapter, the reader will find that each mode and delivery tool presents its own advantages and possible challenges that might influence the decision of the distance education student.

It is, however, not only the delivery modes that influence the decision habit of students. The specific characteristics that separate the distance education student from his traditional counterpart also proved to be very influential. Chapter 4 investigated the decision environment of the distance education student and attempted to isolate the conflict experienced in this environment that eventually institutes a decision. In this chapter, we

also searched for an answer to the difficult question: who is an optimal distance education decision-maker.

It is impossible to make inferences about influential decision factors that affect choice without comprehension of the decision-making process, as this process in itself exerts influential pressure. Chapter 5 aimed at illuminating this decision process and distinguished between the different decision types and conflicts that confronts the distance education student. This chapter also ventured into a discussion on the decision needs and personality traits that have proved to govern the decision habits of individuals.

Chapter 6 explains the research method that surveyed the sample population. We described the research design and sampling procedures as well as the experimental treatment, procedures and measures regarding the questionnaire. After a brief orientation on the validity and reliability of the questionnaire, a separate section was devoted to the research findings and the general procedures for processing and analysing the research data.

This research dissertation culminates in chapter 7. This chapter identifies and interprets the important statistical results and pronounces the implications of our findings. In addition to summarising the research that was undertaken, this chapter also reflects on possibilities for further research.

2 DISTANCE EDUCATION

It is no longer our resources that limit our decisions; it's our decisions that limit our resources.

- U. Thant (1909 – 1974)

2.1 INTRODUCTION

It is within the context of distance education that the student acts as a learner faced with the challenge of selecting a suitable mode of instructional material. Any study regarding the student's decision-making, without reference to the domain in which the student decides, defeats the purpose.

However, a detailed account of the distance education phenomenon is not the focus of this study and, therefore, reference will only be made of certain attributes of distance education. The researcher will initially try to establish a suitable definition for distance education, which will be followed by a short account on its history and evolution since it started about 150 years ago. It was also important to note how distance education, as a widely recognised learning system, relates to the heavily researched traditional system of 'face-to-face' or 'classroom' teaching. In addition, the researcher deems it necessary to portray the role that distance education has to play in modern education in order to remain an active alternative to traditional methods.

2.2 TOWARDS A DEFINITION OF DISTANCE EDUCATION

Defining distance education has proved no mean feat and depending on what your particular focus of distance education is, you can formulate any number of descriptive statements which all only partially succeed in describing the crux of this phenomenon. Literature indicates a vast array of concepts relating to distance education, but as Keegan (1996) correctly indicates, these have often been used out of context. These concepts include correspondence study, home study, external studies, independent studies, learning at a distance and many more. The problem of defining distance education, however, pertains to the many different faces of this phenomenon: is distance education correspondence study at a conventional institution or correspondence study at an Open University? Is distance education merely home study of educational course material or independent study where the student sometimes or never sees the teacher/lecturer? Are all of these the same method of study?

Due to the magnitude of terminology that exists to describe distance education, all of these concepts, for the sake of this study, will be referred to as distance education. In this context, distance education is a learning situation in which the student and the teacher/lecturer are separated at the time learning or instruction takes place. If separation then was the main criterion, it becomes easier to define the concept.

Definitions relating to separation can be organised in two groups, namely pre-1980 and post-1980 descriptions, which focuses on different aspects of the distance education phenomenon. In 1967, Dohmen defined distance education as:

A systematically organised form of self-study in which student counselling, the presentation of learning material and the securing and supervising of students' success is carried out by a team of teachers, each of whom has responsibilities. It is made possible at a distance by means of media, which can cover long distances. The opposite of 'distance education' was 'direct education' or 'face-to-face education': a type of education that takes place with direct contact between lecturers and students (Keegan, 1996).

This definition is very much similar to the 1973 version of Peters (1991: 206) which states:

Distance teaching/education is a method of imparting knowledge, skills and attitudes which is rationalized by the application of division of labour and organizational principles as well as by the extensive use of technical media, especially for the purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialized form of teaching and learning.

Holmberg (1977: 9) wrote:

The term 'distance education' covers the various forms of study at all levels which are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which, nevertheless, benefits from planning, guidance and tuition of a tutorial organisation.

Despite their different approaches to distance education, an analysis of these definitions indicated the following common elements. Firstly, there is a separation of the learner and the teacher. This separation was fundamental to all forms of distance education. Secondly, the structuring of learning material and the linking of these to learning by the student through an educational organisation, differentiates distance education from private study, mere learning from interesting books or cultural television programmes (Keegan, 1996).

Opposing these pre-1980 definitions, are modern descriptions that focus more on the technology involved in mediating the separation between student and teacher. Garrison and Shale (1987: 11) describe distance education as follows:

Distance education implies that the majority of educational communication between (among) teacher and student(s) occurs noncontiguously. It must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the educational process. It uses technology to mediate the necessary two-way communication.

Supporting them is Barker and his supporters who wrote more about the involvement of the new telecommunication technologies when they said that:

Telecommunications-based distance education approaches are an extension beyond the limits of correspondence study. The teaching-learning experience for both instructor and student(s) occurs simultaneously – it is contiguous in time. When an audio and/or video communication link is employed, the opportunity for live teacher-student exchanges in real time is possible, thereby permitting immediate response to student inquiries and comments. Much like a traditional classroom setting, students can seek on-the-spot clarification from the speaker (Barker, Frisbie & Patrick, 1989: 25).

In the same light, Moore defined distance education in 1990 as “*all arrangements for providing instruction through print or electronic communications media to persons engaged in planned learning in a place or time different from that of the instructor or instructors*” (Keegan, 1996: 43). Portway and Lane (1994: 195) portrayed much the same opinion when they argued that distance education is:

Teaching and learning situations in which the instructor and learner or learners are geographically separated, and therefore, rely on electronic devices and print materials for instructional delivery. Distance education includes distance teaching – the instructor's role in the process – and distance learning – the student's role in the process.

In synthesising all of these definitions, we were able to write down the attributes of distance education which is often better than to generate a descriptive statement, for in doing this, one can be prone to disregard some of the important aspects of the system as a whole. Despite falling into the trap described in the foregoing statement, we will attempt to combine all of the above-mentioned definitions. Six common elements to all of these definitions can be highlighted which, when combined, forms a fairly elaborate description that reads as follows:

Distance education is a universal phenomenon characterised by the separation of the human components in the learning situation in which technical media serves as primary communication with the possibility of occasional meetings to address didactic and socialisation requirements. The education is influenced by an educational organisation and participation in an industrialised form of education that separates distance education from other participants to the education spectrum (Keegan, 1996: 8-21).

Now that the context within which the student eventually practices a choice has been described, it becomes necessary to look at the evolution of distance education as it has developed since 1900. The next section provides a brief account on the history of distance education and the role technology played in this evolution.

2.3 A BRIEF HISTORY

It was necessary to study the history and evolution of distance education as many of the problems that face modern education have long past been faced and conquered by distance education. Also, a study into distance education's history will reveal the choice students had in the past. This will set the stage for the discussion in the next chapter which will in more detail look at the different alternatives regarding delivery modes students could choose from in the past and how their choice between alternatives has grown or shrunk in modern times.

This summary will show that the growth of distance education has not been without difficulty and that its historical development was not limited to a single path. As delivery modes are central to the focus of this study, a careful analysis of how technology's development relates to the changing character of distance education is provided.

The first part of our discussion presents an international perspective on the evolution of distance education. The second part concentrates on South Africa's experience regarding distance education. This account briefly refers to the political scene within which distance education has evolved. We also look at the current provision of distance education and provide a brief synopsis on each of the key distance education institutions. Reference is made to recent developments regarding mergers and moratoriums imposed by the Minister of Education. We conclude this section by looking at future prospects for distance education in the country as envisioned by the Council of Higher Education.

2.3.1 AN INTERNATIONAL PERSPECTIVE

Despite a long history spanning more than 30 decades, the change in the quality, quantity, status and influence of distance education only occurred after 1970 (Keegan, 1996). Before 1970, this form of education mainly took the form of correspondence study of which the first records can be traced back to the 1700's, with China being the greatest contributor (Jeffries, 2002). Due to the lack of technological innovation, this correspondence does not relate to modern technology-based education that mainly has its origin as a result of the Industrial Revolution during the 17th and 18th centuries. It was innovations in the Industrial Revolution that paved the way for distance education through advancements in the fields of transportation and communication.

Although there are relatively few records of distance education before 1900, all evidence indicates that the United Kingdom, United States of America, France and China were the primary contenders in this form of education. Traditional schools experienced difficulties in accommodating the large interest in education. These problems resulted from a lack of funding for building large schools, changes in political and developmental priorities and lack of sufficient infrastructures. These difficulties were not only experienced by the countries mentioned earlier, but affected developed and developing countries alike on both sides of the equator by the turn of the previous century. As a result of these limiting factors, distance education mainly took the form of home study and external studies (Keegan, 1996 and Wedemeyer, 1973). These factors, however, did not

prevent the United Kingdom to educate in excess of 500 000 students by 1850 in this fashion (Keegan, 1996).

The first technology-based distance education might be linked to the introduction of the audio-visual devices into schools in the early 1900's (Jeffries, 2002). This instructional media was utilised in extension programs, which by 1920 incorporated the use of slides and motion pictures.

Instructional radio had its first run in the 1930's, but did not prove successful. It was primarily in the United Kingdom Polytechnics, but this media never enjoyed the same foothold in the minds of educators as the television, which, according to several researchers, was truly the innovation in distance education that made it an alternative to reckon with (Minoli, 1996).

The television was introduced to distance education already in 1932, but its extensive use was initially halted by the outbreak of the second World War (Rumble, 1992 and Jeffries, 2000). In addition, because of the timeframe portrayed against a war background, the first implementation of the television pertained to the education of armed forces personnel, government departments and religious faculties (Rumble, 1992).

In 1939, France took the distance education spotlight with the launch of the Centre National d' Enseignement par Correspondence, which had the initial goal of providing education for displaced school children after the French Invasion of the 1460's (Keegan, 1996). Yet the growing stature of the Centre National d' Enseignement par Correspondence never seized and it remained a contender until today, with the only notable difference a change of name to Centre National d' Enseignement a' Distance (Jeffries, 2002).

By 1948, five United States educational institutions were involved in television education which, in contrast to the United Kingdom, related more to synchronous technologies. Although initial growth was slow, seventeen programs used television in their instructional materials by the late 1950's and by 1961, 53 stations were affiliated with the National Educational Television Network. The television also proved a hit in China's educational system at this time, but due to the Cultural Revolution that plagued this country from 1966 to 1976, its impact subsided until 1979 when its implementation picked up some momentum (Coye & Livingston, 1979).

It was not until the late 1960's and early 1970's that microwave technology made its appearance. This innovation posed several advantages, making it more desirable than

the television (Mackenzie & Christensen, 1971). These advantages were primarily related to a marked reduction in cost and as a result, telecommunications accounted for more than 80 percent of off-campus and 10 to 20 percent of on-campus instruction by the year 2000 (Jeffries, 2002). Universities began to set up microwave networks, taking advantage of the instructional television fixed service – a band of 20 microwave-based, high-frequency television channels licensed through the Federal Communications Commission by local credit granting educational institutions - which was authorised by the Federal Communications Commission. Through this innovation, the Federal Communications Commission prompted a great number of educational institutions to utilise instructional television fixed service technology, thus reaching regional campuses and other universities and in doing so, truly made distance education students part of the extended classroom (Syed *Et al.*, 1999).

In 1971, Intel Corp. developed the first microprocessor (a central processing unit implemented on a single chip). During the same year, the first e-mail message (transmission of messages from one computer user to another) was sent. These innovations set the stage for an impressive contribution by the microcomputer to the delivery of distance education. Critics to the distance education field felt that the personal computer and the Internet reinvented the face of education and how students learn at a distance. Technological advancements to the microcomputer led to the establishment of the first computer bulletin board system in 1978.

In the early 1980's, broadcast television changed with the advent of satellite and cable programming services. In 1981, the United States Public Broadcasting Service established a programming service devoted to national delivery of educational programs known as the Adult Learning Service. This service co-ordinates over a 190 public television stations and some 2000 colleges to deliver tele-courses for college credits. Beginning with only a small portfolio of seven tele-courses, the catalogue has grown to over 100 courses with an annual enrolment reaching over 500 000 students. By 1982, the United States National University Tele-conferencing Network used satellite broadcasting among forty of its institution members. Two years later, in 1984, the New Jersey Institute of Technology delivered the first on-line undergraduate course. In 1989, the University of Phoenix and Connect-Ed presented the first on-line degree programs.

The World Wide Web or WWW (a global, networked system that serves data images, documents, multimedia, via the Internet) was developed in 1991, courtesy of Tim

Berners-Lee (Jeffries, 2002). The World Wide Web is often incorrectly referred to as the Internet, which is a global information network connecting millions of computers. The development of the World Wide Web was followed in 1997 by the establishment of the California Virtual University, a consortium of nearly 100 California colleges and universities delivering over 1500 on-line courses. A virtual university can be defined as “*A higher education institution that has no physical classrooms. Instruction at a virtual university is delivered to students at-a-distance*” (A Brief History, 2001). Two years later, during 1999, the education landscape saw the emergence of several learning portals, including HungryMinds, Click2Learn and eCollege, all utilising the Internet for delivery of their instructional content (A Brief History, 2001).

It is safe to say that the era between 1990 and 2000 already saw the next generation of distance education technologies, namely digital (an electrical signal that varies in discrete steps in voltage, frequency, amplitude, locations, etc. which can be transmitted more accurately and faster than analog signals) education (A Brief History, 2001). With the speed at which the technology is advancing and the abundance of personal computers and Web technologies, people have already begun to embrace distance learning in a digital world. In addition to print materials, audio/video programs and satellite broadcasts, Internet and CD-ROM delivery was considered by many researchers to become the largest mediums for distance education. Post-secondary institutions were continuously planning to increase the delivery of distance education. In their quest, they used a variety of media and it is no surprise that the Internet, interactive video and pre-recorded video delivery were among the chosen favourites (National Centre for Education Statistics, 1999).

By providing instruction via the World Wide Web or on a CD-ROM/Internet hybrid, even business travellers or students in isolated areas can enjoy virtual classrooms, irrespective of their location or time zone. In addition, the introduction of affordable digital communications and cellular handheld devices changed the education scene to the extent that our world now has an abundance of distance learning opportunities for anyone, at any time anywhere in the world. Combining these new technologies like animations and streaming video with older (relatively speaking) on-line media such as e-mail, Listserve (an automatic mailing list server application) and chat rooms, a distance education instructor can build a successfully interactive course. A student in such a course would have options for both synchronous (at the same time) and asynchronous (not simultaneous) learning environments.

One only has to look at an approximate indication of the numbers of students involved in distance education to realise that this system's magnitude is a force that will remain in contention in the education paradigm for yet a long time to come. By 1990, The United States of America enrolled in excess of five million students in distance education. In 2000, this figure grew to over eight million students who studied through Open learning systems such as America On-line (AOL), World Classroom and the International Telecommunications Network (Keegan, 1996).

In 1995, China educated more than 800 000 through its Open University, with an additional one million students through correspondence and self-study. By 1995, the east's largest Open University (DIANDA) educated students from 43 countries.

Europe's Open Universities contributed 366 200 distance education graduates by 1995, plus an additional 130 000 that studied distance education courses in conventional universities. By 2000, twelve of the European Union member countries educated 250 000 students via this mode (Keegan, 1996).

This account regarding the international history of distance education showed that the evolution of learning and teaching at distance was not without drawbacks. Yet, its success far outweighs its initial limiting factors, which mainly related to innovations in transport and communications not yet realised at that time. In addition, the history of distance education has paved the way for what many researchers refer to as the 'largest kept secret' for addressing education's continuous confrontation, namely the provision of quality education to all of society in the most cost effective way possible.

What does the future hold? We can only guess, but rest assured that, as long as people want education and employees need training, distance learning will be a healthy and vibrant alternative to traditional classroom instruction.

2.3.2 A SOUTH AFRICAN PERSPECTIVE

Seen against the backdrop of a difficult and repressive history, the challenges that impeded the evolution of distance education in South Africa were by no means insignificant (Bosman & Frost, 2002). Colonialism, racism, apartheid, sexism and repression have dominated South Africa's history. Yet, distance education in this country rose to the occasion to the extent that today the largest distance education student body in the world is part of UNISA, the University of South Africa, with more than 200,000 people enrolled world-wide.

During the initial stages of the 19th century, the British Administration of the Cape Province in South Africa were content to leave education to private institutions, mostly consisting of nurseries and churches serving different racial and ethnic communities, supplemented by government grants. Despite these grants, only a few of the better colleges could extend education beyond secondary level. The best known of these colleges were the South African College of Cape Town, which was established in 1829 for the English-speaking community and the Victoria College for the Afrikaans speaking community.

The first major government initiative in tertiary education in South Africa came only in 1858 when the Board of Public Examinations in Literature and Science was established with the goal of examining candidates seeking civil service employment. In 1873, this Board was replaced by the University of the Cape of Good Hope - an examining body with no teaching facilities. This University had the power to grant degrees similar to that of the then University of London. The University of the Cape of Good Hope obtained a royal charter in 1877. In 1916, after the first Boer War and the Federation of the independent Orange Free State and Transvaal with Natal and the Cape Province in 1910, the Union government reorganised the University of the Cape of Good Hope into the University of South Africa (UNISA). Still an examining body, UNISA then incorporated six university colleges as constituent institutions. These colleges included Rhodes University College, Huguenote University College, Grey University College, Natal University College, Transvaal University College and the Witwatersrand University College. In 1921, UNISA also incorporated the Dutch Reform Church Christian College, which strengthened the Afrikaans element in UNISA and greatly reduced the English-speaking dominance of the former University of the Cape of Good Hope.

Unfortunately, UNISA specifically banned the admission of non-Europeans during its initial operation. The prevailing racism, compounded by the fear that education would enable the majority of non-Europeans to 'swamp' the white communities, resulted in little enthusiasm for University education - be it traditional or at a distance - of the non-European or native Africans. Their post-secondary education was restricted to the Inter-State Native College, which in 1916 was re-christened the South African Native College. This College was incorporated in 1923 with the objective of preparing non-Europeans for UNISA degrees. The initial enrolment of the College in 1916 of eighteen African males and two females increased to include all of 150 students in 1937. In 1951, the College was taken out of the hands of the missionaries and affiliated with Rhodes University and was

renamed the University College of Fort Hare. Receiving full University status in 1969, the University was transferred to the Ciskei homeland government in 1986 (Ajayi, Goma & Johnson, 1996).

As each of the universities and colleges became independent, UNISA increasingly focussed more on its provision of external studies. In 1964, this institution became a fully-fledged correspondence University that now falls under the jurisdiction of the House of Assembly, with a proud mission to offer:

University education by means of distance teaching to all meeting the entrance requirements. On the basis of principles of equal opportunity and academic excellence, it engages in teaching, research and community service, thus providing southern African society with suitably qualified people, knowledge and expertise to meet the needs and aspirations of all communities. (UNISA, 1994)

2.3.2.1 THE CURRENT PROVISION OF DISTANCE EDUCATION IN SOUTH AFRICA

UNISA

UNISA is currently the largest post-secondary education institution in South Africa, comprising approximately 38 percent of all university enrolments. Courses are designed primarily by writing printed study guides and tutorial letters. Some guides were designed to stand alone, while others accompany textbooks. Courses are heavily print-based, as this medium is still perceived to be the most accessible to students. However, audiocassettes are distributed for many subjects and UNISA also purchases airtime on Radio 2000 for use in several subjects (International Commission on Distance Education and Open Learning in South Africa, 1995).

Technikon SA

UNISA is not the only distance education tertiary institution under the jurisdiction of the House of Assembly. In 1980, Technikon RSA was established as an autonomous tertiary institution, also to fall under the House of Assembly. Initially functioning as the Technikon Witwatersrand, Technikon RSA came into existence as a result of the report of a committee appointed by the Minister of National Education to "*investigate the need for*

and the desirability of the technique for distance education" in South Africa (International Commission on Distance Education and Open Learning in South Africa, 1995: 8). In 1993, a name change to Technikon SA (SA standing for southern Africa) reflected this institution's commitment to play a key role in the upliftment of the entire sub-continent.

Technical College of South Africa

The Technical College of South Africa mainly provides distance education pertaining to technical and vocational courses. Courses are offered in the fields of engineering, business and social sciences. Founded in 1984, the Technical College of South Africa presently falls under the Gauteng Department of Education. The College does not have the autonomy of institutions such as UNISA or Technikon SA, because the relationship between technical colleges and their administering departments is closer and more direct than with universities and technikons. The Technical College of South Africa does however, have a board of governance and its principal is a member of the Committee of Technical College Principals.

Vista UNIVERSITY

1981 saw the enactment of Vista University under the Department of Education and Training. This institution aims towards the satisfaction of education needs of the non-European Africans in the country. Vista University began its first academic year in 1983 as an *"open, autonomous University, established with the purpose of providing university facilities for people living in the major urban areas of the Republic of South Africa"* (International Commission on Distance Education and Open Learning in South Africa, 1995: 14). Vista University operates as an autonomous institution under its own statute and is governed by its own council.

Private distance education colleges

Apart from the universities, technikons and colleges, distance education in South Africa has also been provided through a number of commercial correspondence colleges, which are registered with the Correspondence College Council. In 1994, a total of 57 such colleges were registered with the Council of which some have been operating since 1906 (International Commission on Distance Education and Open Learning in South Africa, 1995). A defining characteristic separating these commercial colleges from the other institutions discussed above is that all the commercial colleges are financed privately. The

majority of these colleges offer correspondence courses consisting of printed materials, although some course materials include audiocassettes as a media alternative.

Teacher education

Nearly one third of all South Africa's education students, approximately 130 000, were enrolled in teacher education through distance education in 1995. The primary providers of teacher distance education were the College of Education of South Africa and Success College.

The Gauteng Youth College

Initiated in 1994 by the Education Department, the Gauteng Youth College is a youth education centre for young people who want to obtain a grade 12 (standard 10) high school certificate. This institution has four satellite schools in Johannesburg, Pretoria, Albertyn and Vanderbijlpark. Any student, regardless of age, is eligible to register with the college.

Residential universities and technikons

A number of universities and technikons originally classified as traditional or contact institutions, offer tuition through distance or mixed mode education. These institutions include the following:

- The Public Health Programme at the University of the Western Cape
- The Eastern Seaboard Association of Tertiary Institutions
- University of Natal
- Medical University of South Africa
- University for Christian Higher Education
- Rand Afrikaans University
- University of the Orange Free State
- University of Pretoria
- University of the Witwatersrand (International Commission on Distance Education and Open Learning in South Africa, 1995).

Corporate Distance Education Providers

A number of companies and corporations utilise distance education techniques as a means of providing in-service training to employees (International Commission on Distance Education and Open Learning in South Africa, 1995). Some of the prominent companies and corporations include the Amalgamated Banks of South Africa Training Centre, AGN PowerMatrix and the First National Bank Staff College.

2.3.2.2 CURRENT ISSUES REGARDING DISTANCE EDUCATION IN SOUTH AFRICA

The backdrop of an increasingly racially distorted South African society, in which white people were largely favoured and held power, changed after February 2, 1990 when former president F. W. De Klerk made a memorable speech which not only resulted in the release of another former president, Nelson Mandela, but paved the way for the establishment of the South African Institute for Distance Education in September 1992. This institute had its foundations in the extensive experience gained during the struggle against apartheid among organisations that employed distance education methods to make quality education opportunities available to disadvantaged South Africans. The South African Institute for Distance Education strives towards reconstructing South Africa's distance education system by:

- addressing the inequalities of the past;
- increasing access to education to all South Africans, and
- developing a future education system where education is no longer seen as an area of preparation for life, but rather as a lifelong process to meet changing demands.

Conceived as an independent organisation, the South African Institute for Distance Education do not offer programs to students itself, but work with distance education institutions and their programs, as well as with national and provincial governments, to promote the concept of quantity distance education. Part of their objective is to give distance education a practical expression in the South African education context.

In April 2001, Professor Kadar Asmal (Minister of Education) established the National Working Group, which had as its primary objective providing advice on the restructuring of the institutional landscape of South Africa's higher education system. The contents of their report were released as the National Plan for Higher Education in March

2001 (Restructuring of Higher Education System in South Africa, 2002). This plan contained detailed recommendations about the moratorium that was placed on the delivery of distance education programs by contact institutions and the reduction in the number of higher education institutions from 36 to 21 through mergers (Restructuring of Higher Education System in South Africa, 2002). One particular significant merger calls for a merger of Technikon South Africa, UNISA and Vista University's distance education centres. Together, these institutions will become a large distance education provider comprising over 200 000 students.

The National Working Group was of the opinion that this new higher education plan will *"lay the foundation for an equitable, sustainable and productive higher education system that will be of high quality and contribute effectively and efficiently to the human resources, skills, knowledge and research needs of South Africa"* (Restructuring of Higher Education System in South Africa, 2002). During their comprehensive research, the National Working Group found that the majority of technikons had the ambition to become universities of technology. The response of the National Working Group was that the collaboration between a university and a technikon does not preclude a merger and concluded that universities and technikons should continue to operate as separate higher educational institutions with distinct programs and mission foci. In cases where a merger do result in a comprehensive institution (an institution resulting from a merger), great care should be taken to prevent 'academic draft' from technikon-type programs to university-type programs (National Plan for Higher Education, 2002).

The issue regarding the moratorium imposed on the delivery of distance education programs by contact institutions, was relieved to the extent that the Ministry agreed to lift the moratorium under the condition that the Ministry will not fund new student places in current and new distance education programs in contact institutions from 2000, unless *"their programmes have been approved as part of the institution's three-year enrolment plan"* (National Plan for Higher Education, 2002). This moratorium was initially imposed by the Minister in February 2000 as a result of *"unanticipated consequences, which have impacted on the coherence of the higher education system"* (National Plan for Higher Education, 2002). These consequences resulted from the proliferation of distance education programs that were offered at a growing number of traditionally residential or contact institutions, often in partnership with the private sector. It was the conception of the National Working Group that this proliferation was motivated by financial gain. The moratorium was imposed due to concerns pertaining to the quality and relevance of such

programs and their impact on the sustainability of the new dedicated distance education institution (the Open Learning University of South Africa), as well as on residential institutions in regions where these programs were offered. This moratorium resulted in any future distance education programs at residential or contact institutions to be subject to quality approval by the Higher Education Quality Council.

2.3.2.3 WHAT DOES THE FUTURE HOLD FOR DISTANCE EDUCATION IN SOUTH AFRICA?

Regarding the future of distance education in South Africa, the Ministry agrees with the Council on Higher Education who recommends

A single, predominantly dedicated distance education institution that provides innovative and quality programs, especially at the undergraduate level. The opportunities that the present distance education institution had created for students in Africa and other parts of the world must be maintained and expanded. (National Plan for Higher Education, 2002)

The name of such an institution is anticipated as the Open Learning University of South Africa.

2.4 DISTANCE EDUCATION VERSUS TRADITIONAL EDUCATION

In this section, the researcher compares distance education with traditional education with the aim of coming to grips with the major differences and correlations between the two systems. In order to compare these, it was necessary to understand what traditional education entails. Hence, the issue of understanding traditional education is dealt with first. In the subsequent sections, key distinguishing factors are discussed individually.

2.4.1 TOWARDS AN UNDERSTANDING OF TRADITIONAL EDUCATION

If distance education is highlighted by separation, then it seems obvious that traditional education should be earmarked by a 'togetherness' of the teacher and learner. Yet, when are people together? Does being together imply being present in the same room at the same time, in the same building at the same time or corresponding face-to-face, but all other learning activities take place separately? To avoid a new debate similar to the one in our discussion on defining distance education, where we have to decide which of the

existing definitions best describe traditional education, the concept of traditional education, for this study, will be any teaching and learning where the teacher and learner are present at the same time and same place and both are mutually involved in the same learning context (Mackenzie & Christensen, 1971). This implies the normal offering of teaching, characterised by face-to-face dialogue and the preparation of a lecture by a teacher, delivered to students who are present in the same room at the same time as the teacher. The students experience the lecture with their senses and not via a telecommunications network (Burge & Roberts, 1998).

If you compare ‘togetherness’ with separation, several categories of distinction evolve. Each of these will be discussed in the following sections.

2.4.2 COMPARING DISTANCE EDUCATION TO TRADITIONAL EDUCATION

2.4.2.1 *FACE-TO-FACE TEACHING*

As already explained in the section that described traditional education, it is the face-to-face characteristic of this system that really separates it from distance education. This face-to-face meeting takes place in the traditional school/university/college inside an actual classroom with physical walls and to which the students travel to meet other students and to interact with them and the lecturer. This actual classroom experience is complemented by the occasional tutorial, seminar, laboratory practical, field trips and periods of study in libraries (Keegan, 1996).

Opposing this actual classroom, is the Open Universities, correspondence schools or distance/correspondence departments of conventional colleges/universities that simulate the traditional classroom through virtual classrooms that electronically creates the synchronous meeting. These virtual classrooms are generated with courtesy of microchips and broadband (telecommunication that provides multiple channels of data over a single communications medium) technology that link classrooms by satellite, compressed video technology and full bandwidth (information carrying capacity of a communication channel) links. These technologies enable teachers to still see and hear students in real time and simultaneously, students hear the teachers and other students who take part in the lecture (Palloff & Pratt, 1999).

2.4.2.2 CLASSROOM MANAGEMENT

The traditional education teacher is faced with the challenges of disciplining the students, the creation of an atmosphere conducive to learning and the promotion of student participation (Du Plooy & Kilian, 1982). In order to succeed in these, the teacher needs to establish a relationship with his students (Van den Aardweg & Van den Aardweg, 1988). This relationship is necessary, because the student is often forced to be present in the classroom and therefore, needs external motivation to stay involved and focussed. In addition, the teacher has to present course material to a diverse spectrum of students who use different learning styles (Vrey, 1991).

The distance education lecturer, on the other hand, does not have to discipline or maintain a suitable relationship with large, diverse groups of students. Nor does the distance education lecturer have to complete a certain amount of work in a given time frame. Often students are not forced to take part in the virtual lessons. In stead, students choose to take part and are, therefore, internally motivated. Students do not have to learn or understand immediately as is often the case in the traditional classroom (Mackenzie & Christensen, 1971). Students can take part in the virtual lesson and process materials in their own time and place of preference, applying their unique learning styles.

2.4.2.3 STUDENT LIBERATION

As already mentioned, the traditional education teacher has the immense task and responsibility to keep students motivated in order to assure successful learning. Often, the teacher needs to rely on his previous experience, the challenge of acquiring new knowledge or other methods to trigger the student's interest. Distance education, however, shows an absence of these interest-building devices. In chapter 4, we discuss various options that contribute to the distance education student's choice to partake in the distance education learning system such as cost consideration, geographic location, etc. In addition to these factors, the proceedings of the Round Table on Distance Education for South Asian Countries (1990), indicated that the initial selection of the student to take part in distance education assumes that some degree of interest/motivation was present at the start of the distance education student's studies. Thus, distance education requires an act of self-discipline or *“purposeful act of testing self-resilience and self domination”* (Round Table on Distance Education for South Asian Countries, 1990: 23-24). Distance education leads to a liberation of the student, which is portrayed through self-determination, self-resilience and self-esteem. In contrast, the traditional education student relies on the

teacher for support in developing self-esteem and a positive self-concept (Van den Aardweg & Van den Aardweg, 1988).

2.4.2.4 *STRUCTURE*

In traditional education, skills, attitudes, principles, ways of looking at content, the way a subject relates to other subjects, etc. often needs to be disclosed to the students by the teacher responsible for the content. Opposing this scenario is the distance education teacher who incorporates a differentiated structure that is often limited to reading and self-discovery on the part of the student (Keegan, 1996).

2.4.2.5 *TRAINING*

A final comparison relates to the education and training of the teachers involved in traditional education and distance education. Traditional education teachers often have years of experience which is complemented by three to four years of extensive formal preparation at a college or university (Vrey, 1991). To this extent, Mackenzie and Christensen (1971) makes the statement that there are no institutions providing a program for distance education instructors. As a result, they rely heavily on their subject knowledge and technology for learning to be successful and effective.

This section has shown that distance education and traditional education are significantly different with respect to several of their attributes. It often seems as if the distance education teacher is less challenged than the traditional education teacher, because the physical presence of students can be very demanding. Yet, despite these differences, the success of both of these systems is widely recognised and a continuous source for research into education. Distance education has a very important role to play in education - what this role entails, will be the focus of the next section.

2.5 *THE ROLE OF DISTANCE EDUCATION*

As a participant in the education system, distance education has a momentous role to play in addressing the tangible challenges facing schools, universities, government agencies and corporations. This role will be described as it relates to particular situations, but we wish to highlight that the methodology required for solving and fulfilling this role is beyond the scope of this study.

Many researchers agree that the principal task of distance education lies in supporting all the parties involved to realise a common national objective: *“the creation of*

a technology-based, continuous, affordable and equitable education system” (Minoli, 1996: 8). The aim of this objective is to make learning truly interactive and to create teaching that transcends space and time. Teachers with valuable specialities and experience must reach students miles away and the vice versa canon must also apply: students can reach back to share questions and responses.

In reaching this conjoint goal, the role of distance education can be subdivided into three objectives. The first objective relates to the freedom of the learner, the second to the promotion of independent study and ultimately, distance education’s commitment to the community.

2.5.1 FREEDOM OF THE LEARNERS

In advancing freedom of the learners, Keegan (1996) suggests three measures that should be at the base of all learning. First and foremost, learning should be self pacing, that is, students rate their studies in accordance with their own needs and state of affairs. Secondly, learning should be individualised. This implies that the learner should be free to follow any of several courses of study. Finally, learners should have freedom in the selection of goals and activities (Keegan, 1996).

2.5.2 INDEPENDENT STUDY

Wedemeyer (1973) surmises that learning should be carried out in space and time in an environment different from that of the school where teachers pilot learners to a lesser extent so as to advocate freedom and responsibility in the student’s carrying out of activities that lead to learning. To reach this objective of independent study, education must operate at any place where there are students (or a student) and the obligation of learning must be shifted to the student.

In addition, distance education should strive towards becoming a system that releases faculty members from their custodial duties in order to allow them to spend more time on the educational task of researching and communicating the most recent discoveries in their subject matter and means of delivering it so as to optimise their interaction with their students and quality of instruction. Also, distance education should offer students a wider choice in courses, delivery formats, methodologies and evaluation. In reaching this goal, distance education must use teaching media and methods that have been verified to be successful and effective and should further combine method and media to accentuate

teaching of subjects. Keegan (1996: 61) refers to this objective as “*the design and development of courses to fit into an articulated media program*”.

Rumble (1992) propagates recognition of prior learning and existing competencies. Distance education should also be flexible with regard to student exchange and should standardise credit transfer arrangements and regulation of level and quality of qualifications.

2.5.3 DISTANCE EDUCATION AND ITS COMMITMENT TO THE COMMUNITY

The last role of distance education relates to groups of learners or whole communities. It is the task of distance education to delineate education programs that not only meet the exigencies of the community, but should also generate community discussion. Distance education should also enable facilitators to initiate community actions. These actions should aim at bringing about change in society, social structures and social institutions. After all, it is within the community and society that distance education operates and accomplishes its goals (Rumble, 1992).

From the above it is apparent that the role of distance education is fuelled by the quality of the distance learning programs and is a function of the selected type of solution and the particular needs of the student who learns and studies at a distance. It lies in distance education’s culmination of this role that truly paves the way to equitable, affordable technology-based systems.

In concluding this chapter, the next section provides some retrospective assertion on the dominant issues dealt with in this chapter.

2.6 SUMMARY

This chapter sketched the context within which the student, who learns at a distance, operates and practises his choice between various modes of delivery. A comprehension of this context is obligatory for it is the distance education environment that offers choices and foments conflict within the student, which eventually leads to decision-making.

In this chapter, the researcher showed that the formulation of a descriptive statement for the phenomenon of distance education is very difficult, because the various faces through which distance education reveals itself all spawn their own sets of criteria, making definition prone to be non-inclusive of all criteria.

In the history section, it was manifested that the evolution of distance education was not without trial and that distance education has its modern particularity due to the technological advancement through the ages. It was principally the telecommunications innovation that helped distance education become the contender it is today.

A comparison between distance education and traditional education unveiled that separation and togetherness are the primary distinguishing factors and for the exclusion of teacher training, the distance education teacher often has less exigencies in his educational task relating to issues such as discipline, motivation, and time management.

This chapter also verified that distance education has a definite role to play in the education system. This role mainly pertains to the promotion of student freedom, creation of independent study and commitment to community involvement.

As indicated, technology played and still plays a key role in the provision of quality education at a distance. Technology provides a range of options available for the delivery of instructional material. It is in choosing between these various modes that the students practice a choice. The next chapter will provide an account on the different modes and briefly describe each of these in relation to what the mode entails and what role it plays in providing instructional content to the student.

3 DELIVERY MODES AND MEDIA TOOLS

Technology...the knack of so arranging the world that we need not experience it.

- M. Frisch (1911 -)

3.1 INTRODUCTION

The context within which the distance education student finds himself, presents a range of options from which to choose the desired mode of receiving instructional content. This approach - being able to practise choices - seems profoundly removed from the learning experience of the traditional student that is characterised by a fairly conservative spectacle to the choices, if any, that are offered to the student. With caution not to over-generalise, we refer to Jones, Kirkup and Kirkwood (1993) who made the observation that it often appears as if the evolution of traditional education reduced the classroom student's choices to being present in a room with other, similar students, while passively (or if he was fortunate enough to have a very diligent teacher who always ensured active participation, actively) awaiting the teacher to bring knowledge to him. Variations do come in the form of the odd field trip, class experiment or guest speaker, but the sentiment remains that the traditional student cannot escape this learning experience (Jones *Et al.*, 1993).

This grim portrayal of traditional classroom instruction is not at all intended to demise traditional education. Rather, it serves to amplify the level of liberation of the distance education student. This chapter shows that distance education offers multiple modes from which the students utilising this mode choose to receive instruction. In addition to these modes, several media tools exist that the student uses to assist his learning experience. This chapter aims at providing the reader with insight into each of these modes and tools. In pursuit of this goal, the researcher divided the content of this chapter into seven sections. The first will clarify some misconceptions regarding terminology used in this chapter. The second gives an overview of the traditional modes that were used before the advent of on-line learning. The third inspects the changes that took place while section 4 looks more closely at the modes employed today. A description of each mode and tool follows in the subsequent sections, while a view of future prospects is provided in the penultimate unit. In conclusion, a summary serves as an overview of the whole discussion.

3.2 CLARIFYING THE MISCONCEPTIONS

Before we commence, it is necessary to clarify some misconceptions that became evident from studying the literature. Scholars of the distance education phenomenon appear to have varied opinions as to the gist of this system. Throughout the literature, ‘educational technology’ and ‘modes of delivery’ were used in conjunction and authors used one of these to refer to the other and vice versa. Yet, Minoli (1996) takes a very cogent stand that modes of delivery do not mean or imply educational technology and educational technology does not simply mean or imply machines.

A review of the literature indicated the existence of four very perceptible modes in which distance education is delivered. These include the print-based options of correspondence study, programmed instruction and modularised instruction; audio-based modes; video-based alternatives and on-line delivery (Feasley, 1992 & The Source, 2002).

Modes of delivery must not be confused with educational technology, which according to Bosworth (1991: 48), has been degraded to “*unfortunately, looking after the machinery that is used in the teaching process*”. But what is educational technology? For the purpose of this research study, the meaning of educational technology will correspond with Bosworth’s initial intent, namely that “*educational technology indicates the logical, analytical and rational approach to improve education and quality of teaching, using scientific techniques*” (1991: 88-89).

The question now arises as to what do we call Bosworth’s ‘machinery’ that was used in the delivery of education and which often complicates the alternatives in the student’s decision process? To prevent falling into the same trap discussed in the previous paragraph, we wish to make it clear that any device serving to support the delivery of distance education, will be referred to as a multimedia tool, where multimedia is defined as “*any document that uses multiple forms of communication*” (ABC’s of Distance Learning, 2002).

When a student chooses between various modes of delivery, he also chooses between a range of tools to assist his learning progress. Often these tools serve to mediate the separation that the distance education student and lecturer experience and provide an alternative communication device to the traditional face-to-face dialogue.

To summarise, the distance education student chooses between four modes of delivery and a range of media tools to communicate with the teacher/lecturer. These modes will be discussed in more detail in the subsequent sections, but first it is necessary

to come to grips with what modes and tools were originally available and what changes took place in the delivery of instructional material. Such an historical perspective will serve to aid understanding of the student's choices that was available in the past or that might have influenced the student's decision to select a particular mode in his current studies.

3.3 TRADITIONAL ALTERNATIVES

The problem of isolating traditional alternatives is a conceptual question: when is a mode considered traditional? Depending on the approach to this solution, two possibilities exist, namely, the aim of the tool and secondly, when it was used. As a result of the constant innovations in technological advancements, modes and tools are ceaselessly changing. One attempt at separating traditional tools from modern technological tools was by investigating the aim for which the tool was used. As previously indicated, the initial aim of distance education was to provide education to students who could not attend regular scheduled classes, because they were geographically too remotely separated from any educational institution or alternatively, due to an overrun work and family schedule that made pre-scheduled classes impossible to attend. As a solution to overcome this separation, correspondence study served as the primary delivery mode for many decades (Feasley, 1992 and Mackenzie & Christensen, 1971). The audio and video tools represented by the radio, television and cassettes have often supported correspondence study. Programmed instruction was offered as a later innovation, but several inadequacies resulted in its application being relatively short lived (Bosworth, 1991).

When one tries to separate traditional from modern media tools, the time ingredient becomes more adequate and a similar date to that used in the section defining distance education, namely 1980, serves appropriate. The vast majority of literature refer to media tools that include telephone, television and video applications in contrast to the more modern use of the computer, particularly after the late 1970's and early 1980's (Jones *Et al.*, 1993).

Another media tool that is not bound by the time factor, yet served not only correspondence study, but is still a cornerstone for many distance education delivery modes, is the printed media in the format of the old-fashioned textbook (Bosworth, 1991). Many scholars agree to the importance of realising that printed material is still relevant and it will remain a primary source of instructional content for many years to come (Westbury, 1985).

It appears that many, if not all of the modes and tools classified as ‘traditional’, are still being employed today. If so, what has changed? The answer to this question will be the thesis of the next section.

3.4 THE CHANGING NATURE OF DELIVERING DISTANCE EDUCATION

The primary focus of the changing nature of delivery modes has been to reduce the separation between student and lecturer by promoting easier, more effective means of communication that imitates traditional education. Attention has been diverted from correspondence to on-line education. Communication is no longer via telephone or land mail, but ‘rides’ on the ‘information highway’ – a highway that is not bound by place and time. Roberts *Et al.* defines this information highway as “*a global network of once separated telephone, television and computing systems*” (1998: XI). This network includes the global basis of study, real-time communication between teacher and learner, immediate access to expert knowledge, library and cultural resources and finally, study from home, business or any location that offers tools to access the information highway (Keough & Roberts, 1995).

Modern trends in delivery modes aim to enhance learning in a broad spectrum of settings, which include technological classrooms, professional development, staff training and at-home study. This enhancement has resulted in a ‘blurring’ of the distinct separation between distance education and traditional education (Roberts *Et al.*, 1998).

A good way of conceptualising the change that took place from traditional modes is to look at some of the modern systems used to bridge the gap that resulted from the information highway. For this purpose, six media tools and systems will serve as illustration.

The first example is represented by a platform network incorporating Unix, Disk Operating System and Apple type applications, which are connected to a central file server with printing, telecommunication and fax capabilities. This network is used by the California Community College Chancellor’s Office for Tele-educational and Telecommuting Centres. Similar to this system is a video network used by the Maryland Centre for Public Broadcasting. The Utah State University’s Life Span Education Program links no less than 30 sites using an audio-graphic system and EDNET-2 (a compressed digital two-way interactive video network). The Community College of Maine uses interactive television to satisfy educational needs of small-populated groups of students,

while the ‘electronic classroom’ connects faculty members with the students at NOVA University in Florida. In Canada, the Internet supports networks such as SchoolNet, which connects more than 300 schools across the country (Rossman & Rossman, 1995).

The previous examples are not at all intended to slander the very important role that traditional modes and media played in distance education. In fact, if it were not for these traditional modes, the facade of modern distance education would be far less impressive.

The next section presents the reader with an overview of the various modes and tools used in delivering distance education. It is between these modes and tools that the student exerts a choice according to his personal affection with the goal of customising his learning occurrence. Even though our study focuses on the choice between print and on-line modes, a short reference is also made to the modes of audio and video learning as many of the media tools used to support print or on-line study are directly concurrent to these modes.

3.5 MODERN ALTERNATIVES

“Teaching and learning are all about getting information in cognitive, affective and psychomotor domains of the taxonomy of objectives from the person who knows to the person who wants to know” (Bosworth, 1991: 88). This section aims at investigating the various techniques in which the information Bosworth (1991) theorises about, is delivered to the student – the one who wants to know/learn, and who chooses to do so at a distance.

Various attempts at classifying the different modes and tools in the past all resulted in some grouping according to audio, video and printed material with reference to the computer (Willis, 2002). In almost all the literature, these tools were perceived as separate entities and were discussed as such. It was not until fairly recently that scholars of the distance education phenomenon distinguished between direction of communication and time delay between dialogued responses. If direction is the criterion, tools can be classified as interactive or non-interactive media (Johnston, 1984 and several others). Interactive tools permit some form of two-way communication such as two-way audio systems and computer conferencing. Non-interactive tools on the other hand, only produce communication in one direction when these tools are being used alone. Non-interactive tools include devices such as the radio, audio tapes and the like (Kramer, 2002). Stork (1984: 75) argued in favour of interaction as method of classification, because *“it was directly pertinent to the educator’s interest in teacher-student, student-student and student-material interaction and in the student’s control over the use of the media”*.

Opposing the criteria of direction is the parameter of time delay during communication that also produces two categories of distance education delivery systems. When the communication happens in real-time, the system is referred to synchronous instruction. Synchronous instruction requires the simultaneous participation of all the students and instructors. Such systems include interactive television, audio-graphics, computer conferencing, interactive relay chat, multi-user object orientated and multi-user domain systems. If a time delay occur, that is, communication does not happen in real time, the system is referred to as asynchronous instruction. This type of instruction does not require the simultaneous participation of all the students and instructors. Asynchronous instruction offers the advantage of flexibility – students may choose their own instructional timeframe and gather learning materials according to their own schedules (Snyder, 2001).

In our account of the various tools, the researcher uses a combination of the interactive/non-interactive and synchronous/asynchronous categories and attempts not to limit tools to a specific group according to a particular criterion. Rather the aim is to present the various tools according to an increasing level of complexity and sophistication with regard to the level of interaction between the student and the instructor, much like the approach followed by Minoli (1996). At the lower end of such an approach is the textbook, which utilises no electronic or mechanical devices and allows for the least amount of communicative interaction between teacher and student. The apex of such an approach is what Minoli (1996: 71) referred to as “*continuous presence*” – a real-time, fully interactive system allowing audio and visual interaction between student and teacher and student and peers. Such interaction will be exactly the same as traditional education, with the only difference that none of the participants were present at the same location.

The following discussion deals with the four modes of delivery that currently exists in the distance education system. Each mode is discussed with the aim of unravelling its essence and exposing its difference from the others. The subsequent sections deal with media tools used to assist the student in his endeavour to study through a particular mode. Although level of sophistication is indicated by the criterion of direction, reference is also made to its particular synchronic status.

3.6 MODES OF DELIVERY

It has always been the focus of distance education delivery institutions to provide the most cost effective educational program. In order to achieve this objective, priority in

the media selection process must be given to what is least costly, least complicated, most accessible and is most capable of providing the desired results (Feasley, 1992). This process can be better understood if the existing delivery modes are examined more closely - that is what this section steers towards. A review of the current distance education system indicated the existence of four primary modes of delivery, each with its own unique character and set of media tools aiding the student to achieve his educational goal. In order to simplify this account, the researcher separated the modes from media tools and each will be discussed separately.

3.6.1 PRINT-BASED MODES

3.6.1.1 CORRESPONDENCE STUDY

As mentioned earlier, correspondence study is easily confused with distance education and often the inexperienced scholar will refer to correspondence study when he implies distance education or vice versa. Although distance education had its roots situated in correspondence study, studying via correspondence has developed its own unique character that is easily distinguished from the other modes.

The Distance Learning Week Journal (ABC's of Distance Learning, 2001) defines correspondence study as:

Print-based coursework that was completed by the learners at home at their own convenience, but usually within a set timeframe. All assignments – reading, class notes, written assignments, research and some examinations – were completed independently. Students correspond with a school through e-mail.

As this definition indicates, students are provided with a set of sequential instructional and testing print materials for each course in which the student is enrolled (Feasley, 1992).

Correspondence study's origin dates back to 1883 when the Chatauqua Institute offered degrees by correspondence in the state of New York. The International Correspondence School (ICS) started in 1891 by providing training at home via correspondence to mine, railroad and iron workers. By 1923, ICS enrolled 2 500 000 students in its courses. This institute remains the largest commercial provider of home study courses in the United States today. The first college-level distance courses via mail

was created in 1892 by William Rainey Harper at the University of Chicago – this was widely recognised as the world’s first university distance education program (Feasley, 1992 and A Brief History, 2001).

Correspondence study was not only limited to adult education. In 1906, the Calvert School of Baltimore became the first elementary school to offer CS. In 1915, the University of Wisconsin at Madison formed the National University Continuing Education Association with the primary function of co-ordinating correspondence and extension programs offered to its member schools.

In 1920, the United States Marine Corps enrolled troops in correspondence courses. The Marine Corps Institute continues to prosper today with approximately 150 courses offered at both vocational and baccalaureus level (A Brief History, 2001).

After 1920, the visage of correspondence study changed as focus was deviated away from primarily print-based to the incorporation of radio and television. Despite these changes, correspondence study remains less structured than the modes of Programmed or Modular instruction. In addition, correspondence study is often less electronically orientated than its on-line counterpart. Yet, many scholars see correspondence study as the umbrella term for distance education from which the latter modes evolved (Thomas & Kobayashi, 1987).

3.6.1.2 PROGRAMMED INSTRUCTION

Often referred to as programmed learning, programmed instruction represents the most structured design for print materials (Feasley, 1992) and according to Bosworth (1991), programmed instruction was the first attempt at individualising teaching techniques. Although programmed instruction heavily relies on the printed format of the textbook, it is often more associated with a learning situation where the learner is positioned in front of a video monitor.

Programmed instruction can be defined as ‘*transfer of tutorials and drill-and-practice exercises onto a computer with the following principals: step-by-step progress, limited branching, emphasis on mastery and simple responses*’ (Bosworth, 1991: 23). In this mode, material is presented in a sequence of steps leading to a specified educational objective. Students work at their individual paces by actively writing or selecting answers to questions. Feedback about the correctness of a response is provided instantaneously. Drill-and-practice questions can be prepared at random. In a computerised version,

questions are normally displayed on a video monitor with 20 to 24 lines of 40 to 48 characters and students input their responses to questions by means of a keyboard or mouse (Centre for Educational Research and Innovation, 1987). Because of the printed nature of programmed instruction, dialogue is restricted. Often questions are in the form of multiple choice or text completion and at its very beginning, programmed instruction texts contained no graphics.

Programmed instruction is presented in three formats, namely a linear program, a branching program or a combination program that employs both linear and branching formats (Bosworth, 1991 and Feasley, 1992). In the linear program, the sequence of steps is identical for all the students. This sequence is presented as a series of frames that resembles the sequential nature of pages from a book. Many companies, colleges and private trainers use linear programmed instruction on a ‘drop-in-learner’ approach – and approach which later changed to a ‘flex- and learning-by-appointment’ format.

Students who used the linear format had two fundamental complaints about the system. The first related to inflexibility and the second, the unnecessary use of paper as the device often spewed out realms of paper after the learner provided his response (Bosworth, 1991).

As an alternative to the linear format, branching uses electronics to switch into a series of responses offered by the device – a procedure Bosworth describes as “*juggling of books*” (1991: 171). Typically, a branching program offers instruction for any of the several responses available that the student might select – be they correct or incorrect.

Like the linear format, branching presented its share of inadequacies with the learners. After the learner selected an answer, he would then be instructed to go to the indicated page to verify the correctness of his response. If the response was incorrect, the student was sent back to the original page to choose another answer. The comment was that learners would have preferred a remedial sequence instead of switching back and forth between responses and correct answers.

Branching is restricted as developers of the branching material are of the opinion that it is too expensive to produce frames for all possible types of answers. A second reason for its demise pertains to users’ complaints of ‘getting lost’ due to their scrambling between pages in their search for answers to questions (Bosworth, 1991).

Despite these problems, research revealed that programmed instruction was superior to correspondence study in almost forty percent of more than 100 research studies

undertaken and equally effective in about half of the cases. Relatively seldom did programmed instruction prove less effective than correspondence study (Feasley, 1992). Bosworth's (1991: 172) comment "*people who followed the programmed text, often did better in the examinations*", proclaims the same revelation about the success of programmed instruction.

Modern innovations in hardware, software and documentation resulted in video displays that show better colour, graphics and character forms. Current models also display diagrams, graphs and tables that better illustrate the text.

3.6.1.3 MODULARISED INSTRUCTION

Modular instruction or the modular system of instruction with unit credits, originated in the United States of America. This system entails the subdivision of the content into units (called modules) of work that can be learned as self-contained blocks. The use of instructional modules permits the students to work at differentiated rates by presenting single concept units of study to "*construct learning experiences of any needed magnitude and content coverage*" (Feasley, 1992: 337).

From an instructional point of view, modular instruction implies firstly, the addition of segments or units to make modules, and secondly, the mixture of modules to complete courses. From a learner perspective, depending on how the program is structured, some modules require prior knowledge that can be obtained in a preliminary module, which is normally specified in the introductory material.

To ensure learner success in this system, certain prerequisites for the development and provision of modules are stipulated. The provider of training or learning is forced to disclose what the modules contain, what it leads to in terms of skill or knowledge gained, and finally, what level of competencies are needed to embark on the study (Bosworth, 1991). For this reason, modular modes of delivery are often accompanied by a catalogue of modules that enables the student to make choices from those that might be relevant, and in addition to this, a guidance program so that inappropriate choices are limited.

Modularised instruction has the advantage that students are provided with immediate feedback so that they can determine whether they have achieved mastery. In addition, chances of mastery are heightened by the application of different media tools.

Modularised instruction faces strong competition from on-line systems, which are discussed in the next section. Despite this challenge, Feasley (1992) refers to the study

done by Cross in the late 1970s, before the advent of the on-line system, which showed that modularised instruction accounted for about three-quarters of all community college distance education.

3.6.2 AUDIO-BASED LEARNING

Audio learning involves primarily stimulation of the hearing senses in the learning experience of the student. The student synchronically engages in discussion with the lecturer through telephone technology in his exchange of messages or when accessing expert advice as part of his formal/informal learning experience.

As part of the telephonic technical foundation of audio learning, this mode of delivery also relies on telephone networks, which link all the phones via a dial up telephone line. Also, a device called a bridge is needed which connects all the components involved in this learning endeavour (MacDonald, 1998).

Audio learning offers several advantages. It was interactive with a negligible delay in communication, depending on the amount of users and types of phone lines used. It is also effective, and because it uses human voice, it is emotionally powerful (Burge & Roberts, 1989). In addition to this, phones are widely available, relatively inexpensive and flexible with regard to the learning experience – it offers either individual or team learning and recording of lessons for future use. Add to this the convenience of being portable and easy to operate and you have a very viable delivery mode.

The direct application of audio learning is discussed in more detail in the section on media tools, where the researcher undertakes an in-depth look at the application of telephones and audio conferencing during distance education delivery.

3.6.3 VIDEO-BASED LEARNING

Video learning stimulates the visual senses of the learner and supplements this visual learning by audio components. Dialog is exchanged via microphones, cameras and other equipment. Learning normally occurs in real-time. Media tools utilised range from basic cassettes to advanced conferencing tools. These are discussed individually in the section regarding media tools.

3.6.4 ON-LINE INSTRUCTION

Despite being heavily researched and documented, on-line instruction is not classified in any literature as the fourth mode or as a delivery mode at all, but is rather considered as being a media tool in delivering distance education. The researcher wants to bring it to the reader's attention that, although on-line instruction is not yet featuring in the available texts as a separate learning mode, it is offered at at least one post secondary educational institution in Ottawa as an alternative to print-based modes (The Source, 2002). Therefore, as an emerging modern alternative to the heavily print orientated devices in the foregone sections, it is included in this study and classified as the fourth alternative to the modes already discussed.

On-line instruction is often referred to as networked learning. Two types of networks exist: Intranet (inside an institution) or Internet (across institutions) (Burge & Roberts, 1998 and Keough & Roberts, 1995). On-line modes also require the use of a personal computer, various software applications, and Internet connections. In addition, on-line learning require the learner to register through a web browser. Students and instructors use computers to exchange messages, engage in dialogue and access course resources. On-line instruction can occur in real-time (chat) or delayed time (e-mail). Courses are arranged as modules and are offered via the Internet, which students access in the comfort of their own home, work office or any computer that is connected to the world-wide web. As with regular print-based courses, on-line programs are also to be completed within a specified time frame. Courses are offered on a monthly intake or semester basis. Usually all contact and interaction with the instructor occurs via a computer (The Source, 2002).

An emerging on-line instruction organisation is Ontario-Learn (formerly known as Contact South), which has a consortium of 22 Ontario colleges that are partnering in the development of on-line courses.

On-line instruction offers the advantage of fast, direct communication with your instructor and participation in discussions with peers using private conferences via open 'chats' or 'virtual' classrooms (Kramer, 2002).

Today, most on-line courses still require the use of the textbook and generally, students who partake in this delivery option use several other media tools to assist them in their learning progress. Despite the electronic nature of this mode, all of the modes discussed thus far emphasise the written word, self-pacing and unit mastery. In order to

achieve the latter two objectives, students often use several media tools to assist their studies. These tools are discussed in the next section.

3.7 MULTIMEDIA TOOLS IN DISTANCE EDUCATION

When a student enrolls at a distance education institution and selects his preferred mode of receiving instructional material, the student often finds it necessary to utilise some other device/aid to assist his educational progress. Whether it is a telephone call to clarify a concept or watching a video as an extension to the textbook, these tools have become an integral part of the distance education student's learning experience. As with the delivery modes, students can partake in a choice between any one of the vast arrays of media options available to him. The use of tools is often a designated prerequisite for course completion, but in most cases they only serve as an additional resource in the struggle for control over the content.

In our discussion of these tools, we tried to rank the tools in a hierarchy ranging from the least complex in its sophistication to most complex. Some tools use different technology and apart from stimulating different senses, are invariant in their sophistication. Such media tools will be indicated in their particular sections.

Levels of sophistication are applied to the direction of communication, with one-way tools accounting for the bottom of the hierarchy and two-way audio- and video-conferencing devices being the most complex at the apex.

3.7.1 ONE-WAY, NON-ELECTRONIC MEDIA TOOLS

3.7.1.1 TEXTBOOK

The vast majority of scholars agreed that, in many instances, the best medium might be the printed word, which in the educational context often takes the form of a textbook. Thomas and Kobayashi (1987: 173) argued that, while there are much talk of *“computers in education, and steps are taken to introduce computer literacy into the curriculum, education will remain based on traditional approaches and practices for a long time”*. At the heart of this traditional approach lies the printed word, which, according to Verduin and Clark (1995: 81) *“has always been the dominant medium in distance education and will continue to be the most used form of delivery in the foreseeable future”*.

While the Little Oxford Dictionary (Ostler, 1994: 799) defines a textbook as a *“book for use in studying ‘one’ standard account of the subject”*, a textbook is much more

than just a compilation of pages containing written material. For Bosworth (1991: 71) the textbook is the “*curriculum made explicit*”. Thomas and Kobayashi (1987: 174) defined a textbook as “*an organisation of selected, ordered and simplified content capable of being taught*”. In this definition, organisation refers to context that stretch beyond conventional form of multimedia kits, modules etc. They used the words ‘ordered’ and ‘simplified’ to emphasise the notion of grading and sequencing integrated, planned divisions of content. Their phrase ‘capable of being taught’ focused on the personal user – in this case the distance education student, and how the textbook meets his needs.

Initially the advent of the textbook was limited to the Bible, religious texts, law codes, history, geography, philosophy essays, natural sciences, poetry and drama (Westbury, 1985). Two distinct phases in the emergence of the textbook can be highlighted. The first occurred during the 16th and 17th centuries, that was described as “*when technology of the printed textbook and vernacular instruction emerged and found a fixed form*” (Westbury, 1985: 523). The second era was during the 19th and 20th centuries when the textbook established itself as “*chief determinant of the structure of curricula and teaching*” (Thomas & Kobayashi, 1987: 145).

A brief history of the textbook shows that its origin goes back thousands of years to an ancient time when people engraved historical records, generalities and laws into stone tablets. Papyrus leaves, of which some of the oldest surviving specimens date back 2000 years, later replaced these. The availability of these scripts were limited due to the fact that they had to be copied by hand and often these copies resembled inaccurate reproductions. This hand-copying system was revolutionised by John Gutenberg, who introduced mass printing. This was shortly followed by innovations in ink, printing press and paper technologies. We can safely argue that education as we know it today, was made possible by advances in the printed material (Thomas & Kobayashi, 1987).

The recent debate over whether a textbook can be considered educational technology, showed that few people who see printed matter as such, especially with the demise of the programmed printed format. Bosworth’s (1991) reply to this debate was that the textbook is indeed technology. He argued that, if educational technology is seen as an operating system that conditions the way in which educational processes are formed, then there is no other alternative as to classify the ordinary textbook in this category. Whether there is still insight to be gained from this debate was questionable, but the fact that the textbook was still relevant and has a role to play, is undeniable. As its primary function,

the textbook should provide resource instruction in a given subject at a given level (Verduin & Clark, 1991). In pursuit of this function the textbook should provide a cognitive process that supplements creativity (Bosworth, 1991).

Textbooks offer several advantages over its more sophisticated counterparts. Not only are printed texts very familiar to almost all learners, but they are also relatively inexpensive and portable. Due to its fixed presentation format, students can study any section of its message in any order for any length of time (Feasley, 1992). To this, Bosworth (1991) added that the universal accessibility of the printing process makes it affordable for even the poorest of developing countries. Also, textbooks require no maintenance or additional energy resources (unless, of course, for adequate light). Furthermore, texts are easily distributed by mail and package delivery systems (Thomas & Kobayashi, 1987).

A recent literature overview showed varied opinions as to the role that the textbook has to play in distance education. For Tucker (1984: 75) the textbook should *‘lead the student through a series of concepts and test their grasp all of them. Textbooks should not aim at passive consumption, rather active participation’*. For Bosworth (1991) the textbook is likely to remain the most widely used instructional tool, which serves to equalise quality of distance education as a result of it being independent of the teacher. Textbooks are productive in that it exempts the teacher from direct teaching and it is cost-effective for mass-based distance education. In addition, textbooks should carry the intrinsic value of the nation, integrates a common socialising experience and ultimately standardise education.

The textbook, however, is not the only print-based media that has been and still is used in distance education. The next section will shed some light on other equally sophisticated print-orientated media tools.

3.7.1.2 NEWSPAPERS AND OTHER TEXTS

Video Disks

Newspapers are more renowned for its use in the traditional education system, but distance learners in the United States have being exposed to its educational application since 1973. The premiering institution was the university extension program of the University of California in San Diego. Between 1973 and 1992, more than 1000 college

and university students used almost 18 000 newspapers and earned credits in the sixteen courses offered at this institution (Feasley, 1992).

Newspapers offer the advantage that they are easy to read and easily distributed. Most importantly, their content relates to current events that bridge the gap between academia and the real world.

Other printed media utilised in distance education includes magazines, technical journals, pamphlets, how-to-do-it handbooks, dictionaries, atlases, encyclopaedias, collections of short stories and novels (Westbury, 1985 and Tucker, 1984).

3.7.2 ELECTRONIC MEDIA

3.7.2.1 ONE-WAY VIDEO TOOLS

One-way video tools offer instructional content that was saved or copied on devices such as tapes and cassettes or disks and which is displayed on a video monitor or television screen. These tools rarely encourage or 'move' students to engage in dialogue. Rather, they stimulate the students to engage in reading. Three tools fall into this category: tapes / cassettes, videodisks and videotext.

Tapes/cassettes

Tapes contain a magnetic band capable of saving electronic information. Students engage in watching recorded lectures, complete reading and writing assignments, take tests or perform other activities stipulated in the course outline. Often, these videotaped courses run concurrently with the on-campus schedule.

Videotaping services are available through radio and television services or through regional video companies and educational institutions. Tapes often require extensive planning and producing a tape of good quality can prove expensive and time-consuming. However, once the tape has been produced, it has the advantage that it can be reproduced at a fairly low cost (Feasley, 1992).

The use of cassettes originated because television programs do not stop to answer questions, nor do they adjust to individual differences. Recent surveys indicated more widespread use of videocassettes than television. According to Bosworth (1991), an obvious extension of the straight videotape playing is the deliberate insertion of breaks for learner activity. Inserting these breaks for the purpose of asking questions and waiting for student responses can be seen as the earliest attempts at interactive audio/video, which now

claims a position fairly high up on our hierarchy under 'conferencing'. A modern replica of the tape comes in the form of the optical disk.

Video Disks

Video disks offer the same advantages as its tape rival, except for the additional value that disks carry more information per unit (Minoli, 1996). Video disks can be classified into two groups: laser/compact read-only memory disks (CD-ROM) and stylus disk technologies. Laser disks resemble a long-playing phonograph record. Each side contains 54 000 frames of still images such as photographic slides, charts, diagrams, computer pages etc. Although the uneducated eye would not see the difference between laser and stylus disk technologies, stylus disks are more reliant on optical technology and offers different storage capacity. Courses offered using CD-ROM allows students to access material including audio/video pictures and text-based documents.

Since disks are video technology, they have the advantage of potential transmission to huge screens for large audiences to partake. Video disks permit greater optics for presentation of material than tapes, but drawbacks come in the form of high-cost during initial production. Despite this drawback, video disks offer huge potential if they are used with other teleconferencing devices (Minoli, 1996).

The use of cassettes and disks by professional associations are continuously growing. Associations such as the Association for Media-based Continuing Education has been in existence since 1976 and during the 1980's the Annenberg Corporation's Public Broadcasting Project was an important force in developing video and audio assisted distance education courses.

Cassettes and disks are video formats that require input into a device and then display information on the screen. This format can easily be transported by the student and accessed through any cassette or video player. A different approach to this one-way video tool is the videotext that is not in the format of a cassette or disk. Rather, the information is already stored in a device called a hard drive and requires of the student to travel to a specific location containing the computer with the required course material.

Videotext

Videotext provides electronic pages from computer databases and not magnetic band formats or disks to enquirers. An example of the videotext format was the Telidon

system. This was an 8-colour computer graphics system that created high-resolution colour graphics on specially modified television screens.

Electronic pages may be contained locally or may be distributed from another location by means of a network. Students can scroll through pages much like they would do while reading a book. Pages can be switched at the command of the reader or can be programmed to show a page for a limited amount of time before automatically switching to the next (Ghosh & Cartwright, 1984).

3.7.2.2 ONE-WAY AUDIO TOOLS

Audio Cassettes

Audio cassettes function in much the same way as their video counterpart, with the difference being that they stimulate a different sense, namely that of hearing. An observation by Bates in 1984 revealed that audio cassettes address more diverse needs of the distance learners than most people come to realise. This point was dramatically illustrated by his comment:

The most important development in the media at the British Open Universities since its inception has not been computer-assisted learning, video disks, video data or satellite television, but the humble audio cassettes. In 1970, virtually no courses used audio cassettes and by 1983, the Open University was sending 500,000 60 minute cassettes to students (1984: 3).

Despite this dramatic account, there are instructional situations that require more sophisticated interactions between students and faculty and which can be provided at a reasonable cost using a combination of print and/or video cassettes in conjunction with the following tools, namely radio and television.

Radio

Minoli (1996: 91) was of the opinion that:

One of the most notable scientific discoveries since the 18th century has been the revelation that our atmosphere is criss-crossed with an immense traffic of wave-like impulses... Thanks to science and innovation, we are now able to use radio and the television equipment to explore a portion of the airway's unseen

waves for the instantaneous, long distance transport of pictures, words and music.

Radio is still used today and is very effective in delivering instructional material to distance education students.

The rapid growth of the radio was due to research done by industrial manufactures of radio equipment, studies done by research units of the university departments of physics and electrical engineering as well as work done by independent companies. Yet, none of the research would have been successful, had it not been for the ‘originator of the radio’, Guglielmo Marconi (Minoli, 1996 and others). His first invention was called a wireless telegraph. Several improvements to this device lead to the first human voice broadcast on Christmas Eve of 1906. Although the use of radio broadcasting was initially limited to wartime radio telephony, rapid developments saw the first American radio station in 1920. By 1921, 4000 licenses had been issued in the United States of America and United Kingdom, with more than 560 licensed broadcasting agencies making their appearance. The era from 1920 to the mid-1980s saw continuous refinements to the radio technology such as printed circuits and transistors that replaced the vacuum tube. These innovations not only resulted in lowering manufacturing costs and decreasing the size of the device itself, but also increased the quality of sound and sensitivity of reception.

The first educational radio license was granted to the universities of Salt Lake, Wisconsin and Minnesota. Between 1918 and 1946, 202 educational institutions were broadcasting courses. However, despite this popularity, only one college-level credit course was offered in this way by the year 1940. It was not until after 1960, that radio had a significant impact on distance education (A Brief History, 2001).

Formal distance education by radio is offered in two formats: live broadcast and audio tapes (Ghosh and Cartwright, 1984). Live broadcast offers the advantage that anyone with access to a radio can listen to the course material. Thus, educational institutions can teach large numbers of people at different locations. More often than not, educational broadcasting is provided by FM (frequency modulation). However, nations where the local government operates transmissions for instruction often receive broadcasting on AM (amplitude modulation).

Where instruction is not heard in real time through the air, material is recorded on magnetic tape. Very often, lessons do not begin as a live broadcast, but are instead directly

recorded onto tape and then distributed to radio stations that broadcast their content (Ghosh and Cartwright, 1984).

The use of the radio as media tool in the delivery of instructional content offers several advantages to distance education instructors. It can pace students through the instruction of course material, allows for the provision of feedback which creates a sense of belonging on the side of students, and offers the potential to make corrections in existing material (Feasley, 1992). In addition, primary resources such as speeches, discussions and performances can be brought directly to the students. Not only does it influence students, but the public at large also benefits. The radio offers the potential to modify students' attitudes by presenting material in a novel or dramatic manner or from an unfamiliar point of view. To these advantages, Ghosh and Cartwright (1984) add the additional value that, because radio-networking carriers can pick up signals by simple receiving terminals, arrangements for originating educational broadcasts in the future are not inhibited by any technical factor. This should be to the particular advantage of the less economically developed countries where cost is always a concern.

Television

Even though the television has been utilised for distance education primarily after the 1960s, the general observation amongst most of the distance education scholars is that *“arguably, the invention of television and video recording had the most profound influence on the face of distance education”* (A Brief History, 2001).

Television developed slower than radio, because it is a more complex device. As a result of discoveries at the turn of the previous century, the first wireless picture was sent in 1884. Four years later, photo-electric cells for cameras enabled a better picture quality, but the television monitor as we know it today, had its origin in 1907, compliments of Rosing and Campbell-Swington (A Brief History, 2001 and others). These gentlemen first used cathode rays to produce television images in a television receiver. Later innovations saw the camera tube or iconoscope - courtesy of Vladimar Zworyken (the father of the television), that was patented in 1923. The first televised drama in 1928, broadcasting of sports activities in 1939 and the first television commercial in the same year followed this. However, it was not until the 1950s that the television became a mass communication medium.

The educational significance of broadcasting technology relates to three formats: informal, formal and non-formal, the latter being a combination of formal and informal

education (Minoli, 1996). Informal education is made available to the public. They can choose to tune in and select the choice of material. Informal education, for example Discovery Channel, is mainly delivered through cable and satellite television.

In formal education, the material is organised in a course of study for which the student enrolls. Progress is evaluated and a certificate of accomplishment is awarded on completion. Even though most of the educational influence of television has been informal, this device has been used extensively in formal education, particularly after 1960 (Rossman & Rossman, 1995).

Formal television instruction is delivered in three modes, namely broadcast and cable, instructional television fixed service and video recording. In broadcast and cable television, most instructional content is transmitted from stations specialising in educational and public services programming. The use of cable television for education and community purposes was spurred in the United States by rulings of the Federal Communications Commission (FCC), which required cable systems to maintain at least one channel each for public, educational, government and leased access (Feasley, 1992). A Higher Education Utilisation Survey conducted during 1984 and 1985 indicated that more than 2000 universities and colleges in the United States alone used broadcast/cable instructional television. Two-thirds of this number offered in excess of 10 000 courses via television and enrolled more than 400 000 students. The success of instructional television was confirmed by studies conducted by Chu and Schramm in 1967 which found that students at all grade levels learned as well in almost every subject area (Feasley, 1992).

The instructional television fixed service was created in 1963 as a result of the Federal Communications Commission's resolution reserving selected transmissions frequencies to be licensed to United States credit granting institutions for educational purposes. As a result, certain channels can only be used to deliver instruction, or in partnership with companies that deliver basic subscription-based video services that compete with land-based cable television systems, to deliver entertainment programming. Instructional television fixed service can be defined as being a:

Low-powered, all directional transmission system with a direct reception area of about 20 miles, which can be extended by signal repeaters and linked systems. Each instructional television fixed service licensed was allowed up to four channels that can be used

independently to serve different audiences simultaneously
(Feasley, 1992: 339).

Instructional television fixed service provides low-cost distribution of broadcast courses. The first university to apply for an instructional television fixed service license was the California State University.

Three typical uses of instructional television fixed service by higher education institutions include closed circuit television for an institution with multiple locations; a feed to the cable company and then to homes and finally, linkage of the college or university to businesses, industry or medical institutions (Feasley, 1992). Closed circuit television represents a system by which programs are transmitted to television receivers through wires rather than via open-air waves. Closed circuit television is typically used for sending lessons from an educational institution's central television studio into a variety of classrooms (Rossman & Rossman, 1995).

Closed circuit television offers two advantages over the use of broadcast television. The first pertains to the fact that closed circuit television is independent of the availability of airtime on crowded broadcast channels. Secondly, lecturers can send material to a desired classroom at a time best suited for their preparation and schedule. However, on the downside, institutions do indicate that a closed-circuit television network is expensive to construct and to maintain.

Video recordings offer the advantage that it can be recorded from the television broadcast or that material can be produced directly on tape. According to Rossman and Rossman (1995), the video system of delivering instruction through standard television channels started with the digital distance education revolution. As it presents several advantages, it remains a favourite among many distance education institutions today.

A fairly new innovation is the use of satellite broadcasting. This method mainly started with the development of NASA's application technology satellite series. The advantage of using satellite for education and instruction is that satellites can handle five times the number of transmissions than other transmitters (Rossman & Rossman, 1995).

Despite the fact that television courses are rigorously developed by a team of content specialists and instructional designers, many researchers indicate that in the basic Open University, television material is supplemented by study guides, textbooks, other learning resources and interactive media tools.

To conclude, the content of instructional broadcast (be it via radio or television) is very diverse and covers virtually all subject matter at all levels of education. The radio and television has been and continues to be very important media tools in fostering formal education. Although its use have been limited to the more developed nations, Third World countries have recently generated sufficient resources to implement low-cost technology and benefit from its advantages (Minoli, 1996).

3.7.2.3 TWO-WAY AUDIO TOOLS

Telephone

The roll of the telephone in the delivery of instructional content has mainly been as a support device for interactive conferencing. The students use the telephone to call the instructional content's originating classroom with discussion questions. Telephones have the advantage of real-time responses and with multiple toll-free phone lines into a classroom, multiple sites can simultaneously hear and interact with the instructor (Rossman & Rossman, 1995).

Bosworth (1991) was of opinion that the first and foremost step in telephone applications should always be for the learner to contact teachers or lecturers in times of difficulty or for regular scheduled contact. A secondary application is to bring the teacher and the group together using conferencing features provided through a direct phone line. As an example of such a conference, Feasley (1992) described the University of Wisconsin's Tele-conferencing technology. Each location has a loud speaker and four microphones to permit group interaction. The classes last 90 minutes and involve up to 100 students. In 1992, interaction via telephone was offered in 74 courses for 55 hours per week.

As always, good written material is at the heart of all successful telephone instruction. The telephone has inspired such innovations as the Tele-writer, electronic blackboards (graphic input devices) and slow scan video systems. More recent developments saw the on-line education revolution. Although fibre optics are becoming a modern favourite for the majority of all electronic mail (e-mail), messages are still mailed across ordinary telephone wires (Jones *Et al.*, 1993).

3.7.2.4 ONE-WAY VIDEO- /ONE-WAY AUDIO MEDIA TOOLS

Electronic Black boards

Electronic blackboards are at the base of electronic conferencing. These tools allow the instructor to write on a special surface in the form of a pad or board from which written impulses are obtained and transmitted to each distance location in either one-way or two-way modes (Ghosh & Cartwright, 1984).

Examples of electronic blackboards include the Bell system, which appears much like the standard black boards in traditional classrooms. As a teacher writes, the image is created on a television screen. Similar to the system is the Electro-writer, also used at the University of Wisconsin. The system sends electronic-based images from the instructor's overhead projection unit from the originating location to slave machines at remote destinations that react to impulses from the instructor's keypad.

Other examples include the Tele-note, the Forum system and Tele-writer I and II versions (Ghosh & Cartwright, 1984). All of these systems have the advantage of real-time interaction, but they lack the convenience of sending realistic, 3-dimensional images and pictures. The potential solution to this inconvenience came in the form of the slow scan video.

Slow Scan Video

The slow scan video offers narrow band technology that provides still black and white pictures, which are received by remote locations. Although slow scan video partially addresses the inadequacy of the blackboard technology, slow scan images are delivered at a slow rate due to inadequate bandwidth of ordinary telephone lines. Resolution can be increased, but this luxury comes with a reduction in speed (Ghosh & Cartwright, 1984).

3.7.2.5 TWO-WAY VIDEO TOOLS

Two-way video tools come in the form of computer conferencing that uses electronic channels to facilitate communication among groups of people at two or more locations via computers. Computer conferencing includes interactive relay chat, multi-user object orientation and multi-user domain technologies. Although these tools are not primary tools in delivering instructional content, they are very important supportive devices in the student's communication with the teacher and therefore, are included in this discussion.

Interactive Relay Chat

Interactive relay chat is a software package that allows for real-time, electronic interaction between anyone who has connected to the appropriate channel offered on the Internet. Interactive relay chat has many different channels and every channel contains separate conversations. It also allows for switching between channels and sending messages to users on other channels than the one you are using. This technology is characterised by Internet users typing messages that instantly appear on other interactive relay chat users' computer screens (Kramer, 2002 and ABC's of Distance Learning, 2001).

Listserve

A variation of interactive relay chat is Listserve (also known as news groups) – an electronic mailing list for e-mail driven discussions. Listserve can be defined as “*software that manages electronic discussion groups or computer conference distributions lists*” (Resources, 2001). The discussion groups are often referred to as ‘lists’. Once a student's address is on the list, Listserve allows the student to send messages to anyone else whose name appears on the list. Normally, each Listserve or threaded message board location has a topic or subject that forms the focus of the discussion.

Anyone with Internet e-mail may be a Listserve user. In a Listserve virtual classroom, you can direct your message to the whole group or to a specific individual, but only people who are in your discussion group will be able to read the message (Kramer, 2002 and ABC's of Distance Learning, 2001).

Multi-user Object Orientation

Another real-time Internet communication tool is the multi-user object orientation environment. As a newer version of the multi-user domain application, this technology allows users to create characters, objects and rooms for text-based virtual reality sites. Students connect (in this environment known as telnet) to hosts a virtual room in which they can converse with anyone else who has connected to that same host. Again, you can move from room to room to mail users in another room.

Multi-user object orientation offers the advantage of creating virtual objects to assist instruction. These objects can be in the form of slides (prepared texts containing content and advanced instructions to anyone in the room), or virtual video-recorded topics of conversations or presentations. In addition, students can record discussions in the virtual room.

The educational advantage of this tool is tremendous as is described by this quote from the Distance Learning Resource Website:

Moo's (multi-user object orientations) are most appropriate for 'same-time, different-place' situations where it is desirable to have the class together for interaction. For distance education, a student at home with a modem can connect to a campus computer, Telnet to the MOO site, and join his classmates in asynchronous discussion. Synchronous conferencing enables students at different sites to interact and collaborate. If every student in the class connects at the same time to the same virtual room, or if students in smaller groups meet in separate rooms, synchronous discussions can be held similarly to face-to-face classes. An instructor/moderator can be on-line to guide the procedure. For people who learn better in groups, MOO offers an excellent on-line option (Distance Learning Glossary, 2002).

Multi-user Domain

Multi-user object orientation is derived from multi-user domain technology, which can be defined as “*text-based, virtual reality programs in which users interact in real-time as they move between different rooms in an environment*” (MacDonald, 1998: 160). Multi-user domain offers the additional advantage of multi-user domain mail for personal messages and bulletin boards for public discussions.

Electronic Mail

Electronic mail or e-mail is the most important and popular service on the Internet and application for delivering distance education. E-mail represents an asynchronous communication that does not happen in real-time, but offers unlimited communication between students and teachers and students and their peers. Every Internet user has or can apply for an e-mail address in order to receive messages. The most common use of e-mail is to contact and communicate with others. This communication may occur across the room or across the world. Some distance education courses are often entirely via e-mail, while other courses combine several delivery modes utilising e-mail technology for increased interactivity (Kramer, 2002).

World-Wide Web

The World-Wide Web is used to organise information in the form of hypertext documents on the Internet. Students can find and display files, pictures, sounds, etc. by choosing items via hypertext links (hyperlinks). These links appear as pages of mixed texts and pictorial information.

Due to the fact that the information on the Web gets more diverse and access are more readily available, universities are now increasingly using this tool to supplement traditionally delivered courses or even to deliver entire courses over the Internet. Thus far, it seems that this mode is more inclined and successfully operated by mathematics and science orientated courses (Distance Learning Glossary, 2002 and Kramer, 2002).

3.7.2.6 ONE-WAY VIDEO TWO-WAY AUDIO MEDIA TOOLS

Audio-Graphics

The most detailed documented one-way video two-way audio tool is presented by audio-graphics. Audio-graphics can be defined as *“the combined use of voice transmission, computer networking and graphic transmission through narrow band data communication channels”*, or *“technological arrangement in which audio conferencing be supported by graphic devices”* (MacDonald, 1998: 158). Standard analogue telephone lines or digital communication lines connect various locations and graphics can be transmitted through a wide range of tools including facsimile machines, computers or electronic mailing systems. These devices create, store and send visual material such as hand-written drawings and still pictures.

An audio-graphic conference, which represents two-way video two-way audio involves a technical arrangement in which audio conferencing is supported by devices that send text and still pictures, which are normally displayed on a television monitor and to which students can immediately respond by using speaker phones. Examples of Audio-graphic technologies include Optel Telewriter, Proshare and SMART2000 (Bradshaw & Dessler, 1990).

Audio-graphics hold several advantages for the distance learning experience. Teachers and students can interact in real-time. In addition, learning materials can be produced, saved and copied to all sites in advance. The required material is brought up on the screen through on-line communication methods. Material can also be added to previous material for future usage. Arguably the greatest advantage is that audio- graphics

offer a visual learning experience. It is possible to generate the same kind of diagrams, charts, content outlines and board jottings that you get in a well-managed traditional classroom. In addition, audio-graphics is not limited to non-technical subjects, but can be equally effective in technological subjects (MacDonald, 1998).

Despite these advantages, audio-graphics learning can be very complex for both the student and teacher. Any additions to the learning experience results in a complex communication system that not only becomes difficult to manoeuvre, but can prove very costly and expensive. Also, audio-graphics is less flexible in that it still requires the student to travel to an audio-graphics conference centre with dedicated phone lines attached to the communication devices (Bradshaw & Dessser, 1990).

3.7.2.7 TWO-WAY VIDEO TWO-WAY AUDIO TOOLS

The best imitation of traditional education that distance learning will achieve comes through 'continuous presence' modes of delivery (Minoli, 1996). Two-way video two-way audio tools that offer interactive, synchronous teaching are at the apex of our delivery modes hierarchy and this format of delivery is represented by compressed digital video or compressed video learning, audio conferencing and computer conferencing.

Videoconferencing

Videoconferencing or compressed video learning occurs when students and teachers make use of microphones, cameras and other devices to exchange conversation or send moving colour images to engage in discussion or access experts as part of the formal learning endeavour (Roberts *Et al.*, 1998). Compressed video learning is also known as interactive television or interactive videoconferencing. Interactive videoconferencing differs from ordinary videoconferencing in that the latter utilises different tools that only provide one-way television with two-way audio tools (much like audio-graphics) (Roberts *Et al.*, 1998).

In interactive videoconferencing, the student meets synchronically with peers and the lecturers with the only difference from traditional education that it does not bring all students into the same meeting room. You can hear and converse with others and with the addition of graphic cameras, you can view text, graphics and 3-dimensional objects.

This feat of two-way audio/video is accomplished using digital transmission systems, such as digital telephone lines or fibre optics, called integrated service digital networks. In future, microwave and satellite technology will play a more significant role.

A device called a coder/decoder (Codec) digitises information. Codec compresses the signal at the transmitting end and then decompresses (decodes) this signal at the receiving end. Additionally, Codec converts incoming audio and video from digital data to analog (Roberts *Et al.*, 1998 and Distance Learning Glossary, 2002).

The reason for using the term ‘compressed’ is because full-motion video, such as displayed on television, requires the equivalent of 1200 non-digital telephone lines. Instead, compressed video devices reduce a picture into a signal that can be sent over only two telephone lines. The greater the compression, however, the less similar the picture quality may be to that of full motion videos.

Compressed video can be combined with other multimedia tools. Texts and graphics can be sent with a document camera, which displays information on a liquid crystal display. It is also possible that students without access to compressed video can participate in the conference via audio communication.

Compressed video offers a range of advantages making it a more and more desirable mode to utilise by distance education institutions. The fact that learners can learn and see one another when they exchange messages, create a social presence otherwise only achievable in a traditional classroom. Also, compressed video offers timely or ‘just-in-time’ learning (Syed *Et al.*, 1999). In other words, when new content is revealed or released, it can immediately be brought to the student’s attention. Compressed video learning offers the luxury that it is not content specific, in other words, a range of courses can be taught using this technology.

However, compressed video learning has its challenges. These mainly relate to cost and the resulting implication to replicate television viewing. Firstly, video technology is very expensive and, therefore, it is important that the mode is only used for tasks that take full advantage of its abilities. Secondly, our habit of watching television passively can be a hurdle for successful compressed video learning. It is important that all participants to the conference avoid thinking that they are there just to watch or to monopolise the conversation, which results in a tiring experience for the listeners (Roberts *Et al.*, 1998).

Audio Conferencing

Audio conferencing involves two-way voice communication between two or more groups or three or more students situated at different geographic locations. Currently, two types of phone formats are used, namely digital and analog. The traditional analog means

of communication encodes information as a continuous electronic wave. Opposing this, are modern digital approaches that are presented in discrete binary signals. Digital communication has the advantage of faster switching and has the capacity to simultaneously transmit voice, data and compress video signals over the same line.

In locations serving more than one student, speakerphones or special audio conferencing equipment should be used to reduce echoing and other interference. When more than one location is involved, multipoint network bridging equipment is used.

Basic components of an audio conferencing system includes telephone headsets, speakerphones or microphones and an audio bridge that interconnects multiple phone lines and speaker devices to facilitate multiple interactions. When cameras are added to enable participants to see each other, audio conferencing becomes audio teleconferencing - a system that offers visual and audio stimulus, but is more expensive (Portway & Lane, 1994).

A basic audio conferencing system may not be as 'glittery' as some of the computer applications, but it provides a low-cost, low technology solution to instructional problems. It does not require special technical skills and telephones are generally ubiquitous, easy-to-use and provide the students with a sense of communion and sharing in a familiar environment (Sheppard & Walker, 1999).

Computer Conferencing

Computer conferencing is defined as:

A system which enables two or more individuals at two or more locations to communicate without having to interrupt their work schedule and without having to pay for costly travel. These individuals can exchange information and learning aids through keyboard terminals, printers, and telephone lines. Participants access a common computer for extremely efficient, direct communication (Harasim & Johnson, 1986: 6).

Computer conferencing is slightly different from computer teleconferencing which is defined as "*a computer mediated interaction in real-time, allowing participants to see and hear each other through the use of streaming audio and video*" (Kramer 2002: 228).

Computer conferencing and computer teleconferencing involves the use of computers and software to teach people across time and space. This interaction resembles

a group meeting/discussion, but is held electronically. Messages are exchanged synchronically or asynchronously of which the latter entails storage of messages on hard disks.

This mode allows students to review proceedings, respond to specific messages, enter new information, ask questions to any participant or acquire data at any time of the day or night. Each student can interact via means of a text document or microphone, depending on the software that is used (ABC's of Distance Learning, 2001 and Harasim & Johnson, 1986).

General features of computer conferencing includes text editing, which can be either individual or group related, sophisticated searching abilities for conference items, access to external databases and electronic messaging via e-mail, interactive relay chat, multi-user object orientation or multi-user domain technologies. In addition, computer conference systems maintain a permanent record of proceedings during the course of a conference, thus serving as a type of 'electronic filing cabinet'.

Computer conferencing offers several advantages over electronic bulletin boards and other on-line information databases. These advantages pertain to the different ways computer conferencing allows the student to structure communication. The student can choose to engage in synchronic or asynchronic interaction, combine on-line modes with printed media opt for audio or video assisted interaction – to name but a few options (Roberts *Et al.*, 1998).

As all information on a particular topic is stored together in a conference, students can choose items of personal interest. Additionally, as the technology is continually enhanced, computers become cheaper and more readily available, thus not only shortening the delays between communication, but also making the interaction a more lifelike experience.

3.8 WHAT DOES THE FUTURE HOLD?

The extent to which 'continuous presence' will add to the openness of learning opportunities will depend on the skills of computer programmers. Artificial intelligence may in the future provide computers that will not only think for themselves, but also learn. Despite high expectations of artificial intelligence, it is proving to be more difficult to realise than was initially anticipated. There is the belief that a 'thinking machine' can do all the teaching. People-teachers would become facilitators providing personalised backup

while computer-teachers did all the knowledge and skill input. This is proving a difficult dream to implement and may, anyway, be too impersonal for most learners.

However, the future for on-line learning is enormous. Systems already exist, such as embryo artificial intelligence and the hypertext language for the design of interactive computer learning. In the words of Bosworth (1991: 103) *'Imagination and simplicity could lead to every 21st century learner having his or her own personal tutor on-line or inside the computer. Then we will certainly need to build human physical contact into our systems'*.

3.9 SUMMARY

This chapter emphasised the liberation of the distance education student by way of reviewing each of the different modes that the student who studies at a distance can choose between. Delivery modes can be classified differently depending on the particular criterion applied - according to direction, modes can be interactive or non-interactive; according to time delay, modes can be synchronic or asynchronous. We also showed that, even though many of the traditional alternatives are still used today, the method of delivering instructional material is becoming more and more electronically inclined with on-line delivery modes being the route of the future.

This chapter separated delivery modes from media tools. Modes can either be print-based, audio-based, video-based or on-line. Each mode employs its own set of media tools that range from one-way, non-electronic to fully electronic two-way audio/ video tools in the form of conferencing. These tools were illustrated according to their level of sophistication when viewed from the perspective of interaction between students and lecturer. The textbook is indicated to be the least complicated and the 'continuous presence' of computer conferencing occupied the apex of our hierarchy. It is also made clear that old-fashioned textbooks, despite being the least sophisticated tool, are frequently used with all the modes.

While it is difficult to 'get rid' of the textbook, future innovation move towards greater refinement of artificial intelligence so as to ultimately change the computer into a teacher – a feat no matter how imaginative, that will truly nullify the separation between students and distance education instructors.

4 THE DISTANCE EDUCATION STUDENT AS A DECISION -MAKER

LIBOF: Are you still a student?

TRIFOMOF: I expect I shall be a student to the end of my days...

- A. Chekhov (1860 – 1904)

4.1 INTRODUCTION

To this point, the research has indicated that distance education in its simplest form, is the concept of a student and an instructor engaged in the education activity, separated by time and distance. This separation impelled the involvement of technology to complete the instruction. The purpose of distance education entails exposition of the learner to educational opportunities the students, otherwise, might not have been able to attain. But who is the distance education student? The fact that the student and teacher are separated from each other imperatively implies that the distance education student's characteristics are different from those of the traditional student (Mood, 1995). After all, it is the focus of this study to isolate the factors that affect the distance education student's decision when he chooses between print or on-line modes. Therefore, the researcher necessarily wants to illuminate the characteristics of the student as a component in distance education that undertakes the endeavour to choose, as these characteristics may affect the student's decision to choose a particular mode.

In order to understand the student as a distance education component, the discussion will evolve around five distinctive themes pertaining to the student's character and situation. Initially, we try to define the distance education student and once such a concept is established this definition is used in section 2 to relate the distance education student to his traditional counterpart. Section 3 attempts to portray the student who studies at a distance, as a decision-maker.

Payne, Bettman and Johnson (1993) always place the decision-maker in a decision environment depending on the decision-maker's particular circumstances. We attempt the same toil in section 4, gives an account on the particular environment of the distance education student. A review of the literature also indicated a common agreement among researchers that the labour of deciding is rooted in some sort of conflict. This topic will be discussed in much more detail in the next chapter, but we will briefly refer to the conflict that moves the distance education student to his decision to choose a particular mode

between print or on-line modes of instructional content. As always, we conclude with some reflective remarks on the achievements of this chapter.

4.2 WHO IS THE DISTANCE EDUCATION STUDENT?

Although no formal definition of the distance education student exists, literature on distance education, distance learning and students as learners in general allows us to deduce a concept of distance education student. If we combine all the essentials of these accounts and merge the concept of a student or learner with separation, it becomes possible to derive a description, which by no means should be seen as the definitive or absolute.

The student is the one who learns (Van den Aardweg & Van den Aardweg, 1988). From this, 'learns' can be grammatically altered to learner: *“the one who learns a subject or skill”* or *“the one who engages in the activity of acquiring knowledge by study”* (Branford, 1989: 426). This definition is not sufficient to describe the distance education student, as a student in the traditional classroom environment is also a learner. However, if we shift the focus from learning to study, the Oxford dictionary (1989: 767) comes closer to an appropriate definition. From study, we derive student, who is *“a person who is studying, especially at a university or other place of higher education”*. The reason why this definition is more successful in separating the distance education student from the traditional student, who studies in a classroom environment, is because of the reference to age that is implied. The reader will find that age is a definite distinguishing character of the distance education student. The distance education student is not entirely an educant, for Van den Aardweg and Van den Aardweg (1988: 71) defined an educant as *“an infant, toddler, pre-scholar, primary scholar, and adolescent who needs to be educated”*. Based on studies conducted during 1992 and 1993 at the University of Athabasca in Israel and Britain's Open University, post-school youths do engage in distance education, but in minute percentages (Guri-Rozenblit, 1999). This same argument regarding age was raised by Sewart, Keegan and Holmberg (1983: 166): *“although there are large numbers of youngsters in certain specific distance education systems, generally distance education students are adults”*.

Mood (1995: 101) adds another dimension to age in the following statement:

Most distance education students are adults, who have the autonomy to make choices. Although distance education is used in primary levels of education, particularly in sparsely populated areas, it is usually done in conjunction with intensive tutoring by a

family member. Most distance education is experienced by adults who are highly motivated and self-directed.

To this point, we have indicated that the distance education student is an individual who aims at the acquisition of knowledge, is older than the adolescent and is characterised by autonomy, motivation and self-direction. Yet, in a definition of the distance education student, one is compelled by the description of distance education to reflect on the separation experienced by the student in this format of education. Both Keegan (1996) and Mood (1995) make reference to the fact that the distance education student is separated, not only from the teacher, but also from peers and the physical presence of the institution. This separation results in a learning experience that is solitary, arduous and frightening (Willis, 2002).

Now that we have separated some of the distinguishing factors that is unique to the distance education student, we can combine these to form a descriptive statement that will read as follows:

The distance education student is part of a non-homogeneous body of adult individuals that are more often than not representative of the economically active age group of the population and who is driven by motivation, autonomy and self-directness in pursuit of acquiring knowledge to facilitate work promotion, job-related skill enhancement, or extension of current knowledge that is of interest to the learner. Such knowledge is acquired through a particular mode of study that is mediated by several tools in a structure not characterised by formal classroom attendance, but distance education.

We realise that this definition, like any other, is open to severe critique, which is normally the situation when one tries to limit a phenomenon by inadequate boundaries. In our situation, the adequacy results from the diverse nature of the phenomenon we are trying to describe. This definition will be more successful in conceptualising the distance education student, if we compare the characteristics of the distance education student to that of the traditional education student. The next section attends such a comparison with particular reference to origin, purpose of study, process and requirements for successful study.

4.3 THE DISTANCE EDUCATION STUDENT VERSUS THE TRADITIONAL EDUCATION STUDENT: A COMPARISON

This section aims to elaborate on our definition of the distance education student by comparing the learning situation of the distance education student to that of the student who attends regular classes. The purpose of this section is to give the reader additional information on the background of the distance education student that might be influential in his decision to choose a particular mode of delivery. Six measures of comparison have been identified and are discussed individually.

4.3.1 CHOOSING AN EDUCATION ENVIRONMENT

Whether to study at a distance or attend traditional classes proved to be a valid distinguishing factor. Students choose to study at a distance because of reasons that can be classified either as barriers or push factors from traditional education, or alternatively, attractions or pull factors to distance education (Guri-Rozenblit, 1999).

Barriers or factors preventing the student to choose traditional education may include the following. Situational factors that pertain to circumstances in the student's individual life such as family and work obligations; physical constraints such as geographic isolation that make studying at a distance the only way to gain an education, etc. Geographic isolation may be the result of moving after the student completed most of the credits for a degree and distance education is now more convenient than registering at a new campus. The same argument applies to rural occupants who are isolated from college campuses. In addition, family responsibilities might impede on the student's engagement with instructional content because of his home obligation. Very often work responsibilities that relate to odd working schedules or frequent travelling preclude regular class attendance. The effect of home and work responsibilities on studies is discussed in more detail in the section on outside factors.

Another physical constraint, although fairly limited in its occurrence, is weather considerations, particularly those associated with harsh climates. Harsh climates often result in bad roads making it difficult to travel to the classroom (Mood, 1995 and Guri-Rozenblit, 1999).

Apart from situational factors, institutional factors that relate to the organisational policies and procedures of the education institution might tip the scale in favour of a distance education selection. However, according to the second American Symposium on

Distance Education (McIsaac, 1991), the constraint that seems to be most influential is a psychological factor that concerns the student's attitude towards himself and his learning preferences. The conclusion of this Symposium is that most distance education students are adults, and as such, have the autonomy to make decisions and choices regarding their learning styles and preferences. According to Mood (1995), this autonomy is revealed in the distance education student's motivation and desire to self-direct his acquisition of knowledge.

On the pull side, the main attractions in favour of a distance education selection, is the ability to control the time, place and pace of study. To these, MacKenzie and Christensen (1971) adds the flexibility in choice of curricula, but this is not really an attraction as the traditional student at tertiary level is exposed to exactly the same choice of subjects as the distance education student.

Opposing this choice of the distance education student, Sewart *Et al.* (1983) is of the opinion that traditional education is not characterised by choice, but rather that the student body results from a prescription by the central government. Although this prescription is more pertinent in the primary and secondary levels, Sewart *Et al.* (1983: 165) refers to a "*distinguishable traditional age group with traditional objectives relating to initial employment*". Due to the homogenous nature of the distance education environment, no such 'traditional' group is distinguishable.

4.3.2 PURPOSE OF STUDY

Another enabling factor to separate the distance education student from the traditional education student results from investigating the purpose for their study. If education at primary and secondary levels are prescribed, the student does not have a great deal of influence in the purpose of the study apart from the self-actualisation that the student undergoes which culminates in his ultimate acceptance in his community as a responsible adult (Vrey, 1991 and Du Plooy and Kilian, 1982). The traditional student at tertiary level is more often than not in a preparation phase for a particular or potential career and engages in this process of preparation over a set timeframe that is structured according to time and location (Mood, 1995).

The purpose of study of the distance education student is different to the extent that a mean of 76.6 percent (percentage based on a survey of research done by five universities from 1992 to 1993) of distance education students are already in the job market (Guri-

Rozenblit, 1999). The primary focus of these students is not initial preparation, but rather enhancement of current work related skills or for promotional gain (Mood, 1995).

Additionally, most distance education students embark on a study course with a short intent (Mood, 1995). This statement was deduced from results of an independent study that showed that more students in the distance education format embark on single course studies than on full degree programs. Relate this to the single mode traditional students that pursue - or at least intend to pursue - a full course resulting in an academic degree (Mood, 1995).

4.3.3 ENGAGEMENT WITH THE STUDENT

The essence of any successful education is located in the educator's engagement with the student. Through his authority, trust, expertise and understanding, the student is guided through several developmental phases in his acquisition of knowledge and skills in order to become a responsible adult. This engagement is characterised by a decreasing intensity with relation to the student's progress from primary to secondary and eventually tertiary education (Very, 1991, Du Plooy and Kilian, 1982 and Van den Aardweg and Van den Aardweg, 1998).

Despite the interaction between student and lecturer in the form of remarks on a student's efforts during an assignment, Mood (1995: 102) is of the opinion that engagement is a luxury that the distance education student, even the most motivated, finds elusive. As individuals who have already reached the status of adulthood and whose self-actualisation reached a stabilising plateau, distance education remains an experience that is *"lonely, difficult and daunting"*. Because of this lack of engagement, distance education implies a certain attainment of study skill - one that involves *"planning and the ability to analyse and apply the instructional content being taught"* (Willis, 2002).

4.3.4 ACCESS TO SUPPORT MECHANISMS

It is not only with regard to engagement that the distance education student is at a disadvantage. Because of their isolation, distance education students sometimes lack the support mechanisms that traditional students often take for granted. Support mechanisms can be divided into two groups. Formal mechanisms refer to those support structures that are planned and provided continuously in order to give students counselling, be it academic or personal, or any advice on which courses to take or how to sequence them. To this extent Mood (1995) makes the comment that distance education students often complain

that instructors are not available, no matter what the system of contact - whether correspondence, telephone or computer modes, are employed.

Counselling is not the only support mechanism that distance education students find evasive. Library resources too, are less available to the distance student, particularly those in geographically remote locations. To make matters worse, academic libraries are seldom open to students outside of their own community, which implies that even if the distance education student lives near a campus, access may be denied (Watson & Jayannathan, 1997).

Regarding formal services to the traditional education students, Mood (1995: 102) says:

It is still easier for residential students to linger after class, to visit the professor's office during posted office hours, or to make a special appointment. Even the computer student has more convenient access to the professor's time than the student at a distance.

Like the formal systems, their informal counterparts proved just as hard to come by. Informal systems pertain to the casual encounters on campus with either the instructor or peers. These encounters are very important to the student as a measure of progress when the student compares himself to his fellow students. To this extent, the traditional student has the luxury of hearing the questions others ask, talk about the difficult components of the course work, etc. Unfortunately, there is no way for the distance education student to assess his progress apart from the delayed remarks of the instructor. The drawback of this lack of informal support regularly results in the distance education student who experiences the unfortunate perception that, while everybody else is doing fine, he is struggling (Guri-Rozenblit, 1999).

4.3.5 OUTSIDE FACTORS

A number of additional factors make the learning experience of the distance education student more challenging than what is experienced by the traditional education student. Some of these factors have already been mentioned, such as home and work responsibilities, but to these we can add the following technical considerations.

Home responsibilities and interfering family members, who demand your commitment to them, often result in a lack of study time or a quiet study environment.

Both Kundu (1986) and Moore (1990) indicate that work too, often has a negative effect on a student's study commitments. It is Moore's notion that the distance education student often holds the perception that other duties must be completed before studying - after all, it is the work that pays for the tuition. To this Kundu (1986) adds a sudden deadline, the unexpected out-of-town trip, increased pressure, etc. that results in added stress that makes concentrating difficult (Kundu, 1986).

It is not only work and family responsibilities that provide hurdles. Technical considerations such as access to equipment necessary for a particular course, the substantial monetary outlay involved to get technically prepared for course requirements, etc., have often resulted in decisions with a less than desirable outcome on the part of the student. Students that use computers allocated to the general public because of the absence of a personal computer, are regularly faced with the disappointing prospect of standing in a long queue, failure to connect due to hardware trouble, unfamiliarity with the software applications, and so forth, to name but a few.

From the above it is evident that the average distance education student must overcome formidable hurdles such as isolation, stress as a result of family and work pressure and trouble pertaining to technical devices. Still, with careful planning on the part of all the key players in the distance education system, students that study at a distance can avoid many of the pitfalls.

4.3.6 STUDENT CHARACTERISTICS

Reviews of the work that was done by several experienced scholars indicate distinct differences in student attributes between the distance education and traditional education students. These differences can be broadly classified as follows: age, employment, experience and skills.

Some basic variables relating to student age, gender, state of employment and purpose of study is indicated in **Table 4.1** below.

Table 4.1: Students' distribution by age, gender, state of employment and purpose of study in 1992 at the British Open University, UNED, the Open University of Israel, Fern University and Athabasca University (Guri-Rozenblit, 1999: 67)

Variables	Distance teaching universities				
	British Open University	Universidad Nacional de Educación a Distancia	Open University of Israel	Fern University	Athabasca University
Number of students	120 414	123, 963	17, 929	52, 570	11, 352
Being employed (%)	70	71	82	80	80
Age					
Median	34	30	31	30	34
Under 24 (%)	4.2	21.8	27.6	10.3	19.7
	British Open University	UNED	Open University of Israel	Fern University	Athabasca University
Over 45 (%)	19.3	3.2	9.8	7.4	10.7
Gender					
Female (%)	48.6	42.7	54.6	32.8	66.8
Male (%)	51.4	56.9	45.4	67.2	33.2
Purpose of study					
Degree (%)	78	74	77	80	32
Other (%)	22	26	23	20	68

The results of this table indicate distance education students to be generally older than the traditional education post-secondary youth with a median age of 31.8 years. Only 18.16 percent of the distance education student population is below the age of 24 years - 24 being the age to be more representative of the student population who's study objectives relate to initial employment (Sewart *Et al.*, 1983). Sewart *Et al.* (1983) is of the opinion that when students exceeds 24 years of age, the study objective diverts away from initial employment to bettering current employment position.

The majority of distance education students (70-80 percent) study while being fully or partially employed. This is very similar to the South African experience, which is summarised by Bosman and Frost (2002) as “*most registered distance education students are, in our experience, in full-time employment*”. It is obvious that, because of the age

difference, traditional education students are, apart from the odd part-time job, usually not economically active - at least not from the perspective of supporting a family.

Perhaps the most significant characteristic attribute separating the distance education student from the traditional student, is the experience and skill associated with the particular mode of study. The conclusions of the Round Table Conference on Distance Education for South Asian Countries (1990) and Roberts *Et al.* (1998) highlight the distance education learner's ability to assess himself. Potential distance education students must be self-motivated, must be able to work with minimal direction and encouragement and set up and maintain a schedule. They must be responsible decision-makers and selective with regard to their routine. They must have initiative to engage in research before entering into a particular course and during their studies to assure that they meet their initial objectives. They must be able to manage feelings of insecurity when they 'tread on new turf' - especially turf of the technical kind when engaging in interactive communication (Mood 1995).

Fortunately, after reviewing the testimonials of several experienced distance education students, Mood (1995) concluded that the challenges presented by distance education made the students better and more effective individuals. These students worked harder and ultimately learned more. Clearly, distance education offers benefits that make the many challenges it provides worth conquering!

4.4 THE DISTANCE EDUCATION STUDENT AS A DECISION-MAKER

Leigh (1983) portrays the one who makes the decision as the most important element in the decision process. The question remains, however, whether the student can truly be regarded as a decision-maker. Before we can embark on solving this question, it is necessary to understand the concept of a decision-maker. Once we have established a clear concept of the one who makes the decision, we can compare the student to the specified criteria and make a final judgement.

Taylor (1984: 64) defines the decision-maker as the "*individual, group or society faced with choices*". Similar to this definition is Leigh's description which portrays a decision-maker as an "*individual with beliefs and value which he incorporates into his final choice*" (1983: 23). These definitions share two commonalities. The first relates to the human nature of the process and the second to the challenge of making a choice. In this sense, we can conclude with Keeney and Raiffa (1993) that if an individual has

choices to make, that individual can be considered to be a decision-maker. Does the distance education student satisfy these criteria? Because the first criterion is obvious, we only need to prove that the student has a choice to make. Choice is central to the theme of our research and is not only limited to the decision of choosing between print or on-line delivery modes, but can be extended to include a magnitude of choices the student faced before embarking on the journey to study at a distance. Some of these choices include the consideration of whether to study or not to study, whether to do so at a distance, in the conventional classroom or 'virtual' classroom. An evaluation of the evidence clearly portrays the distance education student as a decision-maker.

As a decision-maker, the student decides using a wide variety of strategies which range from a careful and reasoned examination (and which normally results in an informed decision) of alternatives to simple and fast rules of thumb (often resulting in uninformed decisions with less than desirable results) (Payne *Et al.*, 1993). Through this variety of strategies, the student shows flexibility in responding to wide variety of task conditions. Apart from flexibility, the student as a decision-maker is also the one who adaptively responds to a decision task, namely the task of choosing. This task is undertaken via the use of multiple decision strategies. In this light, Payne *Et al.* (1993: 2) portrays the student as a "*limited capacity information processor to the demands of the decision action*".

To simply portray the student as the human component in the decision process is not satisfactory. As researchers, we need a more descriptive account of the individual characteristics that separate the student from other decision-makers. To this extent, we will use the same classification as put forward by Moody (1983) who, depending on the values of the individual, classifies the decision-maker into six groups according to the approach followed by each in solving the problem (where the problem is defined as the need to relieve the conflict that arose from being presented with more than one alternative to choose from and eventually to make the ultimate choice).

Moody (1983) classifies the individual who is only interested in what is useful and practical as the *economic* decision-maker. If the decision-maker values harmony and individuality, then he is referred to as the *aesthetic*. The *theoretical* decision-maker is committed to the discovery of truth, diversity and rationality, whereas the *social* decision-maker is a lover of people. *Social* decision-makers are kind, sympathetic and unselfish. If the decision-maker is interested in power, influence and being renowned, they are regarded as *political* decision-makers. Finally, the decision-maker whose highest value is the

greatest spiritual and absolutely satisfying experience is called *religious* decision-makers. *Religious* decision-makers are "*aesthetics who seeks experience through self-denial and dedication*" (Moody, 1983: 17). Decision-makers who are not pure examples of one of the above will portray some or a combination of the characteristics of the types mentioned.

The student's decision process to choose a particular mode between the alternatives of print or on-line delivery modes, is primarily an interpersonal process that originates from an internal conflict which the student actualises in a particular decision environment (Hill, 1979). To better conceptualise the student as a decision-maker, it is necessary to investigate the conflict that institutes the need to choose and the environment within which the student finds himself, as this environment is different from the space experience by other decision-makers. The student's conflict and his particular decision environment will be the thesis of the next two sections.

4.5 CONFLICT EXPERIENCED BY THE DISTANCE EDUCATION STUDENT

At this point, the researcher wishes to indicate that conflict is a key factor in the decision process and is discussed in chapter 5. Therefore, types of conflict, how conflict is different from dissonance and a formal definition is central to our discussion on the decision process in the next chapter. This section of conflict aims to firstly, describe what moved the distance education student to make a choice and secondly, describe the factors that are influential on the conflict that is experienced by the student.

Students in the distance education format are typically given a specific set of alternatives and apply their particular attribute values in solving the problem of making an optimal decision. Optimal decisions are those that stem from self-confidence, self-assurance and a pursuit of total and not partial solutions (Leigh, 1983). Here it is important to note that preferential problems (problems where solutions are based on the decision-maker's preference) often contains elements that make the solution difficult (Payne *Et al.*, 1993). The type of problem experienced by the distance education student in this study is fundamentally preferential in nature, because the student will select a mode that suits his preferred needs. As a result, conflict is typically present in the sense that no one option best satisfies all the attributes to which the student as a decision-maker associates value (Carroll & Johnson, 1990).

Conflict has long been recognised as a major contributor to making the decision of the distance education student a difficult endeavour. Because this conflict stems from the

problem of one individual, the student's conflict is described as intrapersonal conflict. Intrapersonal conflict differs from interpersonal conflict to the extent that the latter refers to the solution that satisfies the decision needs of the entire group or society (Hill, 1979). Intrapersonal conflict develops, because the process of studying is not structured in a way where student can be indifferent as a decision-maker to the choices that are made (Hill, 1979). Students have strong feelings about the alternatives that they pursue as well as those that are left behind. Decisions always result in consequences - be they positive when the study endeavour is effective or negative when the student fails to achieve his initial objectives. Negative outcomes usually result in emotions of regret (Taylor, 1984). Therefore, decisions inevitably contain the elements of conflict, which in our study originate from the need to choose between two delivery mode alternatives, namely print or on-line instructional content.

Conflict can be either motivational, cognitive or a combination of the two depending on the student's experience of his decision environment (Gouldstein & Hogarth, 1997). The German psychologist, Deutsch (1973), describes the motivational factors that influence the conflict as follows. Conflict is affected by the characteristics of the one who experiences the conflict. These characteristics include his values, motivation, objectives, history of conflicts and means of resolving them. Conflict is also affected by the relationship of the one who experiences the conflict with his particular environment. In addition to these, conflict is also influenced by the interest of others in the outcome decision that is made to resolve the conflict. The means to resolve the conflict such as dominance, discussion, coercion, incentives and withdrawal is also very influential. To these Deutsch (1973) adds the consequences of the conflict in terms of long-term or short-term results, future relationships, gains or losses that the decision-maker might experience.

Ausubel (Van den Aardweg & Van den Aardweg, 1988: 44) describes the cognitive dimension of conflict as it pertains to the student as a learner as "*the cognitive-personality orientation (of the student) to learning*". The most important dimensions for cognition include:

- difference along a generalising-particularising continuum;
- the tendency to compartmentalise or interpret knowledge;
- preference for cognitive simplicity or complexity, which together with consistency is described by Cassel (1973) and Wright (1984) as the two fundamental decision needs of any decision-maker;

- preference for broad or narrow categorisation;
- degree of openness to new information
- general personality aspects of dogmatism, and
- degree of tolerance for ambiguity.

Each of these will be discussed in broad terms in the next chapter, as they are all consequential in the decision process.

Because the decision environment is influential in the type of choice the student will make, it is necessary to observe this environment more carefully. Such an observation is the objective of the next section.

4.6 THE STUDENT'S DECISION ENVIRONMENT

The decision environment is defined as the conditions that "*influences the selection of objects, bound the search, constraint the selection of alternatives and directly affects the acceptance of an implemented course of action*" (Payne *Et al.*, 1993: 9). The decision environment is the condition and influence under which the student decides. This environment is unique to each individual and does not affect each student in the same way. Binswanger (Needleman, 1968) describes the environment as follows:

- the *Umwelt*, which is the environment or world of objects to which we should physically orientate ourselves and in which we should act;
- the *Mitwelt*, which is the world of interpersonal relationships, and
- the *Eigenwelt* or own world, which is the world of one's relationship with one's self.

Thus, the student as a decision-maker forms relationships with objects in his *Umwelt*, with significant people in his *Mitwelt* and with himself, and as a result establishes an *Eigenwelt*.

"*Choices made within the social and political context of the individual and his environment*" (Taylor, 1984: 62). Payne *Et al.* (1993) describes this context as the factors associated with the particular values of the student. These values are dependent on the individual's perceptions.

The decision environment of the student is subjective and is, therefore, unique to each individual student. It reflects the particular cognitive, perceptual and emotional states

of the student at a specific point in time (Taylor, 1984). Depending on his specific situation, the student's decision environment can result in uncertain, complex and open system decision processes. The uncertain decision process stems from an environment that only provides partial knowledge of the variables. Students with insufficient information will more than likely experience difficulty solving the following questions:

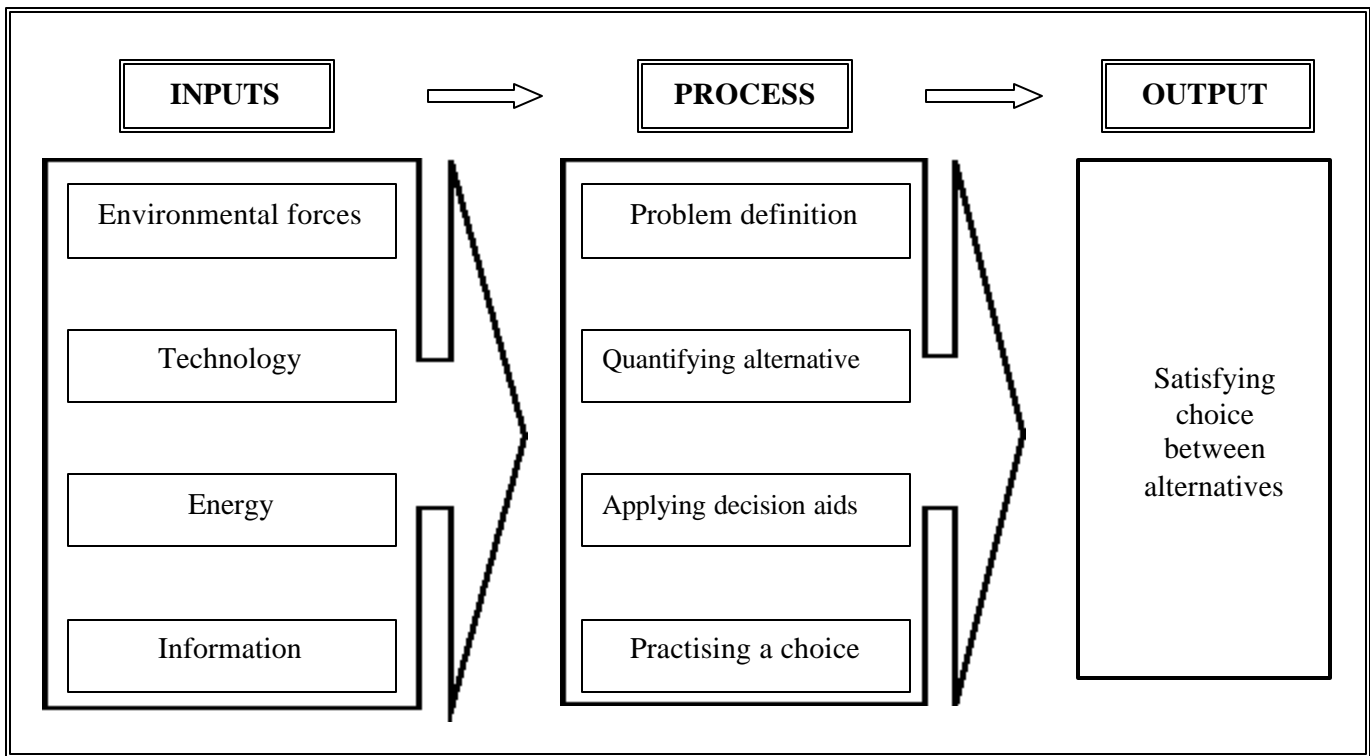
- What is the decision problem?
- What resources are available for solving the problem?
- What events may affect the outcome?

The complex decision, on the other hand, results from an environment that is characterised by too much information relevant to the problem. Complex environments force the student to cope with a multiplicity of factors and their inter-connectedness (Moody, 1983 and Payne *Et al.*, 1993). In addition to the volume of the alternatives, complexity is increased by the additional magnitude of different dimensions on each of the alternatives that contribute to the decision process. To this, Goldstein and Hogarth (1997) add the perspective of time pressure and conclude that the less time the decision-maker has to choose, the more complex the environment becomes. The decision environment can also be made complex by the social and political factors that influence the decision-maker. Normally these factors relate to the number of people involved with a decision-maker during his decision process. As a general rule, Taylor (1984) indicates that the more people involved the more complex environments it comes.

The decision environment can also be regarded as an open system (**Figure 4.1**).

In this system, the student as a decision-maker receives inputs from his environment in the form of energy, materials and decision aids to assist his decision, etc. These inputs are processed in the actual decision activity of understanding the problem, quantifying the alternatives and the application of decision aids in the making of a choice. The output of such an open system is a decision that is either satisfying or regretful depending on the decision-maker's experience of the consequences of his choice (Svenson & Maule, 1993).

Figure 4.1: The Open system decision process model



To conclude, the decision-maker's representation of the environment as being uncertain, complex or open is based on the student's problem space/environment or knowledge slates (Payne *Et al.*, 1993). The student can either choose to dominate the space/environment and most likely practices a choice that will be satisfactory, or can choose to be dominated by the environment, in which case he is more likely to experience regret as a result of an unsatisfactory decision outcome. The decision environment ultimately determines the effectiveness of the implemented decision. It is, therefore, unlikely that a choice made without regard to the environmental factors, would be effective (Johnson, 1990, Maule, 1993 and Taylor, 1984).

4.7 THE STUDENT AS AN OPTIMAL DECISION-MAKER

Dominating the decision environment is only part of becoming what Leigh (1983: 15) refers to as "*being an optimal decision-maker*". Because the student is able to manipulate his environment, he has the potential to become an optimal decision-maker. However, being 'optimal' requires specific personality traits. Leigh (1983) propagates that the student must be a risk taker who pursues total resolution of the decision problem.

The optimal decision-maker will attack the problem instead of passively hoping that the problem will solve itself. This requires of the student to be self-confident and self-assured. In addition, students must have an overriding sense of security and be tough-

minded. Students should have a broad field of vision, but must be able to focus on the relevant and the important and disregard the irrelevant.

Finally, optimal decision-makers should be able to deal with criticism, be it positive or negative, as these inputs will influence the future decision process (Keeney & Raiffa, 1993 and Klein, 1993).

If the student is in control of his decision process, the task of choosing between print or on-line modalities will be much less ominous. These students will ultimately make an informed decision (which is the result of applying all the aspects of the decision process discussed in the next chapter) and will most likely experience satisfaction instead of regret during their study endeavour.

4.8 SUMMARY

This chapter distinguished the distance education student from his traditional counterpart through a definition that illustrated age variance, autonomy, motivation and separation. This distinction was supported by our comparison of the distance education student to the traditional education student and showed that the distance education student primarily differs from the traditional education student with respect to choice of an education format, the purpose of study, the lecturer's engagement with a student, access to support systems and student characteristics. It was also indicated that, in those instances where the decision to study via distance education is not a personal preference, several outside factors, such as weather, family and work prevented the student from taking part in the formal classroom environment.

The account on the student as a decision-maker confirmed the status of the distance education student as being a decision-maker due to his need to choose between the alternatives of print-based or on-line modalities. The choice between alternatives constitutes an intrapersonal decision conflict that the student tries to resolve. This conflict is affected by the student's decision environment - a subjective 'space' that is either uncertain, complex or open depending on how the student reacts to the information that constituted the conflict.

It was made clear that the student should try to dominate this environment instead of being dominated by it, as the latter is most likely to result in an unsatisfactory decision outcome that will lead to regret. Students who can dominate this environment and portray characteristics of being tolerant of ambiguity, has a positive self-concept, were motivated

by the conflict instead of threatened by it and who showed an interest in the decision task, were labelled as being optimal decision-makers.

The next chapter will focus on the specific aspects of the decision process and includes accounts of decision models, decision types and key issues for the student as a decision-maker. These ultimately influence the student's choice between print or on-line modes of receiving instructional content.

5 CHOICE AND DECISION-MAKING

*The result is that peculiar feeling of inward unrest known as indecision. Fortunately it is too familiar to need description, for to describe it would be impossible. As long as it lasts, with the various objects before the attention, we are said to **deliberate**, and when finally the original suggestion either prevails and makes the movement take place, or gets definitely quenched by its antagonists, we are said to **decide**, in favour of one or the other course. The reinforcing and inhibiting ideas meanwhile are termed reasons and motives by which the decision is brought about.*

-W. James (1890-1981)

5.1 INTRODUCTION

We've all had the experience of being with a group of people trying to figure out where to go to eat, what movie to see, or what time to meet. *"What do you want to do?" "I don't know. What do you want to do?"* From the perspective of a distance education student, questions revolve around *"What do I study?"* or *"How do I study?"* and more specifically to our research: *"Now that I know what and how to study, how do I access my instructional content?"*

Some people (students included) just aren't good at making decisions. Other people can snap to a judgement with almost no information at all. The question remains why? What is it in our cognition that helps us choose between conflicting alternatives? Why do some people make decisions more easily than others do and why do some people seem to make better decisions? These questions form the thesis of this chapter.

Understanding the motivational factors that affect the student's choice when choosing a particular mode of delivery, requires some comprehension of the decision process. The influential factors that motivate a student to choose either print or on-line instructional content, relate closely to how a student decides and as such, it is necessary to investigate the key features of the decision process of the student who acts as a decision-maker.

We will begin our journey to expose the essence of the decision process by defining the concept of decision-making. As choice between alternatives is fundamental to our discussion, we distinguish between the semantics of choice and decision-making and establish the relationship between these two concepts. Once such a relationship is conceived, the researcher will present a detailed account of the process of making a decision. We comment on the decision problem, quantification and qualification of the alternatives, the application of decision aids and the decision act itself. Our account on

decision types distinguishes between informed and uninformed decisions, normative and descriptive decisions and finally, interpersonal and intrapersonal decisions. We show that the student's decision to choose between print and on-line modalities is fundamentally an intrapersonal decision process and illustrate the miscellaneous components of this type of decision by investigating the student's conflict, needs, environment and personality traits. A brief summary concludes this exposé on the decision process.

5.2 CONCEPTUALISING DECISION-MAKING

5.2.1 DECISION-MAKING: A DEFINITION

A number of theoretical perspectives have been employed to conceptualise the phenomenon of decision-making. Our approach at trying to define this phenomenon, begins with a chronological presentation of various definitions, starting with descriptions formulated in the late 1960s and early 1970s as these dates signify the onset of the interest in decision theory (Brinkers, 1972).

In 1965 Feldman and Kanter (Taylor, 1984)) described decision-making as *“selecting a path which will move the system - individual, computer program or organisation - from some initial to some terminal state”*. Five years later Shull, Delbecq and Cummings (1970) presented the following definition:

Deciding is a conscious and human process, involving both individual and social phenomena, based upon factual and value premises, which concludes with the choice of one behavioural activity from among one or more alternatives with the intention of moving towards some desired state of affairs.

According to the Encyclopaedia of Education (Monroe, 1968: 272), decision-making is:

That phase of the mental activity in which a volitional tendency reaches its conclusion. The word decision is commonly used only when there has been some deliberate choice relevant.

When Brinkers (1972: 19) was confronted with the challenge of defining the concept, he initially responded with the simple phrase *“make up your mind”*. Brinkers (1972: 19) repeated the 1970 description of Beer who said: *“Decision-making is the fixing of a belief”*. Unsatisfied with these descriptions, Brinkers undertook a deeper analysis into

this phenomenon and presented the following definition which has been repeated by several authors in later works:

Decision is a deliberate act of selecting, by the mind, an alternative from a set of competing alternatives in the hope, expectation or belief that the actions envisioned in carrying out the selected alternative will accomplish certain goals. Decision is the selection of a mental state: it is a commitment to certain actions or inactions. Other people may observe our actions, but they do not directly observe our decisions (1972: 19).

Various other definitions were formulated in this era, but their content is mostly concerned with decision-making as it pertains to management in an organisational context. For them, the decision-maker is typically a manager and choices can be examined in the light of the resulting consequences for the organisation. However, Taylor (1984) makes the statement that other viewpoints specifically indicate that it is misleading to confine decision-making only to the functioning of an organisation. We support this statement and for our study, any definition will be regarded as a conceptual representation without reference to a specific context.

For Cassel (1973: 83) decision-making is the cornerstone of human happiness, because plans and goals for human action necessitate decision-making without which there can be no real human joy and happiness. In this light, Cassel defined decision-making as "*vanguard for the election of choices and it is a learned behaviour - it does not emerge through the process of ageing alone*".

Taylor (1984: 3) describes decision-making as a process that "*involves reaching a conclusion, which implies deliberation and thought and suggests a conscious act*". With this definition, Taylor separates decision-making from natural reaction or unconscious acts, as these would be more accurately labelled as 'habits' or 'reflexes'. Taylor justified this statement with reference to an observation by Ofstad who, in 1961, labelled the unconscious process preceding an action as 'compulsion' rather than a decision.

According to Carroll and Johnson (1990: 19), decision-making means:

A process by which a person, group or organisation identifies a choice or judgement to be made, gathers and evaluates information about alternatives and selects from among alternatives.

To this point, almost all the definitions made reference to a process of selecting or choosing between alternatives. However, Klein (1993) repudiates this notion by proclaiming that much evidence contradicts the assumption that conceptualises or limits decision-making to choosing among alternatives. As an alternative, they propose a more inclusive description that reads "*decisions can be better conceptualised as argument-driven actions*" (1993: 181). The advantage of such an approach is that it allows the decision-maker to examine how he makes a decision and then uses models of optimal choice to improve the decision if that is his preference. By changing the root metaphor 'choice' with 'argument', Klein (1993) is of the opinion that firstly, the essence of decision-making, namely that decisions are positive actions, is better captured. Secondly, such a description recognises the variety of ways in which decisions are made. This second reason implies that not all decisions are well thought through and informed. Instead, decisions are "*often characterised by ineffectiveness, search and the use of relatively weak methods (heuristics) that are more representative of novice-like problem solving*" (Klein, 1993: 180).

At the base of all of these definitions lie five distinctive characteristics of any decision, which Moody (1983) describes as follows. Firstly, all definitions imply the aspect of a 'futurity'. This characteristic involves the extent to which commitment entailed by the decision will affect the future. Moody (1983) labels decisions that affect the future in the long-term as high-level decisions. Opposing these high-level decisions are those that only have a short-term influence and are labelled low-level decisions. The second characteristic, labelled 'reversibility', relates to the speed with which a decision can be reversed and the difficulty in making that reversal. Moody (1983) concludes that decisions are more often than not made too hastily and the resulting impact is lasting. Thirdly, all decisions affect other areas or affect other activities. As a fourth characteristic, Moody (1983) indicates that any decision relates or implies ethical values and basic principles of conduct. Moody labels this characteristic as 'quality'. As a final attribute of any decision, Moody refers to the frequency at which decisions are made – they are a part of everyday life and affect every aspect of our daily routine. This characteristic is labelled 'periodicity' (Moody, 1983).

The next step is to combine the essence of the forgone definitions and characteristics into a description which will also serve to define the distance education student's activity when choosing between the alternatives of print and on-line modes of

instructional material. Again realising that any definition has its limitations, we venture onto that dangerous turf with the following denotation:

Decision-making or deciding is the conscious, human act of resolving conflict inflicted by being confronted with more than one alternative and culminate in the resolution that one alternative is the best option to actualise some desired intent based on the evaluation of information and the value premises of the one who experiences the conflict.

The reader will notice that our definition does not include reference to the terminology 'choice' and 'judgement' like so many other authors have done and yet, choice is fundamental to our research. Naturally then, one asks: What is the relationship between choice and decision? The solution to this question is explored in the next section.

5.2.2 THE RELATIONSHIP BETWEEN CHOICE, JUDGEMENT AND DECISION

Choice involves comparison among alternatives and together with judgement, forms a different kind of decision-making (Carroll & Johnson, 1990). Perlmutter & Monte (1979: 16) define choice as "*experiences when the self is the agent who decides which of two or more options will be accepted*". According to the Encyclopaedia of Education (Monroe, 1968: 242), choice is "*when volition takes place under conditions such that the reactor is conscious that he might have followed either one of two or more courses, the process is called choice*". Choice relates to the availability and the desirability of options and people experience choice when they seem to control the decision-making process. However, such control over the decision process does not guarantee a positive outcome: "*to decide is one thing, to cause the decision to bear fruit, is another*" (Carroll and Johnson, 1990: 26).

Scholars of the choice phenomenon document three kinds of choices. Evaluative choice pertains to people who evaluate their best alternatives. People don't experience choice unless at least one of their available options is at least as desirable as their comparison set (a comparison set refers to the values attached to the attributes of each alternative). Variety of choice is experienced when the best available option exceeds the comparison level (Perlmutter & Monte, 1979).

Discriminative choice occurs when people find two or more alternatives at least as attractive as their comparison level. In this situation, they will compare one variable with another to maximise their benefits.

The third kind of choice occurs when two alternatives are both complex (contains more than one positive attribute) and differ on several dimensions. In this situation, it is not immediately clear which alternative is the better option. When an individual is faced with this kind of choice, his individual preference guides his evaluation process and the individual himself, rather than the obvious qualities of the options, determine the decision. In this case, the decision-maker is perceived as autonomous and the experience to choose is called autonomous choice.

Judgement differs from choice in that during a judgement task, a label is placed on a single alternative or attribute. In this sense, a judgement is seen as some kind of comparison or matching - an alternative or attribute is matched to the individual's personal response scale (Carroll and Johnson, 1990). Judgement is defined as *"the act of weighting facts or evidence in order to reach the conclusion or decision. Judgement precedes a decision and is the result of the process of reflective inquiry and deliberation"* (Monroe, 1968: 571).

The relationship between judgement, choice and decision is clearly indicated by this last definition, which states the chronological occurrence of these processes. Choice and judgement are processes that precede the actual decision act. Van den Aardweg and Van den Aardweg (1988) confirm this relationship. As with decisions, the moment of choice is characterised with conflict that cannot be avoided or postponed when an immediate decision is required. *"Choice can be a moment of tension, strong emotions and indecision. Finally a decision is made"* (Van den Aardweg and Van den Aardweg, 1988: 37). Because of the complicated interplay of aspirations, desired states and objectives, the decision-maker weighs all these aspirations and states against each other and then a choice is made. It is only after the final choice is made that the decision-maker is brought to the point of the specific act to decide (Van den Aardweg and Van den Aardweg, 1988).

To conclude, when a decision is made, it implies that the condition creating the aspiration is accepted, rejected or postponed. This action triggers an evaluative aspect, which results in choosing a specific cause of action - the action of taking such a cause is termed the decision. The decision can have lasting and momentous repercussions or can affect only the immediate future. The effect of such a decision can be either good (in

which case it is labelled an optimal decision) or bad, which normally is the result of the lack of knowledge or lack of practice in their decision activity.

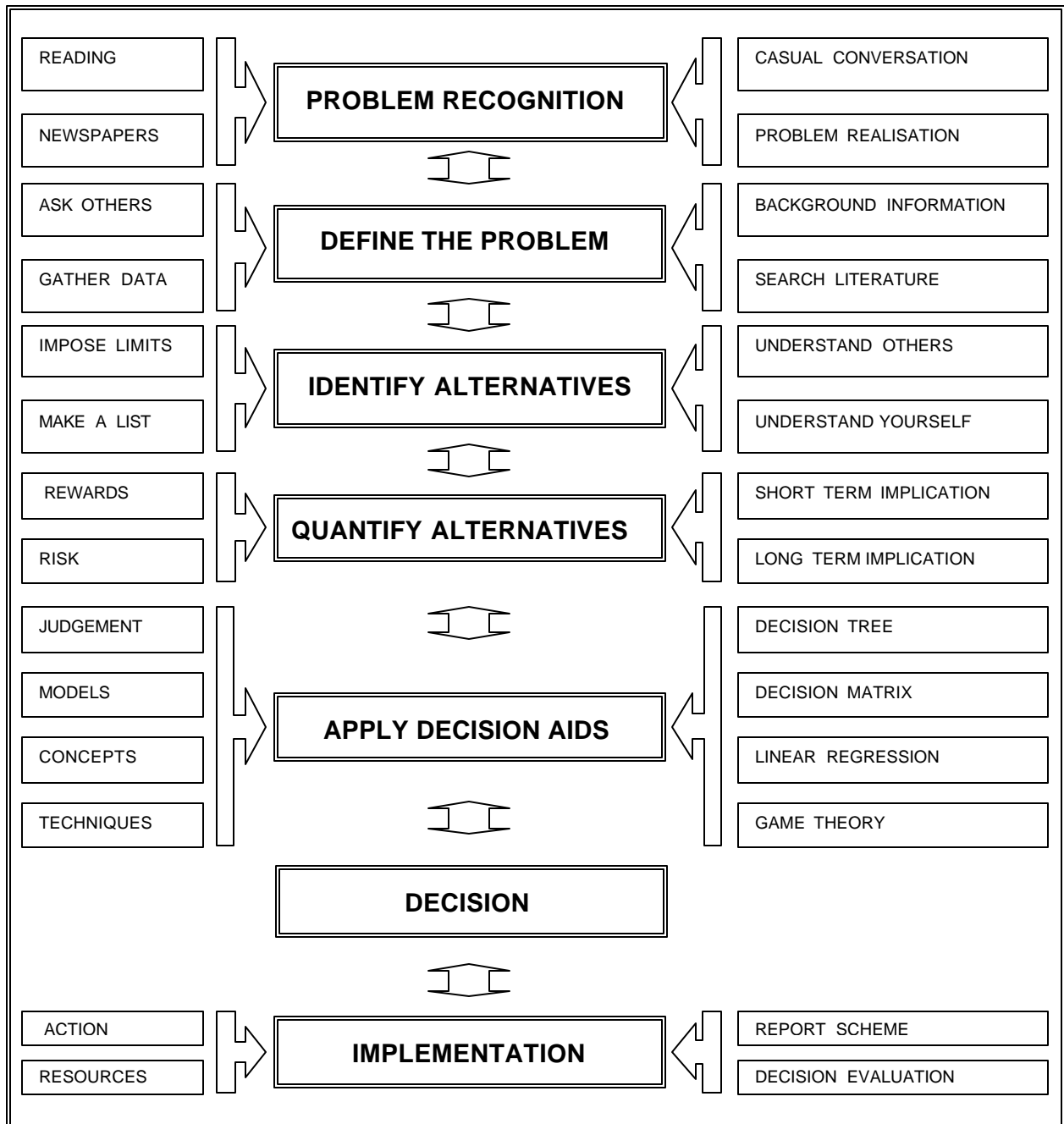
The way in which an act of will - a decision - leads to action, is a good criterion for identifying personality and temperament, which are key features in the decision-making process that will be discussed in broad terms later. Now that we have an understanding of the concept of decision and choice, we will investigate the process involved in the act of deciding.

5.3 THE NATURE OF THE DECISION-MAKING PROCESS

The previous section portrayed the concept of decision as a "*shorthand for mental activities that reorganise and structure decision situations and then evaluate preferences to produce judgements and choices*" (Carroll & Johnson, 1990: 21). Although it is difficult to break up the stream of mental activities and behaviours into defined units, several authors favour the perception that decision-making occurs in a series of discrete steps or events which can be illustrated in the form of a flowchart such as portrayed in **Figure 5.1** (Hill, 1979 & Carroll and Johnson, 1990). It is conceived that strict adherence to these steps provides an ideal model for optimal decisions. However, because everybody is unique and applies different decision-making rules, one often finds situations where the model is violated, for example, situations where a decision-maker's personality, ethical norms, psychological considerations, etc. are more influential than the decision rules that are normally applied.

This section aims at investigating the different steps and explores factors that affect each activity. The chronological sequence of our discussion conforms to the layout of **Figure 5.1**.

Figure 5.1: The decision-making process (Hill, 1979)



5.3.1 PROBLEM RECOGNITION

The process of making a decision originates with the realisation that there is a decision to be made. Many activities that are not decisions per se, but are relevant to decisions, occur prior to recognition or result in recognition of the decision problem. Examples of these activities include non-specific information search, such as reading the newspaper or casual conversation with friends. Carroll and Johnson (1990: 21) refer to these as "*pre-decisional activities which are undertaken to prepare the decision-maker for future decisions*". In this regard, these authors conclude that almost all behaviour is potentially relevant to present and future decisions. In the same light, when people avoid defining a particular situation as a decision or deliberately avoid making decisions, their activity is also a pre-decisional act.

5.3.2 PROBLEM DEFINITION

An explanation and classification of the decision situation and an understanding of the relevant objectives and values follow the recognition of a problem. The decision problem is defined as "*the acts or opinions among which one must choose, possible outcomes or consequences of these acts and the contingencies of conditional probabilities that relate outcomes to acts*" (Wright, 1984: 25). For Brinkers (1972), the decision problem is an awareness of dissatisfaction with the way things are or might be at some future point. We can thus conclude that, whatever the decision, "*it is preceded by a problem of some sort or another*" (Hill, 1979: 23). An accurate description of the problem is already a major step towards the actual solution.

Brinkers' (1972) comparison of current and future situations revealed three distinct problem types. The first problem type involves a condition where the decision-maker's *desired state changes* while the existing state remains this same. In this problem type the decision-maker sorts out opportunities rather than responding to existing state changes. Opposing this problem type is a situation where *the existing state changes*, while the desired state remains the same. Brinkers (1972) postulates that changing the existing condition of the decision-maker causes a threat which the decision-maker will try to resolve. The third decision problem type occurs when *both the desired and the existing states change* simultaneously.

To ensure adequate understanding of each of these decision problems, the decision-maker should first gather background information in the general area under consideration.

This is different from the pre-decisional (non-specific information search) activity, because the gathering of information on a specific program during this stage is purposeful and goal-orientated. Various strategies can be applied in this accumulation of information. The first (and probably easiest) method is to talk to others for they may have confronted this same problem one time or another. Depending on the problem, the gathering of information can also take the form of a *"literature search, a patent search, screening of financial data, a visit to the competition, the advice of paid consultants/experts or examination of case histories"* (Hill, 1979: 23). There are many ways of becoming informed on a subject. Once the problem is understood, the definition should be examined in the light of the information gathered to determine the extent to which it is a true representation of the problem or the decision to be made (Carroll and Johnson 1990).

The decision-making perspective assumes that people attempt to achieve preferred outcomes, objectives or goals even though they may be unsure of or unable to express their concepts of value. The decision-maker's perception of the gathered information and how it relates to the decision problem is termed *the decision frame* of the decision-maker (Tversky & Kahneman, 2000: 25). This decision frame refers to the decision-maker's perception of the acts, outcomes and contingencies associated with a particular choice to be made. The adopted decision frame is controlled by the formulation of the problem and the decision-maker's norms, habits and personal characteristics.

Once a decision-maker has a clear conception of the decision problem he is confronted with, he should now endeavour to identify all his available alternatives.

5.3.3 IDENTIFYING ALTERNATIVES

"Whenever one is confronted with a choice, one must decide which cause of action to take" (Hill, 1979: 23). Very often, our choices are obvious, but some situations occur when the decision-maker has identified several choices and used all of his skill to select one of them, but the choice failed to create the desired outcome, because he overlooked another alternative that evidently proved imperative in the realisation of the desired outcome. The importance of this third step in decision-making cannot be accentuated enough. Even the simple act of choosing between print or on-line modes of delivery can be viewed as a complex mental feat (Carroll & Johnson, 1990). The reason is that actual decision-makers (students) do not consider all the alternatives. Instead, the decision is structured to something like *"pick one"* or *"a proper choice is not important, it is just a means of getting to the end"* (Carroll & Johnson 1990: 21). Through prior habits, exposure

to different study situations, the arrangement of options in the student guide, etc. the number of alternatives for the students that attracts his attention, is tremendously reduced.

For Brinkers (1972) this search for alternatives is an attempt to restore some control over our environment so that the future will be more to our satisfaction than might otherwise be the case. It is imperative to understand the source and reasons for the conflict that generate the decision problem, because:

...the better we are able to do this, the better position we will be in to understand our own objectives and develop suitable alternatives in response to the objectives in the situation at hand (Brinkers, 1978: 20).

The process of developing alternatives occurs over a period of time and should be evaluative as well as creative. In our search for and construction of alternatives, we should bear in mind the purpose of the inquiry. The decision-maker should constantly evaluate the extent to which an alternative or source of action may accomplish the initial purpose.

As a suitable method for identifying alternatives, Hill (1979) suggest writing down all possible alternatives, no matter how farfetched or irrational they may seem at first. By creating a written list of alternatives we not only impose limits to make our choice easier, but we also develop an understanding of others and ourselves. In addition, we reduce the likelihood that a reasonable alternative may be overlooked.

5.3.4 QUANTIFYING ALTERNATIVES

The next step in the decision process involves the quantification of the alternatives generated from the decision problem. The purpose of quantification is to rule out those alternatives that are not pertinent to the problem solution and to weigh the relative importance of alternatives that are necessary for the creation of the desired state. As the decision-maker process his quantification, some alternatives will be accepted, some modified and others judged infeasible or inferior - they will be discarded (Brinkers, 1972 and Hill, 1979).

Authors on Economics, Management Sciences and Psychology have contributed useful methods for assisting decision-makers with quantifying decision alternatives, which are likely to lead to the desired outcomes. Some of these methods are intensely complex and mostly used by decision experts. Even though it is unlikely that a student confronted with the perceivably simple task of choosing between two alternatives will revert to these

aids, they are included in our discussion and serve to orientate the reader on various decision strategies.

In quantifying decision alternatives to determine which is superior, decision-makers have shown to use inappropriately simplistic or outright misleading strategies (Taylor 1984). The following discussion deals with appropriate methods of dealing with complex, multi-attribute decision alternatives. Strategies can be classified into two categories: weighting methods and sequential elimination.

5.3.4.1 ALTERNATIVE WEIGHTING

Weighting methods have been used extensively in applied decision-making. Three common factors to all weighting methods include:

- a means for comparing attributes by numerically scaling attribute values (intra-attribute values) and assigning numerical weights across attributes (inter-attributes preferences);
- a method for aggregating the preferences into a single number representing the decision-maker's preference for each alternative, and
- a rule for choosing the one alternative that receives the highest weight (Taylor, 1984).

Weighting methods can further be classified into additive weighting and linear weighting. Each of these is discussed separately.

Additive Weighting

Additive weighting can either be simple, in which case the decision-maker assigns weight related to the importance of each attribute and numerically scales the alternative on each attribute, or sophisticated. In the simple version, the decision-maker can get total scores for each alternative by multiplying the importance weights assigned to each alternative by the scale value given to the alternative on that attribute and by aggregating the products over all attributes. After all scores are calculated, the alternative with the highest overall score should be chosen.

A more sophisticated form of additive weighting - hierarchical additive weighting - acknowledges that attributes of alternatives may serve as a means to attain higher level objectives (Taylor, 1984). When using this method, preferences or values are assigned to

higher level objectives and then the instrumentality of each attributes for attaining the high level objectives is assessed.

Linear Weighting

Linear weighting is used to infer the preferences from a prior set of decisions. It helps decision-makers to improve future decisions through eliminating random errors. This method is also known as ‘boot strapping’ since this type of decision-making can be viewed as decision-makers lifting themselves out by the boot straps. Linear weighting is particularly effective when many similar decisions are made (Taylor, 1984, Wright, 1984 and Castellan, 1993).

Although linear weighting strategies have been used successfully in many different contexts, ranging from product scheduling to medical diagnoses and judicial cases, its most frequent application is in personal selection in an organisational context.

5.3.4.2 SEQUENTIAL ELIMINATION

The primary difference between sequential elimination and weighting methods is that sequential elimination is less demanding on the cognitive abilities of the decision-maker. Sequential elimination entails the following key factors:

- attribute values are scaled in at least an ordinal manner and preferences are ordered across attributes;
- standards are specified across attributes, and
- a process is given for the comparison of values of attributes so that alternatives may be eliminated or retained.

Simply put, sequential elimination entails the judging of alternatives by comparing them to some standard, or alternatives can be compared to other alternatives to determine their relative merits. Decision professionals commonly apply the following three formats of sequential elimination.

Setting Preference Standards

Perhaps the least demanding approach for multiple attribute decision-making is for the decision-maker to simply specify the preferences as standards that must be met by the chosen course of action. Decision-makers compare the attributes that describe decision alternatives against standards that have been specified. Standards can be applied either

disjunctively (for instance only one standard at a time) or conjunctively (all must be met). Generally, cognitive standards are applied in a satisfying manner, that is, alternatives are sought until one is found that meets the standards without even trying to determine if one even better alternative exist.

Lexicography

Lexicography refers to the “*similarity between this method of making choices in multi-attribute situations and the manner in which words are ordered in a dictionary*” (Taylor, 1984: 16). Lexicography entails the ordering of attributes in terms of their importance. The one at the top of the list - that is, one alternative has a higher value than all other alternatives on a particular attribute - would emerge as the obvious choice for an optimal decision. In the event that two or more alternatives are tied, these alternatives are examined on the second most important attribute and so forth, until only one alternative is left.

Lexicography poses two drawbacks. Since only one attribute is considered at a time, poor values on one attribute cannot be directly compensated by good values on another. Secondly, the chosen alternative may only be slightly better on one attribute. As a solution to these drawbacks, Taylor (1984) suggests the application of ‘bands of discrimination’ to ensure that the rating scale against which alternatives are judged, reflects important differences in each attribute.

Elimination by Aspects

Elimination by aspects involves viewing alternatives as sets of aspects. Aspects are ordered in terms of the extent to which they permit a decision-maker to differentiate among alternatives and not in order of the decision-maker’s preference for them. Elimination by aspects relates to lexicography in that alternatives are compared on one aspect at a time. The difference is that alternatives, which fail to meet a specific standard, are eliminated from further consideration. When none of the possible causes of action appear attractive, elimination by aspects can be used to eliminate undesirable aspects. In this case, choice involves discarding the most undesirable alternative and choosing the best of the remaining unattractive options (Tversky & Kahneman, 2000).

To conclude, both lexicography and elimination by aspects reduce the cognitive demands of choosing by comparing alternatives one attribute at a time. In addition, when

using these methods, a choice can be made before all attributes have been considered on condition that one alternative emerges as clearly superior on the most important attributes.

Sequential elimination has the advantage over weighting methods in that it is very useful when little is known initially about the available decision alternatives. Standards may be loosely set during the initial stages of the decision process and then gradually tightened by emphasising those attributes that the decision-maker considers most important. In this way, the set of alternatives are narrowed down until one alternative eventually emerges as the optimal choice. What makes sequential elimination even more attractive to use is that they follow simple procedures that are easily justified to other people, should that be necessary.

However, sequential elimination does not ensure that the alternative that is actually selected is better than the rejected alternatives. To this extent, weighting methods are better. Despite being cognitively the more demanding, they have the advantage of greater insurance that the chosen alternative is actually superior (Taylor, 1984 and Tversky & Kahneman, 2000).

5.3.5 THE APPLICATION OF DECISION AIDS

Hill (1979: 24) makes the generalisation that:

Unfortunately, many of the critical decisions made by experienced leaders in both business and government, are based on habit, 'gut feel', advice from 'experts', snap judgements or just plain chance (the toss of a coin).

It is easy and tempting to include students in this generalisation - how many students do engage in elaborate decision processes for the simple task of choosing a desired mode for receiving instructional content? With caution to draw 'premature' conclusions on our research, time has proven Hill's statement to carry substantial weight (Tversky & Kahneman, 2000).

In recent years, decision experts have devised techniques that can assist the decision-maker in his decision endeavour that will help him avoid relying on gut feel alone. These techniques are known as decision aids and they aim at optimising the likelihood that the decision-maker reaches the best conclusion available to him. The study of decision aids belongs to research called decision analysis: a set of models and methods for helping people make difficult and stressful decisions (Payne, Bettman and Johnson, 1993). These aids include decision trees, decision matrixes, game theory and the

quantitative, mathematical models of linear programming, linear regression and forecasting.

All these aids rely on the availability of precise information and may therefore prod the decision-maker to comprehend more extensively the scope of the problem, the differences among alternatives and the relative utility of each. Because decision aids are tools, they are like other tools, limited in their usefulness by skill, resourcefulness and insight on the part of the decision-maker. We explore each of the different decision tools in the subsequent sections.

5.3.5.1 *DECISION TREES*

Similar to other diagrams, the decision tree involves the construction of a diagram that visually portrays attributes of alternatives and the stages of responses a cross time (Loke, 1995). Normally, decision trees are applied when the outcome or ‘payoff’ is known or can be estimated and the probability of various results can be calculated (Moody, 1983). However, even when this information has not been available, decision trees proved to be very beneficial.

The advantage of constructing a decision tree lies in the awareness it creates of all the available options and possible outcomes. The diagram itself may force the decision-maker to consider alternatives that otherwise, would not have been considered. Additionally, the decision-maker may recognise negative consequences that must be avoided, regardless of the probability of their outcome.

Constructing A Decision Tree

A decision tree, such as portrayed in **Figure 5.2**, can be constructed by applying the following four essential steps.

Step 1: Visually portray all relative information to the decision problem in the form of a decision tree. It is important to indicate the chronological interaction of alternative courses of action and distinguish between choice and decision points. Effective decision trees portray all the decision and choice points in order to properly label and check that calculations.

Step 2: Indicate the payoffs or outcomes at the tips of the tree branches. The best indicator for outcomes or payoffs can be drawn from similar past efforts. However, if such information is unavailable, the decision-maker should estimate them. The drawback of

estimation is that, the more the estimation, the greater the risk of pursuing a decision on data that may be misleading.

Step 3: The decision-makers should now assign probabilities to each of the choice branches. Again, optimal trees will portray data based on statistics from past events. Since both probabilities and payoffs take maximum and minimum values, the analysis needs to be performed twice. The decision-maker should also realise that payoffs and probabilities may overlap, which creates the risk of making final data inconclusive.

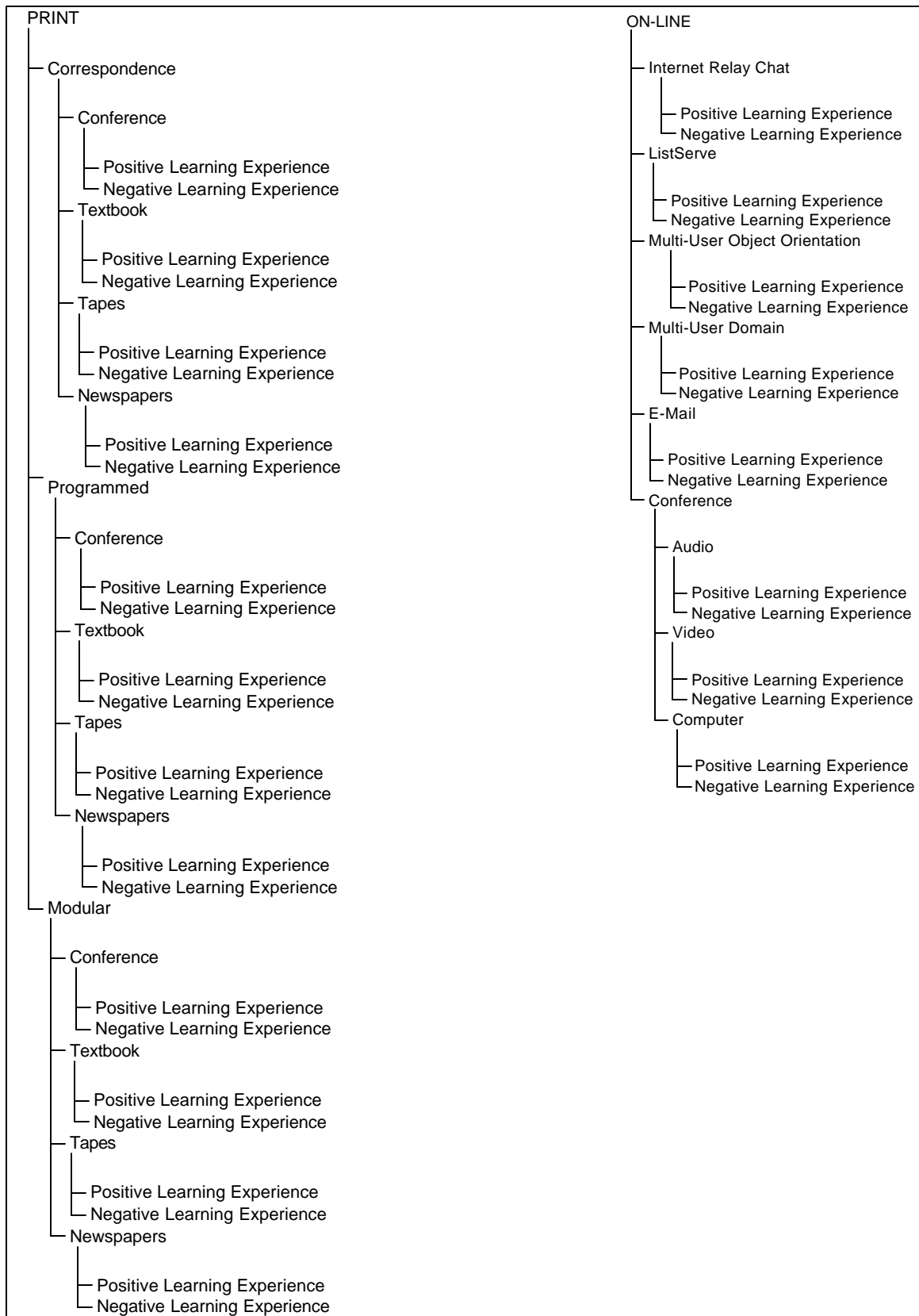
Step 4: The final step involves the selection of the best course of action by doing the necessary calculations. If the decision-maker's preference for risk avoidance is not taken into account, averaging the data should prove a sufficient indication of what branch to follow. However, if risk avoidance is considered, the decision-maker must choose how much to sacrifice in potential gain for the sake of eliminating risk.

Decision trees provide an excellent method for making decisions, especially for the inexperienced decision-maker, because:

- they clearly portray the sequential nature of the problem so that all choices can be viewed, discussed and challenged;
- they provide a framework to quantify outcome values;
- they provide a probability estimate of achieving desired outcomes, and
- they help to make the best decision based on the existing information.

An important principle to note is that decision trees, as with all decision-making methods, should be used in conjunction with common sense. Decision trees are just one important part of the decision process which heavily relies on our cognitive input (Taylor, 1984).

Figure 5.2: Possible decision trees for choosing between print or on-line modalities



5.3.5.2 *DECISION MATRIX*

The decision matrix is another aid that may facilitate an optimal choice once a number of alternatives have been identified and understood in sufficient detail. Although it can be used successfully with only two alternatives, its efficiency increases in relation to the number of alternatives.

The decision matrix presents information relevant to the decision problem in the form of a grid that allows the decision-maker to weigh payoffs and drawbacks of each alternative. The matrix allows users to compare strategies in terms of desirability and feasibility factors pertaining to the particular problem. Generally, desired feasibility factors relate to cost, personal needs, beliefs, past experience and the like, but complex problems may require some more detailed factors.

Constructing A Decision Matrix

The matrix heuristic can serve a different function at each stage in the application process. First, it can help to analyse the problem task or objective by breaking down each alternative into a number of requirements. Secondly, once the requirements have been determined, the matrix assists in sorting them according to their relevant importance. Five steps in the construction can be identified.

Step 1: As an initial process, the decision-maker should identify all the alternatives and familiarise himself with each. He should evaluate and identify attributes for each, which will be written in the row at the top of the matrix (**Figure 5.3**). Only those attributes that differ among the alternatives will be considered. As already indicated, the criteria for comparison vary immensely from person to person, because they reflect what is really important to the decision-maker.

Step 2: This step involves weighting each attribute according to its order of importance. The attribute with the highest priority (relative importance) is given the highest score. Weighting factors are then determined by summing up these scores and dividing the total into each (Taylor, 1984). It is important to realise that the sum of the weightings must reflect unity. The weighting cannot be added indiscriminately without adversely changing other values.

If the decision-maker is familiar with the alternatives and their attributes, the weights can be analysed directly. Alternatively, if the decision-maker is unfamiliar with the alternatives, the value one can be divided equally among attributes and then be

distributed across the weights as the relative importance of each attribute is compared with others, keeping the sum always equal to one.

Step 3: The next step is to construct the matrix grid. Alternatives are listed on the left and selection criteria/attributes appear across the top. Weighting values calculated in *Step 2* are recorded opposite their respective criteria.

Step 4: Once the grid is in place, the decision-maker should assign a rating factor or normalise a utility scaled to each alternative. These factors normally range from 1 to 10, with 1 being the least desirable and 10 being the most desirable. These factors are assigned to one alternative at a time across each attribute so that each alternative can be compared against the criteria.

Step 5: The final step is the application of the optimal choice. This is determined by calculating the product of each rating factor and each corresponding weighting factor. The product is recorded in the appropriate space and all the products are eventually aggregated with the final sum of each alternative appearing in the final column on the right.

Since all weighting factors must equal a total of one and the highest rating factor is 10, a perfect sum, which represents the optimal choice, would be 10. The decision-maker applies the choice by selecting the alternative with the highest total value (the value closest to the optimal value of 10).

Table 5.1 shows an example of how the decision matrix might be applied by the distance education student. In our example, the optimal choice would be to choose the print-based alternative.

Table 5.1: A possible decision matrix chart for choosing between print or on-line

		SELECTION CRITERIA							
WEIGHTING FACTOR		Comfortable	Reliable	Simple	Cost effective	Flexible	Time effective	Career potential	Sum
ALTERNATIVES		.20	.18	.16	.13	.19	.04	.1	1.0
	PRINT	6	3	4	1	2	5	7	3.79
	ON-LINE	3	1	5	2	4	7	6	3.483

5.3.5.3 GAME THEORY

Together with mathematical modelling, game theory is applied by large corporations to aid business decisions with the purpose of gaining financial control over a rival company. As such, game theory has little relevance for a student who has to choose between only two alternatives. Therefore, we will not provide a detailed account, but instead, a short overview should serve to inform the reader of the existence of such a decision aid. Von Neumann and Morgenstein developed game theory in 1947 (Hill, 1979). This aid involves the attempts of one party to determine their rival's most profitable counter strategy to his own best moves and then devises his own strategy accordingly. The key to success in game theory involves avoiding predictability. Decision-makers, who engage in constant, patently obvious patterns of decision-making, often find themselves out manoeuvred and at the worst end of the payoff continuum.

5.3.5.4 MATHEMATICAL MODELLING

Professional decision-makers make extensive use of three mathematical aids to assist in decision-making. These include linear programming, linear regression and forecasting.

Linear Programming

Linear programming is used to optimise resource allocation when confronted with certain side constraints that limit the range of choices. It is a purely mathematical technique that, with the aid of high-speed computers, provides computational ease with some very complex decisions. Four criteria summarise the appropriate use of this heuristic:

- the problem must be sufficiently complex;
- the solution must justify the cost for the additional effort required;
- the problem must be quantifiable, and
- all mathematical relationships must be linear (hence the name linear programming).

Linear Regression

Decisions are also aided through regression analysis. Linear regression assumes the decision-making process is an algebraic one. Individual factors are identified,

weighted and combined to result in decisions. Regression techniques applied for combining the weights include an analysis of variance, conjoint measurement and multiple regression. Analysis of variance focuses on the interaction of variables. Conjoint measurement examines the scaling techniques for rank-ordered data and multiple regression examines the linear combination of variables (Loke, 1995).

A variation of linear regression comes in the form of information integration. This method examines the specific types of combinations, but the final decision is no more assured of resulting in optimal results than the original heuristic.

Forecasting

Forecasting is a decision aid based on what we expect will happen in the future (Hill, 1979). To better anticipate our position in the future, we note certain trends and visualise the solution that will best aid the trend that will lead to that desired state. An awareness of the changes that occur in the long run should lead us to make better decisions (Taylor, 1984).

To illustrate how the distance education student can apply forecasting to decide whether to choose print or on-line modalities of instructional content, we present the following scenario. A student who envisages himself in a career where computer applications will account for the majority of his working experience, should invest study time via on-line modes. This will not only assist his study experience, but will also stand him in good stead for his work environment.

5.3.6 THE DECISION

In the decision process, the decision itself is regarded as the culmination of the process. Our action will trigger movement and change. Once our actions have led us to decide on a particular course of action, we rarely know how things will turn out, because there are too many alternatives (Brinkers, 1972). Despite these uncertainties, the decision-maker normally has faith that the alternative he selects is the most effective in pursuing his objectives. Therefore, once a decision has been made, there is a tendency to “*stick with it*” (Hill, 1979: 24). However, this is not necessary and can be very risky, especially if the consequences of our decision are not carefully monitored. In the event that the consequences contradict the decision-maker’s expectations and desires, it may be that the decision should be reversed - if that is still possible. Decision-makers should, therefore,

guard against an over- confident course of action, as this will make negation of choice very difficult (Taylor, 1984, Hill, 1979).

5.3.7 IMPLEMENTATION

Implementation involves the application of procedures to ensure that the decision is carried out as planned. Implementation should be accompanied by a reporting scheme that relates or charts the progress towards the ultimate decision goal. Feedback to the consequences of the applied decision should be recorded and serves as a reference for future decisions (Carroll and Johnson, 1990 and Hill, 1979).

5.4 DECISION TYPES

An analysis of theories that illustrates the processes underlying decision-making has revealed six prescriptions consistent to behaviour among various decision-makers. From a rational, cognitive perspective, decisions can be *normative* (logically consistent procedures on how individuals should decide) or *descriptive* (decisions that individuals make and how they actually decide). From an optimisation perspective, decisions can be *informed* (and will most likely yield optimal outcomes) or *uninformed*, which more often than not produce undesirable results. From a number perspective, decisions can be *interpersonal* or *intrapersonal*, depending on how many people are involved in the decision process. This section reviews each of these processes in more detail.

5.4.1 A RATIONAL, COGNITIVE PERSPECTIVE

5.4.1.1 THE NORMATIVE APPROACH

Normative decisions are defined as "*decisions made through comparing actual behaviours with that predicted by the calculated law of probabilities*" (Loke, 1995: 4). Simply put, this approach specifies what people should do (Taylor, 1984). Normative decisions assume highly rational and accurate procedures for making decisions. Contained in this assumption is consistent preference, knowledge of preference, knowledge of alternatives available, access to information about the consequences of selecting each alternative and a combination of the information according to the expected utility rule (a rule that weights outcomes by their probability of the occurrence (Fishburn, 1972).

According to Loke (1995), normative approaches were primarily used before the 1960's. These decisions relied heavily on a combination of formal probability and utility:

individuals behaved to maximise their performance based on utility and probability. The utility model is one of the earliest and most documented models in decision theory.

Normative approaches entail reflection on the action with the largest sum of product of subjective value and objective probability of payoffs. For example, if an individual (student) has a preference for belief in truth over belief in compassion and compassion over moral right, he will as a rule always choose truth over moral right or compassion (Loke, 1995).

Another dimension to normative decisions is presented by the dynamic model, which is normally associated with decision behaviour that involves risk – that is information is limited and the outcome's ambiguous. One variant of the dynamic approach comes in the form of the Atkinson subjective value model (Loke, 1995). The Atkinson model includes the personality variables of the decision-maker. This model assumes two types of decision-makers: on the one hand are those whose motivation to succeed is greater than to fail, and decision-makers whose motivation to fail is greater than to succeed (Loke, 1995). Thus, the decision made by an individual depends on his desire to maximise the chances of success or failure.

Although normative principles are logical and appealing (and based on theories that promise optimal results in the long-term), research showed that actual decisions consistently diverge from this normative approach (Fishburn, 1972). This same argument is presented by Taylor (1984: 6): "*empirical research has shown that people do not behave as the model predicts*". Further more, researchers have argued that the normative model does not apply to situations where people do not really care how well they benefit from an optimal outcome or lack sufficient comprehension of their decision situation. The point made here is not to disprove the rational approach, but to reveal phenomena that are important for both theory and practice. These arguments necessitated a new model that will describe actual decision behaviour - at a model presented by the descriptive decision approach (Nisbett & Ross, 1980).

5.4.1.2 THE DESCRIPTIVE APPROACH

The descriptive models examine "*what individuals actually do in decision-making situations*" (Loke, 1995: 4). This is a behavioural approach to decision-making. Hence, these procedures do not examine whether the judgement and the decision is correct, rather

it involves underlying processes that are more influential at that particular stage in the decision-making process.

When compared to normative approaches, descriptive decision-making takes more elements of the decision process into consideration. As a result, the decision-maker's ability to calculate probabilities and make accurate decisions is handicapped.

One distinguishable characteristic of descriptive decision-making is that the decision-maker normally continues to use certain unreliable information at each state of the decision process - an effect Loke calls "*the cascade interference effect*" (1995: 7) and which results in his conclusion that "*humans are not good intuitive statisticians*". This however, does not imply that all decisions are poor - Fishburn (1972: 27) propagates that a key feature of descriptive approaches entails "*decision-makers normally to a good job, but not really the best job given the information at hand*".

Another distinction between normative and descriptive approaches is that descriptive approaches incorporate the order of stimuli into the decision-making process. Furthermore, the model recognises the possibility that decisions could be made through other factors where the similarities between events are used to make decisions.

If descriptive methods are less likely to produce optimal results, then, from a research perspective, one has to ask: why do people prefer to use risky alternatives to proven, rational models? To this question, Fishburn (1972: 27) simply responds "*they are easier for the unaided decision-maker to employ than highly sophisticated design rules such as those proposed by economists and management scientists*".

5.4.1.3 INTEGRATING DESCRIPTIVE AND NORMATIVE APPROACHES

Taylor (1984) guards against making rigid distinctions between normative and descriptive theories, as this can be misleading. For Taylor, behavioural decision-making represents an integration of descriptive and normative approaches, because there is much overlap of interest between these two viewpoints and "*the contributions of many people concerned with descriptive aspects of decision-making have markedly influence the normative decision analysts*" (Taylor, 1984: 6).

If people make the decisions they should make, normative and descriptive theories merge into 1. The conclusion is that when a comparison between normative and descriptive decision types are attempted, it should be done pertaining to various decision-making phenomena, since normative theories may rest upon assumptions that fail to

accurately describe actual behaviours. Our research supports this integration approach. We thus argue that it is misleading to propose solely a normative approach specifying that people always maximise expected outcomes, because they are unable to process the large amounts of information that confront them in a complex station situation.

Our last statement supports previous innuendoes that suggest two other types of decisions not discussed in any of the literature that was reviewed. If people do not always make the best choices under given conditions, it implies that decisions are not always optimal. On the other hand, if people do make the best possible decision under given circumstances, decisions are classified as optimal. This scenario paves the way for the classification of informed and uninformed decisions - the topic of the next section.

5.4.2 AN OPTIMISATION PERSPECTIVE

5.4.2.1 LIMITED RATIONALITY

Extensive literature has been produced in the past that reveals the human mind as "*limited in attention, memory and calculation*" (Fishburn, 1972: 26). Our short-term memory allows us to only process a few 'chunks' of information at one time and moving that information into our permanent, long-term storage is difficult (Van Den Aardweg & Van Den Aardweg, 1998).

The impact of these limitations on judgement and decision-making is very important. Since we cannot deal with large amounts of information, it often causes us to develop shortcuts, rules of thumb or heuristics for making reasonably good decisions, but not always *informed* decisions. In the words of Taylor (1984: 111-112):

In comparing decision alternatives to determine which is superior, decision-makers have been found to use inappropriately simplistic or outright misleading strategies.

Often, our constraints or limitations result in *uninformed* decisions that lead to undesirable results. This human characteristic produces two kinds of decision-makers: those who do initial research and engage in informed decisions, and those who rely on their 'gut' feel or internal conviction that make uninformed decisions.

5.4.2.2 INFORMED DECISIONS

Combining several viewpoints on optimal decision types, we present the following definition for informed decisions:

Informed decisions are activities where the action in response to the problem brings about a choice based on information gathered during the decision process (Brinkers, 1972, Taylor, 1984 and Moody, 1983).

This definition implies that the decision-maker engages in an extensive research and information gathering process that assists his final choice. It is assumed that, once the decision-maker has gathered and evaluated all possible information relevant to the problem, the final decision will be the optimal choice - regardless of whether the outcome leads to the anticipated desired state or a less desirable state. The reason why we distinguish or separate informed decisions from uninformed decisions is that, according to Ranyard, Crozier and Svenson (1997: 75) "*there are differences between satisfied and regretful decision-maker's pre- and post decisional processes*". Their research have indicated four distinct differences between informed and uninformed decision-makers:

- informed decision-makers are more active in their interaction with the environment during their pre-decisional and post decisional processes;
- informed decision-makers show more consolidation of their decision;
- informed decision-makers are less prone to emotion of regret, shame or guilt, and
- informed decision-makers are more likely to stick with their choice.

5.4.2.3 UNINFORMED DECISIONS

Now that we have defined informed decisions, it is a simple task to describe uninformed decisions by focusing on the opposite of our definition in the previous section. Uninformed decisions are, for the purpose of our research, defined as:

A process without the logical sequence of events that pertains to the gathering of relevant information to the decision problem, which increases the likelihood of reaching unsatisfactory results (Hill, 1979).

Generally, uninformed decisions lack a clearly defined process. They seldom show vigilance in decision-making, which under most circumstances yield unsatisfactory results.

Uninformed decisions are more subjective to change once a decision is made - they lack Hill's (1979) 'stick with it' tendency. In addition, decision-makers often show ignorance to the number of alternatives and they fall prey to only partial comprehension of the problem.

5.4.3 A NUMERIC PERSPECTIVE

Depending on how many people partake in the decision process, we can distinguish between decisions made by only one individual, namely intrapersonal decisions, or decisions involving a number of individuals, which is known as interpersonal or group decisions. The decision of a student to choose between two alternatives is primarily of the intrapersonal type, but in our discussion we will also make brief reference to interpersonal decisions as an alternative decision type and investigate how they differ from intrapersonal decisions.

5.4.3.1 INTERPERSONAL OR GROUP DECISIONS

Interpersonal decision types involve more than one individual in the decision-making process and are frequently referred to as group or organisational decisions (Hill, 1979). Lieberman (1972: 29) defines group decision-makers as "*collections of information processors who have varied goals, varied roles and who communicate information in real time*". Interpersonal decisions have two distinguishing factors separating them from intrapersonal decision types. Firstly, interpersonal decisions are sensitive to factors affecting each individual participating in a decision process. This attribute implies that the factors that affect decision-making at intrapersonal level also affect decision-making at the interpersonal level, which in turn will have an effect on the way decisions are made in groups, organisations and even nations. The second difference pertains to the problem type. Usually, interpersonal decisions involve a more complex problem. This last statement does not contemplate that individual decision-makers are not capable of also making complex decisions. The difference between the complex problem at interpersonal and intrapersonal level is that, at the intrapersonal level, the decision-maker is solely responsible for the consequences of his choice, despite the fact that during his decision process he might have utilised assistance from several other individuals. We wish to make it clear to the reader that a decision where an individual seeks help from other individuals

is not a group decision. In the latter type, each individual in the group is equally responsible for the consequences of the chosen course of action.

5.4.3.2 INTRAPERSONAL DECISION-MAKING

Payne *Et al.* (1993: 2) describe this concept as:

An individual's use of multiple decision strategies in different situations, including various simplifying methods or choice heuristics, is an adaptive response of a limited capacity information processor that to the demands of decision tasks.

This definition is similar to Hill's (1979) and Taylor's (1984) concepts of intrapersonal decision-making which define the phenomenon as the efforts of one individual who tries to resolve conflict in order to reach a personal desired state. Interpersonal decisions are usually characterised by relatively simple decision problems (that is, when compared to complex interpersonal problems). Generally, intrapersonal decisions can be regarded as intelligent responses under the assumption that people have multiple goals for decisions coupled with the desire to be accurate and the desire to conserve limited cognitive responses (Payne at all, 1993).

5.4.3.3 RELATIONSHIP BETWEEN INTRAPERSONAL AND INTRAPERSONAL DECISIONS

Many decision scholars agree that decisions are not made in a social vacuum (Ranyard *Et al.*, 1997 and Hill, 1979). A magnitude of social factors can influence decision-making of individuals. Generally, individuals feel accountable to others and this accountability affects how they decide. Hill (1979) describes this interconnectedness as concentric circles whose inner rings are located within those more peripherally. We can thus conclude that intrapersonal considerations influence the shape of decision-making at an interpersonal level (inner rings) and these may in turn affect decision-making in increasingly complex social arrangements (outer rings).

An interesting consideration is presented by the question: are interpersonal decisions more successful than intrapersonal decisions? Initially the tendency is to favour group decisions to be more successful - groups have the advantage of combining bits of information that are not held by an individual and secondly, groups boast the sheer capacity of work (Fishburn, 1972).

However, Fishburn (1972) refers to new studies that have directly compared groups and individuals on this same problem. The conclusion is that groups fell prey to the same errors and biases as individuals. Also, groups have their own characteristic problems: a premature tendency to reach conclusions; a tendency to become even more extreme over issues when the group has an initial leaning towards a desired course of action, and groups have *"the pervasive ability to eat up time and resources"* (Fishburn, 1972: 28). We can thus conclude that there exists no guarantee that interpersonal decisions will produce higher quality results even when knowledge and competency are adequate within the group as a whole.

The remainder of our discussion in this chapter focuses on the key aspects of intrapersonal decision behaviour. These aspects include an in-depth thesis on conflict, decision needs, decision environments and finally, the effect of personality traits on decision-making.

5.5 CONFLICT

Conflicting issues and concerns are inherent and ever-present aspects of the daily practice of decision-making. Although the study of conflict and decision-making is nothing new, modern attentions surged towards conflict in the workplace and conflict and emotion within organisations. This attention has potential impact for informing decision-makers in the business context. However, because our research is primarily a study of interpersonal conflict, we adopted an approach that focuses on a formal definition, the difference between conflict and dissonance and types of conflict as it pertains to the particular experience of the individual decision-maker.

5.5.1 A DEFINITION

A literature review into psycho-analysis exposed two definitions pertaining to conflict that satisfy the purpose of our study. The first is drawn from the Oxford Dictionary of Psychology: *"conflict is the situation that exist when two contrasting tendencies oppose each other in the mind"* (Colman, 2001: 597). The Penguin Dictionary of Psychology provides a more detailed description:

Conflict is an extremely broad term used to refer to any situation in which there are mentally antagonistic events, motives, purposes, behaviours and impulses. If the situation is presently occurring, it is termed actual conflict (Reber & Reber, 2001: 187)

Van den Aardweg and Van den Aardweg (1988: 49) present another description on conflict: *"the clash between the self, people and/or ideas they present"*.

From these definitions, the following should be noted. Conflict can be conscious or unconscious. Conscious conflict occurs when a desire is opposed by a moral constraint. Unconscious conflict originates from neurotic symptoms (Colman, 2001). The second notable feature regarding conflict is drawn from Freud's understanding that *"conflict between ideas are inevitably traceable to conflict between interests"* (Colman, 2001: 187). As interests are not always compatible with one another, decision-maker's interests often come into conflict. In this light, conflict can be perceived as being a struggle between various interests. A final notable feature relating to the definitions is that, because conflict occurs when actions or behaviours are incompatible, there is a natural tendency to reach a state of equilibrium - that is, engage in attempts to restore the self by resolving the conflict. Most conflicts are resolved quickly, but many have unpleasant consequences (Van den Aardweg and Van den Aardweg, 1988).

How does conflict relate to decision-making? People are not indifferent to the choices they make. Decision-makers have strong feelings about the alternatives that they select, as well as those that were not selected. We can thus conclude with Hill (1979) that, because decisions have consequences, the act of deciding invariably contains the element of conflict.

5.5.2 CONFLICT VERSUS DISSONANCE

Conflict should not be confused with dissonance and therefore, we are impelled to orientate the reader on the difference between the two concepts. Dissonance is defined as:

An emotional state set up when two simultaneously held attributes/cognitions are inconsistent or when there is conflict between beliefs and overt behaviour (Reber & Reber, 2001: 128).

As already mentioned, the individual strives toward a state of equilibrium (the process that balances assimilation and accommodation as they interact). When the decision-maker encounters a situation of which he cannot make sense, he is considered to be in a state of disequilibrium or dissonance. The decision-maker brings his situation into a state of equilibrium or 'sonnance' if he is able to make a change in his cognitive structure to accommodate the new operation or concept. Thus, the resolution of conflict is assumed

to serve as a basis for attitude change in that belief patterns are generally modified in order to be consistent with behaviour.

To conclude, when an individual or decision-maker holds inconsistent ideas, he experiences tension and discomfort. A natural behavioural response to this discomfort is to seek ways to decrease dissonance (Hunt, 1993).

5.5.3 TYPES OF CONFLICT

It is possible to distinguish between four types of conflict. This section investigates each of them in more detail.

5.5.3.1 *APPROACH–APPROACH CONFLICT*

This type of conflict is defined as “*a conflict resulting from being drawn towards two equally desirable, but mutually incompatible goals*” (Reber & Reber, 2001: 145). Characteristic of such conflict is the fact that, the closer the decision-maker comes to choosing one alternative, the more likely he is to be torn by the positive features of the other alternative. In this type of conflict the decision-maker may be expected to vacillate between positive goal objects and being plagued by indecision until he can find some way to choose (Hill, 1979). Despite being reminded of the road not taken, Reber and Reber (2001) shows that the decision-maker resolves approach–approach conflict when he gets closer to one of the two alternatives, because desirability has been shown to increase with proximity to that goal.

The distance education student faced with a decision to choose between print or on-line modalities will experience approach – approach conflict when both these options are equally attractive, that is, he could choose either one to reach a desirable state.

5.5.3.2 *APPROACH–AVOIDANCE CONFLICT*

Defined as “*conflict resulting from being drawn towards and repelled by the same goal*” (Reber and Reber, 2001: 187), approach-avoidance conflict is probably the most difficult conflict to resolve. It is often the case that an alternative is associated with both positive and negative features. Such alternatives cause the decision-maker to decide whether or not to approach goal objects about which he is truly ambivalent (Hill, 1979). The situation that arises from such an act is that, the more the decision-maker approaches a particular alternative because of the desirable attributes associated with that alternative, the more aware he becomes aware of its negative features. The opposite, however, is also true.

The more the decision-maker avoids an alternative, the more salient its positive attributes become. Because the decision-maker is both pushed and pulled by the forces active within him and these forces are equal in intensity, the decision-maker will experience the greatest conflict between opposing alternatives.

Associated with our study is the scenario that the distance education student finds, for example, on-line modes to be more desirable. As such, his decision leans towards choosing this attribute only to find that the closer he gets to choosing this mode, features that might impede a positive learning experience, are revealed.

5.5.3.3 AVOIDANCE–AVOIDANCE CONFLICT

Avoidance–avoidance conflict *“results from being repelled by two undesirable goals when there are strong pressures to choose one or the other”* (Reber and Reber, 2001: 187). This conflict causes an extremely unpleasant situation, which prompts one to select the lesser of two evils. Much like the situation regarding approach–approach conflict, the decision-maker is likely to vacillate, uncertain about which way to turn. The closer the decision-maker gets to choose one alternative, the more unattractive this alternative appears in relation to the other alternative.

Against the backdrop of distance education, the student might perceive that neither print nor on-line modes of instructional content are optimal for his study experience. He may lean towards print as this initially seems less daunting, only to find (of course) that it appears increasingly unattractive the closer he gets to selecting it. Instead, when he opts for the on-line alternative, exactly the same situation occurs.

5.5.3.4 DOUBLE APPROACH–AVOIDANCE CONFLICT

A final type of conflict, defined as *“conflict in which each of two goals has both positive and negative aspects”*, is presented by the double approach–avoidance variant (Reber and Reber, 2001: 187). This conflict causes an enriching and complicated decision experience as most alternatives available to a decision-maker have both positive and negative consequences. The resulting situation is that a choice between two alternatives becomes a choice *“between causes of action about which the decision-maker is truly ambivalence”* (Hill, 1979: 61).

Armed with a list of alternatives on both print and on-line modalities, the distance education student attempts to make a choice. Since both options have positive and

negative features, the student is in the state of genuine ambivalence about not 1, but both possible choices. The student is damned if he does and damned if he doesn't, no matter which of the delivery modes he decides to choose.

To conclude, the above four basic types of conflict illustrate what the student is likely to be confronted with during his study endeavour. These conflicts differ firstly, in the number of alternatives available and secondly, in the symmetry of positive and negative features associated with each alternative. They all result in emotions of ambivalence, uncertainty and vacillation that lead to the perpetuation of conflict. Regardless of the type of conflict, the student will resolve the conflict by applying a choice.

The following section considers the basic needs that may govern the habitual ways in which students resolve their intrapersonal conflict.

5.6 FUNDAMENTAL DECISION NEEDS

People have a wide variety of needs, which in the domain of Educational Psychology, can be arranged according to Maslow's needs hierarchy (shown in **Figure 5.3**).

Maslow's hierarchy assumes a reasonable degree of satisfaction in all needs located lower on the hierarchy as these are a necessary prerequisite essential for the effective functioning of the needs higher up on the scale (Cassel, 1973). **Figure 5.3** clearly illustrates two distinctive orders (levels) of needs.

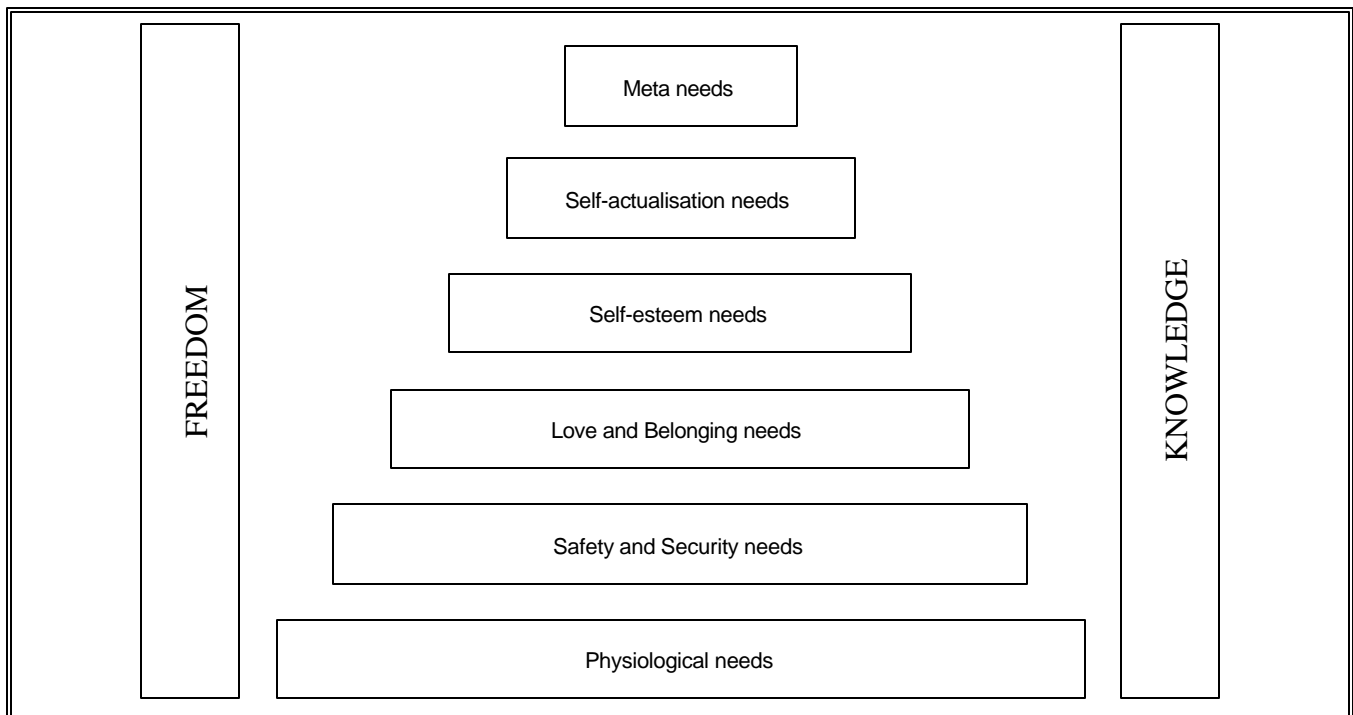
The low-order, basic or priming needs include:

- physiological needs: the need for food, water and physical comfort, and
- safety: the need for protection from physical and physiological dangers, routine, environment, etc.

The higher order needs include

- belonging: the need for the love, to be wanted, appreciated, the need for rootedness, etc.;
- esteem: the need for the knowledge about our worth, ability, competency, a positive self-concept and respect from others, and
- self-actualisation: the need to grow, evolve, become and achieve one's highest potential, the aesthetic needs for beauty, symmetry, closure and stability.

Figure 5.3: Maslow's hierarchy of needs (Van den Aardweg and Van den Aardweg, 1988)



All of these needs are actualised against the background of two continuing needs: our desire for freedom and knowledge. The individual needs a variety of freedoms and many kinds of knowledge to satisfy the basic growth needs (Van den Aardweg & Van den Aardweg, 1988).

Our study however, portrays man as a decision-maker and as such, decision experts stipulate additional needs. Although all of the needs mentioned above may indeed have a bearing on our decision-making, it appears that three needs in particular - the need for simplicity, the need for consistency and the need for validation of choice - are likely to prove especially significant and require additional clarification.

5.6.1 THE NEED FOR SIMPLICITY

Our study portrays man as a decision-maker who is limited with respect to his judgement and decision-making ability. The significant result of these limitations is our tendency to simplify situations (Fishburn, 1972). In the cause of our daily lives, we experience countless social and non-social stimuli presented by a complicated, intriguing and sometimes overwhelming world (Hill, 1979). It is within this complicated world that we attempt the formidable task of deciding. This complicated setting specifies a great many objectives which need to be considered in most decision problems and weighing the relative importance of these objects *"place severe demands on the sharply limited ability of decision-makers that process information and make choices"* (Taylor, 1984).

Research on human limitations in cognitive abilities indicated that, when decision-makers face choices, they typically resort to simple methods for judging cues and making comparisons among alternative courses of action. We do this by developing models that help us to organise our perceptual environment. A decision-maker's conflict resulting from the uncertainty about which of more than one alternative to choose, is likely to eventually prove intolerable and the decision-maker's need for simplicity will eventually dictate commitment to some course of action.

Our need for simplicity has proved to be both effective and advantageous, as well as a curse. The former is illustrated by its enabling ability to allow us to impose frameworks that organise a set of choices and events in a specified, structured cognitive manner that allows us to take a course of action. The latter, however, is illustrated by the liability of our simplistic nature in that our desire to simplify blinds us to the true subtlety of the choices available to us. Hill (1979: 63) describe this liability as:

Transforming a world of true continuity into one of perceived polarity may rob the decision-maker of the sensitivity to nuance what is essential for truly effective decision-making.

5.6.2 NEED FOR CONSISTENCY

When faced with choice problems, decision-makers not only adopt simplifying strategies that are more selective in the use of information, but they also portray a desire for coherence and internal consistency (Ranyard *Et al.*, 1997 and Lieberman, 1972). Hill (1979) relates this need for consistency with the decision-maker's own prior history, the people with whom he interacts and the environment that the decision-maker finds himself in. It is concluded that decision-makers, when choosing among alternatives, typically needs to behave in ways that maintain or restore consistency among several attitudes, beliefs and values that are part of his personal context.

This need for consistency is two-tiered in nature. At the one end is our desire for attitudinal consistency - a consistency explained by Heider's (in Hill, 1979) theory. This theory stipulates that individuals have a need to develop an attitudinal system in which their component attitudes are in balance (that is consistent) with one another. Attitudinal imbalance causes stress and motivates the individual to restore consistency as quickly and as easily as possible. Heider's theory is supported by psychology theorists such as Osgood

and Tennanbaum (in Hill, 1979) who focused on the importance of maintaining attitudinal consistency during an analysis of the circumstances surrounding a particular decision.

The second tier is presented by a need for attitude-behaviour consistency (Hill, 1979). This consistency between attitudes and actual behaviour can develop in either of two rather different sequences. The first sequence involves an attitude that leads to behaviour consistent with that attitude. On the other hand, a decision-maker may find himself behaving in a particular manner and subsequently discovers what his underlying motive or attitude must have been. In the latter sequence, the behaviour shapes the attitude that determines our selection of a particular alternative.

5.6.3 VALIDATION OF CHOICE

A final need consistent with all decision-making is our desire to justify the appropriateness of our choice to others and ourselves. This desire to know that we have made the correct decision, stems from our lack of self-awareness as decision-makers (Lieberman, 1972). We have high opinions of our decision-making ability and are systematically over- confident about the quality of our judgements and decisions. The process by which this justification or rationalisation of choice unfolds, may occur in one or all of four types:

- promotion of the positive attributes of the chosen alternative;
- playing down the virtues of the non-chosen alternative;
- playing down the drawbacks of the chosen alternative, and
- promoting the disadvantages of the non-chosen alternative.

This brief summary of the fundamental decision needs have indicated that, in order to understand why decisions are made as they are, one needs to appreciate the human proclivity to behave in ways that are simplifying, consistent and longs for justification. We wish to make it clear to the reader that the fact that decision-makers behave in ways that are simplifying and consistent, should not be construed as implying that a decision cannot be influenced or that it is necessarily an irrational process. Rather, these needs should be viewed as constraints impacting on the decision process, which cannot be easily changed, but can be better understood. Such an understanding can help decision-makers to realise and become aware of the forces that acts upon them, thereby encouraging greater vigilance

in their future decision endeavours (Taylor, 1984, Hill, 1979 and Goldstein & Hogarth, 1997).

The needs discussed in this section form an integral part of the person or human component in the decision-making process. Any behaviour of this human component is better understood as a function of two parameters: the environment and personality traits. These parameters are the final two components of this chapter, which will receive closer analysis in the subsequent sections.

5.7 DECISION-MAKING: INTERACTION WITH THE ENVIRONMENT

The research of Ranyard *Et al.* (1997: 75) refers to a host of scholars who all agree that "*the decision process includes cycles of actions and reactions in relation to a changing environment*". In this environment, that decision-makers carry out strings of actions over a period of time in order to cope with a decision problem and to gather information regarding the alternatives. In addition, the decision-maker reacts to external events that occurred during the decision process. These cycles of action and re-actions are referred to as "*action- feedback loops wherein the decision-maker reacts to the consequences of actions that he has performed earlier in the decision process*" (Ranyard *Et al.*, 1997: 75).

The decision environment consists of all aspects of and elements in the decision-maker's physical and social world. Since the student chooses between alternatives within this social and physical environment, it is impossible to truly comprehend the meaning of the individual's decision behaviour without a further analysis of these two domains.

5.7.1 THE PHYSICAL ENVIRONMENT

The physical environment is defined as "*the condition and influence under which one lives*" (Van den Aardweg & Van den Aardweg, 1998: 85). The decision-maker embarks on his journey in this environment as soon as the ovum is fertilised by the sperm. That ovum now becomes part of the environment and the environment acts on the ovum. This principle of being in the world now applies throughout the life of the individual and reveals his relationship with the environment: the decision-maker is inseparable from this environment.

The physical environment is more than just objects surrounding the individual. The physical environment is also a *people* world (Oberholtzer, 1968). This idea is supported

Du Plooy & Kilian (1982) who guard against synonymising world with environment. The environment is the world from the perspective of *"world that has been made liveable for the individual"* (Du Plooy & Kilian, 1982: 128). In the process of making the world a liveable environment, man assigns meaning to all he encounters. Through meaning, his environment becomes sensible: *"he experiences cognitively and emotionally the things that he is confronted with in a matter that gives meaning to the individual"* (Du Plooy & Kilian, 1982: 129).

The fact that man assigns meaning to what he encounters does not imply that meaning is a total reflection of all that is experienced. Meaning is assigned voluntarily and according to one's own choice. Thus, meaning is assigned to matters/objects of personal importance with the aim of enriching his own life world.

Through the individual's relationship with his life world, his environment takes on a certain shape (Landman, Roos & Liebenberg., 1971). This shape is different from the shape of plant or animal life shapes. The animal and plant kingdom has no control over their environment. On the other hand, the shape of human life reveals that man should not fall pray to his environment, because he has the ability to change his situation in his environment through decisions and choices (Landman *Et al.*, 1971 and Du Plooy & Kilian, 1982). In addition to the rational choice and decision-making, shape is altered by the content of the life world/ environment of the individual: what he does, thinks and methods embraced to unfold and enrich his world with meaningful matters and concepts.

Du Plooy & Kilian (1982) conclude that shape and content of an individual's environment should not be seen as overlapping terms, rather the one is an extension of the other. In this sense, environment implies content. But content needs not only entail relationships with lifeless objects. According to Oberholtzer (1968: 1):

Man's life world is, against the backdrop of reality, the subject of an individual that is met by his fellow beings, objects, God (a god) and where he meets them.

This definition paves the way for a second type of environment, namely the social environment.

5.7.2 THE SOCIAL ENVIRONMENT

The social environment is defined as *"the development of relationships and associations with others"* (Van den Aardweg & Van den Aardweg, 1988: 214). This

environment is marked by mutual interaction, friendliness and geniality with the aim of enjoying the society or the companionship of others. From the moment of birth, the individual enters the world as someone who constitutes an integral part of the first and most natural social community – the family. Through his socialisation, the individual grows social relationships and social behaviours that encourage the acceptable assimilation of the individual into society. These behaviours include familiarisation with rules, attitudes and other details of the culture within which the individual is borne. Thus, the formation of healthy relationships with others is basic to the social environment of the decision-maker.

It is within this society that the individual attempts to maintain himself and inevitably will find himself in a situation that contradicts his own beliefs or desires. This causes conflict within the individual. On the one hand, he does not want to be dominated by society, but on the other hand, he does not want to isolate himself. It is within this conflict that the individual experiences his dependency upon others (Du Plooy & Kilian, 1982).

The individual also realises this social dependency in his decision task. As already indicated, decisions normally involve insufficient evidence, differing values, a variety of personal and differing interests and external pressures - all of which serve to make the individual experience uncertainty during decision time (Lieberman, 1972). It is during these weighty and uncertain decision moments that decision-makers frequently turn to others for help with the solution of problems in the hope that a detached, more objective observer may offer assistance.

However, it is not only from the perspective of seeking assistance that the decision-maker affects his environment. We have already mentioned that decisions are not made in a social vacuum, but that many social factors influence decision-making. Usually the decision-maker feels accountable to others such as family and peers. This accountability can affect how the decision-maker actually decides, because he necessarily wants to justify his choice to those that he perceives to be important.

It is however, not only the individual who reflects on society. The decision-maker is a 'being in society'- as such, society has to take him into consideration. That is why, when the decision-maker seeks help, he often finds that much is offered to him (Lieberman, 1972). The extent to which the decision-maker will accept the help of others,

depends on his perception of how well this assistance will aid his realisation of a specific desired state.

A final reflection on this social environment is provided by Jacks (Du Plooy and Kilian, 1982). According to Jacks, the social environment within which the decision-maker finds himself is constantly changing. The implication is that the decision-maker's decision action within the environment is only relevant at that particular point in time. All decision actions should thus be reviewed against the background of a time implication. Jacks describes this time implication successfully when he says:

Our decisions today is the enrichment of the life we all enjoy, but it is tomorrow what their influence will be felt and that the society which they have largely created, will come into being (Du Plooy & Kilian, 1982: 3).

In conclusion, decision-making situations involve a consideration of the physical and social environments on decision-making activities. These environments can arise from the need to involve many people in the decision process and to consider the preferences for objects in the decision-maker's life world. The extent to which the decision-maker allows these environments to influence or reflect on his decision result, will depend on the value assigned to each by the decision-maker (Taylor, 1984).

We have shown that decision-makers are motivated by several common needs that affect their method in which alternatives are developed, evaluated, chosen and justified. These needs form an important part of the *person* of the decision-maker. The remainder of the person consists of a set of traits that may be different from one decision-maker to the next and that are likely to influence the effectiveness of the decision outcome. The following section considers several of these personality traits and investigates their possible influence on the decision outcome.

5.8 PERSONALITY TRAITS AND DECISION-MAKING

A final investigation is necessary before we could attempt to empirically research the factors that affected the distance education student's decision when choosing between the modalities of print or on-line instructional content. This investigation is aimed at examining the relationship between various personality traits that have been isolated by previous researchers based on their affect on the decision-making of individuals. In our discussion we defined personality and then focused on the traits associated therewith and

explained what modern research has proved to be its influence on decision-making in general.

5.8.1 PERSONALITY

Personality is defined as the *"sum total of the behavioural and mental characteristics that are distinctive of an individual"* (Colman, 2001: 547). For Reber and Reber (2001: 525), personality is *"a compendium of traits or characteristic ways of behaving, thinking, feeling, reacting, etc."* According to Van den Aardweg and Van den Aardweg (1988: 168) personality is *"the sum of intrinsic traits, characteristics and consistent attitudes that identify an individual as unique"*. Personality is different from the *self*, *self-concept* and *self-esteem* (concepts that will be defined separately in a different section). The personality emerges from the self to the extent that one's personality is different from that of another person. This difference results from the fact that individuals have different levels of awareness about themselves, different knowledge and perceptions of their awareness and different levels of self-esteem. From these it is clear that each individual projects himself differently to others (Van den Aardweg & Van den Aardweg, 1988 and Reber & Reber, 2001).

Personality assumes a dynamic relationship between the individual and his world. This relationship either suggests a positive interaction if the individual is friendly, enthusiastic, co-operative and trustworthy. However, if the individual shows traits of deceit or moodiness, the relationship is denoted as being negative. In order to develop an adequate relationship with the world, that is, to present a positive personality, Comb (Van den Aardweg & Van den Aardweg, 1988) suggests the following:

- seeing oneself as positive, successful, esteemed, of integrity;
- perceiving oneself realistically and honestly;
- show empathy to others, and
- always strive to be well informed.

5.8.1.1 THEORIES OF PERSONALITY

Freud

The theory developed by Freud maintains that the structure of the personality is determined by the manner in which the *Id* (that aspect of the personality which is beset

with violence, instincts, aggression and immediate), the *Ego* (that aspect of personality which negotiates conflict between the *Id* and the *Super ego*) and the *Super ego* (that aspect of the personality which relates to societal models and principles) have been integrated and modified during development through everyday experiences. In order to survive the pressure administered by the *Id* and the *Super ego*, the *Ego* develops defence mechanisms. Should these mechanisms dominate and endure, the individual is at risk to develop a disorganised personality. Van den Aardweg & Van den Aardweg (1988) describe Freud's defence mechanisms as follows:

- rationalisation: individual's self perception and the development of excuses for one's shortcomings;
- rejection: involves projecting one's shortcomings to others;
- fantasy/day dreaming: cognitive satisfaction of desires;
- identification: relation to an admired individual in order to develop a positive self-esteem;
- sublimation: involves a substitution for aggressive behaviour;
- regression: reverting to behaviour of an earlier stage of life, and
- repression: involves a constant denial of expression.

Roger

Roger emphasises the influence of the phenomenal field on personality. His theory portrays the self as central to the environment. Within this environment, the personality is developed based on the individual's ability, motives, role as a community member (such as being a student), how he defends himself in circumstances and how he values himself.

Allport

Allport places much emphasis on the individuality of the personality. This individuality is portrayed by the unique organisation of the personality, its changeable nature with reference to behaviour and thought and its intrinsicity with regard to conscious and unconscious processes. Allport's theory shows the following to be important to personality:

- knowledge and experience of the body (physical self);
- the realisation that the 'I' is different from others (self identity);

- the development of self-esteem through success or failure, shame or pride;
- extension of the self through possession of objects and people;
- solving problems, tests, hypotheses about the environment (rationality), and
- setting appropriate long-term goals and striving to pursue them (Van den Aardweg and Van den Aardweg, 1988).

5.8.1.2 EFFECT ON DECISION-MAKING

Studies done by Taylor and Dunette in 1974 (Taylor, 1984: 101) indicate that personality exerts a major influence on idiosyncratic decision-making, especially with regard to the amount of information sought and the rate at which the decision-maker assesses the information. A second deduction is that the post decisional process of confidence in choice and flexibility with regard to altering decisions, strongly related to *"the personality traits of dogmatism"*. A final observation is that the influence of personality in general is better understated if one investigates the effect of individual traits/characteristics. They found that the traits of beliefs, self-actualisation, tolerance for ambiguity, self-concept, motivation, interest, locus of control and risk-taking are the most significant influential factors. These factors are confirmed by studies done by Hill (1979).

To better understand the relationship between personality and decision-making, we investigated each trait and comment in the next section on its influence on decision-making as confirmed by modern research.

5.8.2 BELIEFS

What an individual believe is defined by the Oxford Dictionary of Psychology (Reber & Reber, 2001: 84), as *"any proposition that the individual accept as true on the basis of inconclusive evidence - a conviction, faith or confidence in something or someone"*. According to the Penguin Dictionary, a belief is simply *"an emotional acceptance of some proposition, statement or doctrine"*. A belief is stronger than baseless opinion, but not as strong as an item of knowledge (Colman, 2001: 86).

When a decision-maker decides upon an alternative, he rarely knows how things will turn out, because there are simply too many uncertainties. Despite these uncertainties, the decision-maker has faith (believes) that his chosen alternative will be as effective as any of the others in pursuing his objectives. However, the strength of his belief depends on

the pre-decisional research effort and involvement of the decision-maker in his analysis (Fishburn, 1972).

5.8.2.1 *EFFECT ON DECISION-MAKING*

A key characteristic of personalistic or intrapersonal decision-making is the evaluation of alternatives on the basis of the needs and expectations of the decision-maker. The individual identifies his beliefs in the relative abilities of each alternative to attain a predetermined desired state based on the evidence available to him. It is thus concluded that any decision is consistent and coheres with the individual's belief regarding an alternative. Belief enters in the form of his personal probabilities for consequences as conditioned on strategies (Fishburn, 1972).

5.8.3 *SELF-ACTUALISATION*

Introduced by the German psychiatrist, Goldstein, this concept is defined as "*the motive to realise one's latent potential, understand oneself and establish oneself as a whole person*" (Colman, 2001: 66). A different description denotes self-actualisation as "*the attainment of all that an individual can possibly attain in every aspect of development*" (Van den Aardweg and Van den Aardweg, 1988: 84).

Goldstein's initial concept portrayed self-actualisation as the 'master' motive, or the only real motive to the extent that all other motives are merely manifestations of this master motive. After Goldstein introduced the term for the first time, Maslow and Jung formalised their own theories on this concept. Where Goldstein denotes self-actualisation as a motive, Maslow views this phenomenon as a process towards a level of development - the final level of psychological development that can be reached when all basic and meta needs are fulfilled. Where Maslow and Goldstein did reach common ground is that both their theories expressed the qualities of independence, autonomy, tendency to form few but deep relationships, philosophical sense of humour, resistance to outside dangers and a general transcendence of the environment rather than simply coping with it. To these qualities, Van den Aardweg and Van den Aardweg (1988) add capability of assigning meaning and progressive orientation, involvement in tasks outside the self and experience of meaningful activities to a great degree.

A different perspective on self-actualisation is provided by Carl Jung who defines the concept in terms of the individuality: "*the process by which a person becomes a psychological individual that is an indivisible unity or whole*" (Van den Aardweg and Van

den Aardweg, 1988: 155). According to the individuality theory, self-actualisation begins when a child realises that there exists separateness from his mother. When individuality is completed in that latter half of an individual's life, the dynamic forces of personality are harmonised, balanced and centred. The individual becomes a true self and experiences inner peace, quiet and a sense of wholeness. On completion of individualisation, the conscious and unconscious begin to complement rather than oppose each another.

Two conditions regarding self-actualisation need to be clarified. The first is that self-actualisation is not synonymous with perfection, as perfection is unattainable. This becoming of the best one can be implies acceptance of the self to a degree that can produce guilt, anxiety, shame and aggression. It is thus a realistic acceptance of oneself and of one's limitations.

Secondly, self-actualisation is not achieved passively. It is the product of deliberate effort to realise one's potential. This effort involves meaningful activity. These activities do not concern the self per se, but activities that are located outside the self. To conclude, self-actualisation cannot be attained if it is an end in itself - it involves transcendence above the apparent limitations of time, space, physical and mental abilities (Van den Aardweg and Van den Aardweg, 1988, Colman, 2001, Reber and Reber, 2001).

5.8.3.1 *EFFECT ON DECISION-MAKING*

Self-actualisation's effect on decision-making is evident indirectly, rather than directly (Taylor 1984). The level of self-actualisation reached by a decision-maker will affect activities such as cognitive ability, tolerance for ambiguity, self-concept and the like, which in turn will exert a definite direct impact on the actual choice made by the individual. As each of these activities are discussed separately and their influence on decision-making analysed at the time of their discussion, we limit this interpretation to the effect of cognitive ability structure. Wright (1984: 44) quotes Brunswick who in 1950 made the following comment on cognitive structure and its relation to optimal decisions: "*A simple, firm, often stereotypical cognitive structure is a required*". Where cognitive structure is insufficient, it appears to limit the decision-maker's effectiveness in aggregating preferences and information, in judging the diagnosticity of information and in the retention of information in the short-term memory.

Cognitive attributes are further found to influence the information processing abilities of decision-makers. It is concluded that intelligent decision-makers process

information faster and are capable of making optimal decisions more frequently given a shorter time allocation. Whilst cognitive attributes affect information handling and choice behaviours, they are found to have little effect on post decisional processes (Taylor, 1984).

5.8.4 TOLERANCE FOR AMBIGUITY

Tolerance for ambiguity refers to:

A cognitive style characterised by an inability to accept with discomfort situations or stimuli that allow alternative interpretations and a preference for situations or stimuli that appear black and white to those that consists of shades of grey (Colman, 2001 376).

The Penguin dictionary describes this phenomenon as *"the degree to which one is able to tolerate lack of clarity in a situation or in a stimulus"* or *"underlying personality dimensions when the primary interest is in the pole of intolerance"* (Colman, 2001: 26).

To some extent, nobody is fond of being continuously confronted with ambiguous situations. Also, people differ in their underlying willingness or ability to tolerate information with two or more meanings/interpretations. After a while, all people find ambiguity and uncertainty intolerable (Hill, 1979). Some individuals, however, are far less tolerant of ambiguity than others - they prefer information that is concrete, rather than abstract and problems with simple solutions rather than the more complex. Personality types that are associated with low tolerance of ambiguity include authoritarianism and conservatism (Wright, 1984 and Colman, 2001).

Ambiguous situations result when the source of influence on the situation has credibility due to its expertise or group unity and size and, therefore more closely relates to interpersonal decision situations where prior judgements are not found and the social support is absent (Loke, 1995). When decisions are made in these situations, that is, the uncertainties are themselves unspecified, it is called a decision under ambiguity (Carroll and Johnson, 1990).

5.8.4.1 EFFECT ON DECISION-MAKING

The primary effect of ambiguity is that it increases the difficulty of identifying the best course of action to take. Studies done by Jane and Mann in 1977 (Taylor, 1984) revealed that effective decision-making requires a willingness to think carefully before acting. This thinking process should involve canvassing thoroughly all alternative causes

of action, weighing the rewards and costs of each alternative, etc. The resulting situation is that a person with a high tolerance of ambiguity will be more willing and able to engage in each of the stages associated with the decision-making process. Similarly, a person who is intolerant of ambiguity will tend to be far less patient. The latter decision-makers tend to make decisions pre-maturely, thereby reducing their chances of making truly effective decisions (Taylor, 1984). In the words of Budner: *"people who insist on a yes or no answers (intolerant of ambiguity) just do not know how complicated things really are"* (Wright, 1984: 44). Such individuals act with anxiety and withdrawal from uncertain situations (Reber and Reber, 2001).

5.8.5 SELF-CONCEPT

Perceived by many as the core of our personality, self-concept has varied descriptions - some of which are inclusive and others exclusive. Vrey defines self-concept as *"a configuration of convictions concerning oneself and attitudes towards oneself that are dynamic and of which one is normally aware or may become aware"* (in Van den Aardweg & Van den Aardweg, 1998: 84). Reber and Reber (2001: 660) present another description: *"one's conception of oneself as complete and thorough a description as it is possible for one to give"*. This definition contrasts self-concept with the term self-esteem, which emphasises evaluated judgements. Self-esteem is *"the degree to which one values oneself"* (Reber & Reber, 2000: 661). This perception is different to that of Colman (2001: 660) who defines self-concept as one's self-esteem: *"one's attitudes towards oneself or one's opinion or evaluation of oneself, which may be positive (favourable or high), neutral or negative (unfavourable or low)"*.

Our research supports Van den Aardweg and Van den Aardweg's (1988) description which makes a distinction between self-esteem, self identity and action (I am, therefore I...), but combines all these terms as three mutually dependent components of the self-concept. They isolate the following fundamental aspects of the self-concept. The self-concept is a psychological construct that one creates to understand a particular reality. They assume an integrated structure of the concept of the self to which differentiation and generalisation are important. Measured against subjective standards, it is highly significant for the self and affects the entire personality (Van den Aardweg and Van den Aardweg, 1988).

To conclude, self-concept refers to the affection people have about how well they do in their own eyes and in the eyes of others. People with a positive self-concept tend to

have a greater self-esteem and self acceptance and as a result, have shown to be less anxious about what others think of them than those with a negative view of themselves (Taylor, 1984).

5.8.5.1 EFFECT ON DECISION-MAKING

Research has shown two distinct ways in which self-concept influences decision-making. Firstly, because people with a low self-concept generally experience greater anxiety, these people are more prone to experience stress. Stress makes a thorough search for and evaluation of alternatives extremely unlikely. Secondly, because of people with low self-concept's greater concern about how they look in the eyes of others, these decision-makers may be unduly sensitive to social pressure resulting in them not doing what they believe to be right, but rather what they believe others perceive as right (Taylor, 1984). These two reasons thus indicate that people with a low self-concept are less likely to make optimal decisions.

5.8.6 MOTIVATION

Motivation is defined as "*a driving force/forces responsible for the initiation, persistent direction and vigour of goal directed behaviour*" (Colman, 2001 464). Van den Aardweg and Van den Aardweg (1988: 38) define this concept as:

The driving force, impetus of the personality, which is put into effect by an act of the will in accordance with what the individual wants to do.

Motivation can be regarded as an energiser for behaviour (Reber & Reber, 2001). Motivation is intimately entwined with emotions as emotional states tend to have motivational properties and energising elements. This close relationship between motivation and affect, namely that the psychological structure in the one tend to indicated in the other, is confirmed by Isen (in Goldstein & Hogarth, 1997: 519): "*positive affects may influence task motivation, because richer tasks are also more motivating*".

Motivation is related to motives - they are the actual factors that motivate a person, such as a need to succeed in a test, race, etc. These motives get the individual started and provide direction to select the optimal behaviour for attaining desired goals. Motivation also includes the biological drives of hunger, sex and self-preservation. These drives can be 2-tiered. On the one side, energising drives can be general arousal without any specific

goal or direction. Such drives are termed 'generalised' energisers and are responsible for dominant behaviour in a specific situation (Reber & Reber, 2001 and Colman, 2001). At the other end are motives or drives that are specific to particular needs. These drives require analysis in terms of specific goals or directionality. In the domain of human psychological motivation, this type of motivation is labelled *axiomatic* - "*a particular behaviour or tendency is observed, because of a specific motivational state*" (Reber & Reber, 2001).

Motivation is a universal characteristic of all individuals - no person is ever unmotivated (Van den Aardweg & Van den Aardweg, 1988). People constantly maintain or enhance their personal affect. From these feelings, motivation is inspired by the need to be consistent, the need to be self-actualised and the need to become functional (Van den Aardweg & Van den Aardweg, 1988).

Literature shows two types of motivation - intrinsic and extrinsic motivation. The individual's own urges, goals, curiosity and interests fuel intrinsic motivation. Extrinsic motivation stems from without the individual. Heavily dependent upon others, this motivation needs constant reinforcement without which motivation will cease. If abused, extrinsic motivation can impede the development of intrinsic motivation.

5.8.6.1 EFFECTS ON DECISION-MAKING

According to Cassel (1973: 69) the "*nucleus of personal motivation in man remains the decision-making process*". A decision serves as the blueprint of the individual's action - his decision identifies the personal choice or alternatives to pursue. To lack motivation is similar to having no personal goal - without a goal there is no decision to be made. When decision choices deal with actions or with a means of achieving an end, rather than the expected outcomes, or when the desired state is vague and ambiguous, motivation may be lacking (Cassel, 1973 and Goldstein & Hogarth, 1997).

Taylor (1984) identified a second influence of motivation. The effect of motivation on decision-making may reflect a shift in aspiration levels over a series of decisions, producing corresponding changes in decision criteria or otherwise, affecting the evaluative aspects of decision-making.

5.8.7 INTEREST

Defined as *"the deliberate, voluntary focus of attention, concern and activity on a particular person, object, event or sphere"* (Van den Aardweg and Van den Aardweg, 1988: 120), interest is intensely related to motivation - they are not the same phenomenon, but interest is a necessary prerequisite for motivation (Cassel, 1973). In addition, interest is also delicately related to what a person can do and has already experienced. Also, there is a high correlation between interest and achievement and interest and needs (Van den Aardweg & Van den Aardweg, 1988).

Like motivation, interest is part of the decision process. One cannot have motivation without at the same time having interest. This will to be motivated, to understand, communicate and do things oneself is subjectively innate - it is related to a person's values and the intensity of the interest is indicative of the need for self-actualisation in the direction of the interest.

5.8.7.1 INFLUENCE ON DECISION-MAKING

Due to the close correlation and interconnectedness of interest with motivation, one can deduce that the effect that interest has on the decision tasks imitates that of motivation. In the words of Cassel (1973: 33) *"the builder does not begin construction of a home without some blueprint or design"*. Similarly, productive endeavour on the part of the decision-maker during the decision process is only effective to the degree to which he is able to direct his interest towards the accomplishment of carefully defined desired outcomes. Lack of interest will cause half-hearted investigation of the alternatives, which is not fruitful in the achievement of expected results.

5.8.8 LOCUS OF CONTROL

This concept was first introduced by Rotter in 1966 who described the phenomenon as *"the subjective probability that outcomes are determined by self effort (internal control) or by outside agency (external control)"* (Hill, 1979: 68). Colman (2001: 415) provides another definition with a slightly different perspective:

A cognitive style or personality trait characterised by general expectancy about the relationship between behaviour and the subsequent occurrence of reinforcement in the form of punishment.

This definition shows that the locus of control is not a measure of reality. In this sense, locus of control does not involve the question whether true control derives from endogenous or exogenous sources, but how the individual perceives the outcome.

In effect, the world can be seen as consisting of two extreme personality types: those who believe that their outcomes are dependent upon their own behaviour (called internals) and those who believe that the outcomes they experience are independent of their own behaviour (called externals). Internals believe that they determine their own rewards and costs and thereby shape their own destiny. Externals perceive that the rewarding of costly outcomes are determined by fate, luck, chance, other people and not by anything that the externals themselves may do. Between these two extremes, lies a continuum of intermediate cognitive styles pertaining to locus of control (Wright, 1984 and Hill, 1979).

5.8.8.1 EFFECTS ON DECISION-MAKING

The effect of the locus of control on decision-making is 2-tiered. At the one end, locus of control is likely to affect the decision-maker's ability and willingness to search for and evaluate information. According to Hill (1979: 68), *'the extent (to which) a decision-maker believes that the locus of control over outcomes is external to him (that events are largely beyond his control)... he is likely to invest very little care and effort in the study of alternatives'*. Conversely, internals are more likely to take the search process seriously and will probably experience greater results.

Wright (1984) refers to studies done by McInish in 1982 who found a second influence of locus of control on decision-maker's decision results. According to this study, externals are more likely to endeavour in risky decisions (where decision outcomes are unknown) than internals. McInish explains this outcome in terms of the lack of research by externals - *'why bother, after all, if one's ability to influence outcomes is minimal'* (1985: 47).

5.8.9 RISK

Decision-makers differ in their underlying willingness to take risks (Hill, 1979, Isen, 1997 and Wright, 1984). This willingness to take risk is independent of the particular social situation in which they are placed. Some people go out of their way to avoid situations in which it may prove necessary or desirable to take risks. Others seem to thrive on risk and seek out situations in which it pays to gamble.

Generalised risk-taking can be divided into four independent dimensions: monetary risk taking (gambling), physical risk taking, social risk taking and ethical risk taking. Isen (Goldstein & Hogarth, 1997) concludes that all four domains are closely related to a function of positive affect - positive affect resulting from induced feelings of control promotes wagering, especially where the costs are low, but the stakes are high.

5.8.9.1 *EFFECTS ON DECISION-MAKING*

Hill (1979) concludes that it may be that the most effective decisions are made by people who are neither extremely high nor extremely low in their willingness to take risks. A decision-maker that is high in risk taking propensity is more likely to disregard the importance of a careful screening of alternatives and may end up experiencing less than optimal results. Similarly, a decision-maker who is unduly concerned about risk avoidance is apt to be so constrained in his search for and evaluation of alternatives that he has great difficulty committing himself to a decision - moreover, the decision itself may prove to be unnecessarily conservative.

Optimal decisions are made by decision-makers with a willingness to take risks, but who knows when to continue the investigation of alternatives and when to withhold from it, when to pursue a risky course of action and when to avoid it. Positive affect may support the decision-maker and inspire greater commitment to all the aspects of the decision process. The result is no longer that of a risky decision, but an informed judgement (Goldstein & Hogarth, 1997, Wright, 1984 and Hill, 1979).

5.9 SUMMARY

This chapter showed that the act of taking a decision is a process, which, although closely related, is different from choice or judgement. This process can be regarded as an open system that consists of six distinct procedures. Once the problem is defined and all alternatives have been identified, the decision-maker can apply several techniques, including a decision tree, decision matrix, game theory or the mathematical models of linear programming, linear regression and forecasting to quantify his options. This is followed by the actual decision, which places the burden on the decision-maker to implement a choice and assume responsibility for a selected course of action.

We indicated that the extent to which decision-makers adhere to each aspect causes two distinct decision types, namely informed and uninformed decisions. Apart from these two types, decisions may also be normative or descriptive. Depending on the number of

people involved in the actual decision process, it is possible to distinguish between interpersonal and intrapersonal decisions – the latter being the focus of our study.

This chapter also embarked on a detailed account of conflict, defined the phenomenon and showed how conflict is different from dissonance. Four types of conflict were identified and each was related to the possible origin of a decision for the distance education student.

We showed that each decision-maker has three distinct decision needs that regulate his behaviour, namely the need for simplicity, consistency and the need to validate or justify his action. We placed the student as a decision-maker in a physical and a social decision environment and showed that no decision can be made or analysed without regard to the particular environment that the student finds himself in.

The latter portion of our discussion investigated the particular personality traits that literature has shown to be influential in the decision behaviour of individuals. Eight personality traits were identified and each, after we defined the concepts, was analysed for the illumination of its possible effect on the final outcome of the decision process.

This chapter concludes our literature review and paves the way for our empirical research. In the subsequent chapters embark on an investigation with the aid of a questionnaire and statistical analysis of the results produced by the questionnaire to unravel the particular motivational factors that affect a student's decision when he chooses between print or on-line delivery modes of instructional content in the context of distance education.

6 FROM THEORY TO PRACTICE: RESEARCH METHODOLOGY

Education is more than filling a child with facts. It starts with posing questions.

- D. T. Max (The New York Times)

6.1 INTRODUCTION

The previous chapters addressed the first four initial research questions by shedding light on the choice alternatives presented to students in distance education. We saw that technology had a great deal of influence on the present delivery mode alternatives. We also reviewed the specific characteristics portrayed by the distance education student, which might influence his decision behaviour. The previous chapter explained the decision process and premised personality traits influential in the final choice between print-based or on-line modalities.

We will now investigate the underlying themes of our research project. We empirically measured the motivational factors affecting the decision behaviour of distance education students who chose between the modalities of print and on-line instructional content and compared our survey results with that of previous research. This chapter therefore, had as its primary objective, answering research question 5 stated in chapter 1: *Which motivational or decision factors described a positive or negative choice preference towards either print or on-line modalities?* Chapter 1 stated 3 additional questions associated with question 5, which also needed investigation:

5.1 Which of the factors identified above would significantly distinguish between the sample means of print-based students and on-line students?

5.2 What was the relative contribution of each factor to a particular choice preference?

- Did our data support previous research that a relationship exists between optimal decision-making and personality traits?

We organised the content of this chapter into twelve sections. Following this introduction will be a brief discussion on the type of research design that was implemented. The extent to which the study relied on quantitative and qualitative methods will also be indicated.

Section 3 discloses the objective of the research, which will be followed by a statement on the hypothesis implied by our design. Section 5, entitled Data Collection, explains the design and administration of the questionnaire employed in our research.

Section 6 orientates the reader on the sampling procedures and defines the populations represented by the sample. Some sampling decisions that affected our selection process are noted. We also comment on the setting from which the sample was drawn.

Section 7 provides a detailed account of the measurement scales employed, as well as a description of the coding and scoring of data. This section is followed by a description of the procedures for maximising internal validity and reliability.

Section 9 describes the statistical procedures used for the testing of the research questions, which is followed by an objective report of the results yielded by each test.

This chapter concludes with a presentation of the results, followed by a discussion and interpretation of the results in the light of other research.

6.2 TYPE OF RESEARCH DESIGN

We engaged in a non-experimental, descriptive and exploratory research design that combined aspects of correlational and survey methods for obtaining information. Non-experimental criteria, according to McMillan (2000: 9) was realised in that we had *“no direct influence on what has been selected to be studied, either because it has already occurred, or (more relevant to our design) because it cannot be influenced”*. In other words, we were unable to control nor did we attempt to control any factors or phenomena that might have influenced the respondents’ behaviour. As we also investigated possible relationships between these uncontrolled variables, our research contained evidence of being correlational (Fraenkel & Wallen, 2000 and Crowl, 1996). Rather than to prove causality, the researcher related a set of clearly defined variables to the choices students made when they selected print or on-line modalities.

Descriptive research is defined by Best (Cohen, Manion & Morrison, 2000: 196) as

Conditions or relationships that exist, practices that prevail, beliefs, points of views or attitudes that are held, processes that are going on, effects that are being felt, or trends that are developing. At times, descriptive research is concerned with how

‘what is’ or ‘what exists’ is related to some preceding event that has influenced or affected a present condition or event.

In our attempt to answer the latter two questions of this definition, information was gathered by means of a once-off self-report that took the form of subjects’ responses to structured questionnaire items. This process of collecting information from a group of selected respondents, with the aim of analysing the results in order to answer research questions, accounted for our *survey* research classification above (McMillan, 2000).

The validity of the research was tested qualitatively through a review and content analysis of the literature stream with respect to optimal decision strategies and quantitatively through the use of descriptive statistics.

6.3 RESEARCH OBJECTIVE

This research initiative measured and compared the motivational or influential decision factors affecting students who selected the print-based alternative to motivational decision factors of students who selected the on-line alternative of receiving instructional content through means of an empirical investigation.

6.4 RESEARCH HYPOTHESIS

Based on the findings of our literature review, a statement that *‘there were no statistically significant differences or relationships’* (McMillan, 2000: 43), or null hypothesis, was implied in our research design. The null hypothesis that was tested read as follows:

There was no statistical significant difference between the motivation for choice means of students who prefer print-based instruction and the motivation for choice means of students who prefer on-line instruction.

Using an error threshold or alpha (α), defined as *‘the acceptable probability of a Type I error’*, which is conventional to most behavioural sciences, we made a decision to accept or reject the null hypothesis at a probability of 0.5. The decision to accept or reject the null hypothesis was based on test statistics calculated through an F-test and $\frac{\sigma^2}{\sigma^2}$, as our analysis was associated with a univariate and multivariate analysis of variance containing both nominal and continuous data.

6.5 DATA COLLECTION

6.5.1 INITIAL CONSIDERATIONS

We initiated the data collection phase by approaching distance education institutions that offer courses via modes of print and on-line delivery alternatives. Initially, three post-secondary distance education institutions located in Ottawa (Canada), were contacted via telephone and written requests to obtain permission for conducting research that would involve their students. All of these institutions refused to expose information of the students to a so-called third party student, which they defined as being a student not enrolled in their institutions. These institutions also did not volunteer to administer the instrument to students that satisfied our conceptually defined population requirements. As a result of the difficulty associated with obtaining a sample population in Ottawa, we shifted our attention to the University of South Africa. Our research supervisor, Professor Mashile, was approached to assist in the search for possible sample pools from which the convenience sample could be accumulated. Professor Mashile identified students in six courses at UNISA for possible inclusion in the sample. After approaching each of the affected course leaders, only two consents were granted. The other course leaders either did not respond, or refused to give permission, since they were already involved in research with their groups and as such, they were reluctant to burden the students with an additional questionnaire to complete.

The second phase of our data collection involved a clear articulation of the purpose of the survey, namely to gather information on the decision habits of students when choosing between two delivery mode alternatives. As a second component of this phase, we stated clear secondary objectives that would enable us to achieve our primary objective in section 6.3. These secondary objectives involved the following:

- acquiring all necessary data needed to complete the survey;
- optimising the use of students' time and resources;
- minimising cost of administering the instrument, and
- minimising the degree of complexity during analysis of results.

The third component of our design phase involved our consideration of the type of information needed that would best allow us to make conclusions about the most influential motivational decision factors during the student's choice between print and on-

line modalities. This phase was closely related to the literature review during which the aspects of the decision process and possible influential factors were investigated. On completion of the literature review, we isolated eight motivational factors (decision-making, self-concept, learning styles, conflict, attitude, social environment, physical environment and previous experience) that could have been influential in the decision process of students when they chose between print and on-line modalities. These factors constituted our theoretical model and are constitutively and operationally defined in the section 6.5.3.

The final preparation component of the data collection phase involved the consideration of various data collection techniques available and the selection of one that would satisfy our research objectives. A careful analysis of these methods and quantification of the alternatives resulted in the decision to utilise a questionnaire, delivered by e-mail (Mertens, 1998 and Cohen *Et al.*, 2000).

The next section focuses on the considerations that governed the design of the questionnaire.

6.5.2 DESIGNING THE INSTRUMENT

6.5.2.1 A DESCRIPTION OF THE QUESTIONNAIRE ITEMS

The questionnaire (Appendix 4 and 5) included 46 items in two sections. Section A, entitled Background Information, consisted of three dichotomous questions (item 2 to 4) and eleven multiple-choice questions (item 1 and items 5 to 14).

Item 1 of section A was used to separate the sample into two groups (print-based group versus on-line group) based on the specific choice the student made to receive instructional content. Two items assessed students' previous experience: item 2 with the choice they made in item 1 and item 12 with computers in general.

Information specifically used to characterise the sample frame included items on the student's study status (item 3), gender (item 4), level of education (item 5), age (item 9), marital status (item 10) and native language (item 11).

Items 6 (responsibilities that compete for time), 7 (approximate distance from educational institution), 8 (primary mode of transportation), 13 (access to a computer) and 14 (access to the Internet) assessed the physical environment of the student.

Six items in section A (items 6, 8, 10, 11, 13 and 14) included a category ‘other’ to allow for responses not anticipated during the design phase.

Section B, entitled Decision Process, contained 32 items which all followed the rating scale method of Rensis Lickert (Crowl, 1996, Cohen *Et al.*, 2000 and McMillan, 2000). All 32 items included a value that measured the respondents’ agreement or disagreement with statements on aspects of the decision process identified during the literature review.

Section B included seven items (20 – 21, 30 – 31 and 43 – 44 and 46) that assessed the decision behaviour of respondents. Eight items (19, 24, 32 – 34, 37 – 38 and 42) measured their self-concept and four items assessed their learning style preference (18, 27 – 29 and 35). Items 16 and 23 assessed the respondents’ attitude towards computers and books respectively, while six items (17, 22, 36, 39, 40 and 45) provided insight into the respondents’ social environment. Four items measured the respondents’ conflict experienced during his choice (15, 25 – 26 and 41). A more detailed description of each individual item and its relation to a specific factor is provided in section 6.5.3 entitled ‘Defining the motivational factors’ and section 6.7.3 (‘Scoring of the data’).

6.5.2.2 THE PHYSICAL APPEARANCE OF THE QUESTIONNAIRE

Three considerations influenced the physical appearance of the instrument, namely sequencing of the questions, the layout of the questionnaire and the method of administering the questionnaire. In an attempt to limit the creation of a mood set or mindset, which might negatively influence the reliability of the results, items measuring a particular aspect in Section B were not sequence or grouped into topic sections (Cohen *Et al.*, 2000).

We invested a lot of time in creating a final product that looked easy, uncluttered, attractive and interesting – all aspects of a successful survey questionnaire that are conducive of augmenting the response rate (Fraenkel & Wallen, 2000, Cohen *Et al.*, 2000). Each section began with an explanation of its purpose and the reasons for inclusion. This was followed by instructions that guided respondents through simple examples of the types of questions they could expect in each section.

At the beginning of the questionnaire, respondents were assured of confidentiality, anonymity and non-traceability. A brief note at the end of the questionnaire thanked respondents for their participation and co-operation.

A major determinant of the final product was related to the administration process. On reading the letter of transmittal (Appendix 3), the reader will notice that two options for participation were provided to the respondents. The Internet option (Appendix 5), developed by an expert Web developer, provided the respondents with several option objects, defined as “*entries in a select list*” (Lemay & Tyler, 1999: 1136). Each option object (1 per item) contained several radio buttons, which are defined as “*a list of items of which only one can be chosen*” (Lemay & Tyler, 1999: 523) – one radio button for each of the available alternatives. For items including the ‘other’ option, text input fields, which enabled the respondents to “*type text into a single line field*” (Lemay & Tyler, 1999, 521) were included.

Once the designated location of the Web-based questionnaire application was accessed, the respondents were greeted with a neatly formatted set of questions against a light blue background. The instrument was designed so that a respondent could not submit an incomplete questionnaire. After completion, application of a ‘submit’ button returned the answers to the researcher, which concluded the respondent’s participation.

The Microsoft Excel spreadsheet version of the questionnaire (Appendix 4) mimicked the on-line format of questions, but involved a slightly different application process. Each item’s alternatives were numbered starting at 1. The questions were designed such that respondents had to type the number of the option they selected for each item in a designated answer box located next to each question. As with the on-line version, a text box was provided in the event that the ‘other’ alternative was chosen.

In order to prevent respondents from altering the format of the questionnaire, the questionnaire spreadsheet was protected, allowing respondents access only to answer boxes and text boxes.

Once respondents had completed the questionnaire, they were required to mail the questionnaire to a given electronic mail address from where the researcher could access the results.

6.5.2.3 PROCEDURES DURING THE DESIGN PHASE OF THE INSTRUMENT

Four distinct phases signified our methodology procedure associated with the questionnaire. Once we finalised all the items to be included in the questionnaire, the questionnaire was pilot tested. Our pilot testing phase included several rounds of

clarifying wording, rearranging orders and numbers, discussing the questionnaire, revising and re-testing.

Testing of the questionnaire formats were aimed at insuring the following:

- Did all the radio buttons of the on-line application work?
- Could respondents only select one alternative for each item?
- Did all the text boxes function appropriately?
- Was it possible to submit an incomplete questionnaire?
- Was it possible to alter the Excel questionnaire?
- Did the 'submit' button deliver completed responses to the desired location?

For the pilot testing phase, Professor Mashile administered the questionnaire to a group of volunteers and staff members at UNISA. Comments were generated individually by each of the volunteers. After completion, the comments, which mainly suggested reconsideration of the length of the questionnaire, were reviewed and the necessary adjustments made.

Only after the researcher and the research supervisor were satisfied that the instrument would produce the desired results, the letter of transmittal (Appendix 3), was e-mailed to the sample population as an introductory 'warning' that a survey was intended. The letter addressed five issues: description of the formats in which the questionnaire would appear; indication of the Internet address location of the on-line option and address to which completed questionnaires should be returned; purpose of our survey; time frame allocated for this phase and indication of the expected return date of the questionnaire.

The letter appealed to both authority (it was sent out under the most respected person's name associated with the research – with his permission, of course – Professor Mashile) and to the self-interest of students by focussing their attention on the important role their contribution would play.

In order to make the questionnaire completion more convenient for respondents, two options for participation was provided. The first option, located at <http://members.rogers.com/desurvey/survey.htm>, appealed to those students who had convenient access to the Internet. The second option, appealing to those students with less convenient access to the Internet, was mailed as an attachment with the letter of transmittal.

The questionnaire was administered one week prior to the cut-off date. It was anticipated that the desired sample size of 100 respondents would be reached after the first administration of the questionnaire, which occurred on October 3, 2002. By the cut-off date, 204 responses in total (167 Internet and 37 Excel responses) had been received. Despite the fact that we generously exceeded the desired total of 100, we anticipated that more students would respond if given extra time. We decided to extend the cut-off date to October 21, 2002 and administered the questionnaire for a second round to addresses that were returned due to technical difficulties during the first round of administration. The second round of administration resulted in 29 additional responses of which 24 were Internet and 5 were Excel responses.

6.5.3 DEFINING THE MOTIVATIONAL FACTORS

To illustrate how the factors defined below are structured within the questionnaire, we include **Table 6.1**. This table illustrates which motivational factors had to be measured, which indicator variables were associated with each factor and which questionnaire items were used to measure each variable. This table also shows the distribution of factors across the two sections of the questionnaire.

Table 6.1: Theoretical model

Section A:		
Motivational Factor	Variables	Item number
Physical Environment	Time responsibilities	6
	Access to educational institution	7, 8
	Access to technology tools	13, 14
Previous Experience	Experience with present choice	2
	Experience with computers	12
Section B:		
Optimal Decision-making	Problem definition	46
	Alternative identification	30
	Alternative quantification	21, 43
	Decision aids	20, 44
	Implementation	31

Table 6.1: Theoretical model continued

Self-concept	Risk-taking	34
	Perception in the eyes of others	37
	Self-confidence	19, 24, 32, 33, 38, 42
Learning Styles	Kinaesthetic learning	18, 27, 28
	Auditory learning	29
	Individual versus group learning	35
Social Environment	Social dependency	17, 35, 36, 39, 40, 45
	Social environment awareness	22
Attitude	Attitude towards books	23
	Attitude towards computers	16
Conflict	Conflict approach-approach	25
	Conflict approach-avoid	26
	Conflict avoid-avoid	41
	Conflict double approach	15

6.5.3.1 PHYSICAL ENVIRONMENT LATENT FACTOR

Section 5.7.1 defined the physical environment as the condition and the influence under which the student lives. This definition assigned four characteristics to the environment: physical objects surrounding the individual, his relationship with his life world, meaning that is assigned to what is experienced and finally, the individual's relationship with the objects in his physical world. We limited the content of our construct to the physical objects that characterised the student's environment that might have been influential during his decision to choose either the print or on-line option.

Our construct definition required three predictor variables: responsibilities that contested for the student's time, access to the student's educational institution and his access to technology tools. The first predictor variable was measured by the question *Apart from studying, what other responsibilities accounted for the student's time?* The variable 'Access to educational institution' was measured by two questions: *How far was the student removed from his educational institution?* And secondly, *How did the student travel to his educational institution?* Regarding 'Access to educational technology tools', we measured the student's access to firstly, a computer and secondly, the Internet.

6.5.3.2 PREVIOUS EXPERIENCE LATENT FACTOR

We were interested in knowing whether the student's choice of a particular mode was based on the fact that he was familiar with the mode or with technology that is associated with particularly the on-line mode. The construct 'experience' was therefore defined in terms of whether the student had previous exposure to the mode he chose or to computers in general.

To assess the construct of experience, we measured two predictor variables. The first variable assessed whether the student had previous experience with his present mode in prior studies. The second variable assessed whether the student had previous experience with a computer.

6.5.3.3 OPTIMAL DECISION-MAKING LATENT FACTOR

The literature review distinguished between four types of decisions: interpersonal versus group decisions and informed versus uninformed decisions. We limited our construct definition to the level of optimisation (the latter group) that the student achieved when he made the decision to choose his present mode. Our construct definition therefore, read *How successful or informed was the student's decision that lead to a choice of either print or on-line instructional content?*

To assess the level of optimisation achieved by the students, we measured five predictor variables or processes of the decision act as described in section 5.3. These included a measure of the student's understanding or definition of the problem; a measure of the degree of alternative qualification, a degree of alternative quantification; a measure of the degree to which decision aids were employed and finally, the student's willingness to accept responsibility for the implication of his decision.

6.5.3.4 SELF-CONCEPT LATENT FACTOR

Our construct definition followed the description in section 5.8.5, namely that self-concept refers to the affection people have about how well they do in their own eyes and in the eyes of others. This affection determines the extent to which the individual has confidence or believes in the success of his actions. Our construct definition did not distinguish between self-esteem and self-acceptance, but rather approached these concepts as closely related constructs to the definition of the self-concept.

We measured self-concept in terms of three predictor variables. Firstly, we assessed the student's willingness towards risk-taking – *did the student prefer games of luck to games involving skill?* Secondly, we measured their sensitivity towards the perception of others regarding the implication of their actions and finally, how confident did they feel about their actions.

6.5.3.5 LEARNING STYLE LATENT FACTOR

The literature review showed numerous constitutive definitions for the concept of learning. Entwistle (2001) categorises these definitions into the conceptual styles of holist, serialist and versatile, depending on the particular approach implemented by the student in the process of acquiring knowledge. Another author presents the definition “*A person's learning style is a combination of how they perceive, then organise and process information*” (Lewis, 2002).

The focus of our research however, was not so much the process of acquiring knowledge, but the specific activity associated with this process when the student learned or studied with the aim of acquiring meaning or their ‘*preferred modality*’. We therefore, defined learning styles in terms of two sensory processes and one social interaction process that characterised the student's learning: auditory learners (those that rely on hearing for acquiring new information), kinaesthetic learners (students who learn by doing, either through touching or body movements) and individual or group learners (those who either study alone or prefer to study with other people).

The above construct definition required the measurement of the following predictor variables: did the student consider doing things the best method of learning and therefore, engaged in movement during his study or did he consider hearing things as the best method to learn? Finally, did they regard self-study as the best method, or did they prefer studying with other students?

6.5.3.6 SOCIAL ENVIRONMENT LATENT FACTOR

Social environment was defined as “*the development of relationships and associations with others*” (Van den Aardweg & Van den Aardweg, 1988: 214). This environment is marked by mutual interaction, friendliness and geniality with the aim of enjoying the society or the companionship of others. The extent to which the student relied on social interaction for support during the decision process, delimits the construct definition.

We measured two variables relating to the student's interaction with his social environment. Firstly, we asked whether the student requested advice from other people when he makes decisions. Secondly, since the social environment implies a mutual awareness between the student and other subjects in the environment, we also measured the extent to which the student was aware of the implications that his decisions might have on the environment.

6.5.3.7 ATTITUDE LATENT FACTOR

Our literature review favoured the constitutive definition of attitude that characterised this construct as the directive or dynamic influence upon the individual's responses to all objects and situations with which he was related. In this sense, attitude is a mental state that prepares people for action. This mental state that prepared the student for the action of making a decision, delimited the construct definition that we measured, in other words, did the student's attitude towards either books or computers direct him to choose a particular mode of instructional content delivery.

We measured attitude as the student's mental state towards books and towards computers. This operational definition measured whether the student was positive or negative about books in general. As a second component of this definition, we measured his attitude towards computers: *Did he like computers in the sense that they were stimulating?*

6.5.3.8 CONFLICT LATENT FACTOR

Our construct definition was based on the description found in the Penguin dictionary of Psychology (Reber & Reber, 2001), namely that conflict refers to contrasting tendencies opposing each other in one's mind. We were interested in knowing what type of contrasting tendencies the student experienced when he chose between print and on-line modalities.

In order to assess the type of conflict that was experienced by the student, we measured each of the four types of conflict specified in section 5.3.3. Firstly, to what extent was the student attracted to both options? Secondly, to what extent was the student attracted by one mode, but simultaneously repelled by that same mode due to a negative aspect associated with that mode? Thirdly, to what extent was the student repelled by both options? Finally, to what extent did the student associate both positive and negative attributes with each of the choice alternatives?

6.6 THE RESEARCH GROUP

6.6.1 DEFINING THE POPULATION AND SAMPLE

Our research investigated the motivational factors that affected the decision behaviour of distance education students who chose between print and on-line modalities. This objective specified two minimum criteria for our target population, defined as “*the larger group to which one applies the results*” (Fraenkel & Wallen, 2000: 103). Firstly, the respondents had to be in a distance education format of receiving instructional content as defined in chapter 4 of our research. Secondly, all respondents should have had the choice of receiving instructional content through either print or on-line modalities. Therefore, the conceptually defined population included all students who satisfied both criteria (Mertens, 1998).

Realising that a survey of the entire populations would be impossible due to time and cost constraints, we decided to reduce the conceptually defined population to an experimentally accessible population – “*the list of people who fit the conceptual definition*” (Mertens, 1998, 225 and Fraenkel & Wallen, 2000). Our experimentally accessible population included all students in two undergraduate modules at the University of South Africa. Module A, a first level, full year course in computing, was located in the Department of Computer Science and Information Systems in the Faculty of Science. Students enrolled in this course had a choice of using print-based or on-line learning materials.

Module B, a third level, second semester course, was located in the Department of Industrial Psychology, Faculty of Economic and Management Sciences. A comparison of the number of students registered for each module indicated that module B had a relatively small number of students enrolled in relation to module A. Module B was also structured differently from module A in that it was offered on-line only. However, students who did not want to study on-line took a different, but similar print-based module. Students enrolled in this module therefore, had a choice and satisfied our minimum criteria.

Two decision factors influenced the selection of the final experimentally accessible population: permission to use students and cost/time constraints. As the researcher was physically removed from the only institution that was willing to grant permission to involve their students in the survey, it was decided that the most cost-effective means of administering the instrument would be to utilise the Internet and mail the instrument to

respondents electronically. This required a third criteria for the experimentally accessible population: all respondents had to have access to an e-mail address.

The Department of Computer Services at the University of South Africa supplied the e-mail addresses of all students registered for modules A and B. These addresses were extrapolated from the application forms students completed during registration. A total of 1677 e-mail addresses were received and comprised our sample frame (Mertens, 1998). In order to maximise population validity, the instrument was only mailed to students who appeared on the list.

6.6.2 SAMPLING STRATEGIES

Based upon our logistics, ethics and paradigm, we chose a typically quantitative research sampling method, known as the convenience sample or “*a group of students who are conveniently accessible for study*” (Fraenkel & Wallen, 2000: 122 and McMillan, 2000: 208). Also known as accidental or opportunity sampling, this strategy is defined as “*choosing the nearest individuals to serve as respondents and continuing that process until the required sample size has been obtained*” (Cohen *Et al.*, 2000: 102).

Convenience sampling, a strategy from the non-probabilistic, constructivist paradigm defined as “*a sampling where the probability of achieving population elements is unknown*” (McMillan, 2000: 108), is recognised by several researchers as the least desirable sampling strategy (Mertens, 1998). Unfortunately, we had little choice regarding alternative strategies based on our sampling decisions as discussed in the previous sections.

As there is no precise way of generalising from a convenience sample to a population, and because the nature of the convenience sample may produce biased results, we acknowledged the limitations of this strategy and will not attempt to generalise the results produced by our survey beyond the given population pool. We would, however, like to bring it to the reader’s attention that the purpose of this research was not to generalise, but to better understand relationships that exist between decision behaviour and final choices in a distance education setting. Convenience sampling allowed us to limit any findings to the type of subjects in our sample frame.

6.6.3 SAMPLING BIAS

The researcher attempted to limit the effect of deliberate sampling bias – “*a type of sampling error that is controlled or influenced by the researcher to result in misleading*

findings” (McMillan, 1998: 115) in two ways. Firstly, we did not only include subjects who responded in a particular way and secondly, we did not disregard any of the responses, but included all the results in the final analysis.

Non-deliberate sampling was controlled by accumulating and researching sufficient information on what was required to obtain an unbiased sample and secondly, resisting the motivation to *prove* a desired result or point of view.

Despite our efforts to limit the above sampling errors, we anticipated that the results would probably be biased due to the following three reasons:

- our sample was a convenience sample addressed to students with e-mail addresses – as such, any students without convenient access to the Internet or an e-mail address had no chance to participate;
- students who were unwilling to give their views would not return the questionnaire, and
- students who completed the questionnaire were more than likely students holding strong opinions about the way they normally make decisions. This is related to Crowl’s (1996) observation that voluntary participants tend to be more intelligent and better educated and therefore, have different characteristics than other members of the population.

6.6.4 RESPONDENT CHARACTERISTICS

From our sample frame of 1677 respondents, 209 e-mails were undeliverable and returned to the sender. From the remaining 1468 students, 233 students participated in the survey. This data set represented 15.87 percent of our initial sample frame. The sample characteristics are portrayed in **Table 6.2**.

Of the total number of 233 students, 165 (70.8 percent) students chose the print-based alternative, while 68 students (29.2 percent) selected the on-line alternative. Full-time students totalled 38 (16.3 percent), while 195 (83.7 percent) were part-time students. The data set contained responses from 133 males (50.1 percent) and 96 (41.9 percent) females. The majority of students, 117 or 50.2 percent, indicated their highest level of education to be high school, while 85 students (36.5 percent) had a Diploma. A relatively small percentage, only 3.9 percent, held qualification higher than that of a Diploma.

Full-time work and a combination of responsibilities accounted for the majority of time responsibilities, 54.5 percent and 29.4 percent respectively. Of the 77 students who showed more than one time responsibility, 73 respondents indicated that family and work were the major contenders.

Regarding age, 84.6 percent of respondents were between the ages of 21 and 40, with the 21–30 age bracket being the most representative (43 respondents) of our sample.

Table 6.2: Respondent characteristics

STATUS AS STUDENT						
	Print		On-line		Total	
	N	%	N	%	N	%
<i>Full-time</i>	25	15.2	13	19.1	38	16.3
<i>Part-time</i>	140	84.8	55	80.9	195	83.7
<i>Total</i>	165	100	68	100	233	100
N = Frequency for that variable in each group						
GENDER						
	Print		On-line		Total	
	N	%	N	%	N	%
<i>Male</i>	95	57.6	42	61.8	137	58.8
<i>Female</i>	70	42.4	26	38.2	96	41.2
<i>Total</i>	165	100	68	100	233	100
EDUCATION						
	Print		On-line		Total	
	N	%	N	%	N	%
<i>High school</i>	81	49.1%	36	52.9%	117	50.2%
<i>Diploma</i>	63	38.2%	22	32.4%	85	36.5%
<i>Degree</i>	15	9.1%	7	10.3%	22	9.4%
<i>Post Grad.</i>	2	1.2%	0	0.0%	2	0.9%
<i>Masters</i>	3	1.8%	3	4.4%	6	2.6%
<i>Doctorate</i>	1	0.6%	0	0.0%	1	0.4%
<i>Total</i>	165	100	68	100	233	100
TIME RESPONSIBILITIES						
	Print		On-line		Total	
	N	%	N	%	N	%
<i>Full-time work</i>	85	51.5%	42	61.8%	127	54.5%
<i>Part-time work</i>	11	6.7%	4	5.9%	15	6.4%
<i>Family</i>	12	7.3%	2	2.9%	14	6.0%
<i>Other/Combination</i>	57	34.5%	20	29.4%	77	33.0%
<i>Total</i>	165	100	68	100	233	100
AGE						
	Print		On-line		Total	
	N	%	N	%	N	%
<i><20</i>	13	7.9%	6	8.8%	19	8.2%
<i>21-30</i>	100	60.6%	43	63.2%	143	61.4%
<i>31-40</i>	39	23.6%	15	22.1%	54	23.2%
<i>41-50</i>	9	5.5%	4	5.9%	13	5.6%
<i>> 50</i>	4	2.4%	0	0.0%	4	1.7%
<i>Total</i>	165	100	68	100	233	100

Table 6.2: Respondent characteristics (continued)

	MARITAL STATUS					
	Print		On-line		Total	
	N	%	N	%	N	%
<i>Never married</i>	91	55.2%	30	44.1%	121	51.9%
<i>Married</i>	30	18.2%	18	26.5%	48	20.6%
<i>Married with children</i>	25	15.2%	5	7.4%	30	12.9%
<i>Single with children</i>	11	6.7%	5	7.4%	16	6.9%
<i>Other</i>	8	4.8%	10	14.7%	18	7.7%
<i>Total</i>	165	100	68	100	233	100

	LANGUAGE					
	Print		On-line		Total	
	N	%	N	%	N	%
<i>Afrikaans</i>	53	32.1%	19	27.9%	72	30.9%
<i>English</i>	77	46.7%	30	44.1%	107	45.9%
<i>IsiNdebele</i>	1	0.6%	2	2.9%	3	1.3%
<i>IsiXhosa</i>	3	1.8%	2	2.9%	5	2.1%
<i>IsiZulu</i>	6	3.6%	6	8.8%	12	5.2%
<i>Northern Sotho</i>	4	2.4%	2	2.9%	6	2.6%
<i>Sesotho</i>	2	1.2%	1	1.5%	3	1.3%
<i>Setswana</i>	4	2.4%	2	2.9%	6	2.6%
<i>Siswati</i>	0	0.0%	0	0.0%	0	0.0%
<i>Tshivenda</i>	0	0.0%	0	0.0%	0	0.0%
<i>Zitsonga</i>	1	0.6%	0	0.0%	1	0.4%
<i>Other</i>	14	8.5%	4	5.9%	18	7.7%
<i>Total</i>	165	100	68	100	233	100

More than half of the data set had never been married. Of the 18 students who chose the ‘other’ option, 2 were engaged, 1 was engaged with children, 4 were divorced and 3 were divorced with children. Two students classified themselves as being single and 2 students single without children. One respondent was gay. One respondent indicated being single, but will get married within the next two years. Two students did not specify a specific condition regarding their marital status.

Just under 77 percent of respondents had a native language of either Afrikaans (72 students) or English (107 students), while 16 (7.1 percent) selected the ‘other’ option and described themselves as follows (number of students in brackets): Creole (1), German (2), Igbo (1), Gujarathi (1), Hindi (1), Shona (3), Portuguese (3), French (2), KiSwahili (1) and Chinese (1).

The majority of item categories describing the data set showed that students who selected the on-line option mimicked their counterparts in the print-based group to the extent that the category containing the highest frequency in the print-based group was also

the highest frequency category in the on-line group. What was important to note, however, was that the distribution of scores for each category of the characteristic variables was not even across categories. For each of the variables measured, one or two categories dominated. **Table 6.2** gives a picture of respondents without post-secondary qualifications studying part-time and who were employed full-time with the added responsibility of a family (at the time of the survey). These characteristics were supported by the 'age' variable, which showed that the majority of the sample came from the economically active segment of the population. Most respondents were not married, or were married without children. The final notable result from **Table 6.2** was that most respondents were either White or Coloured, as their native language was either Afrikaans or English.

We would like to conclude this section by drawing the readers' attention back to our definition of the distance education student, formulated in chapter 3. A preliminary review of our results showed support for at least four of the six specified criteria of distance education students: they were definitely non-homogeneous, tended to be older or representative of the adult sector of the population, and were economically active. This supported our venture towards a closer and better understanding of the characteristics of the distance education student.

6.7 PREPARATION OF DATA FOR ANALYSIS

6.7.1 MEASUREMENT SCALES

Our instrument contained two types of variables. The first type are referred to as frequency or categorical variables and is defined as "*variables that do not vary in degree, amounts or quality, but are quantitatively different*" (Fraenkel & Wallen, 2000: 57 and McMillan, 2000: 31). The second type were quantitative variables, defined as "*variables that exist in some degree along a continuum from less to more and to which numbers can be assigned to different individuals or objects to indicate how much of the variable they possess*" (Fraenkel & Wallen, 2000: 57).

With the exception of item 7, which measured the variable 'access to educational institution', item 9, measuring the variable 'age' and item 12, measuring 'previous experience with a computer', all items in Section A measured according to a nominal scale. Depending on the number of categories in each item, ranging from a minimum of two categories to a maximum of twelve categories, the researcher assigned numbers to categories in order to show differences.

Section B of the questionnaire measured six factors (**Table 6.1**). All items in this section measured according to the ordinal scale (Fraenkel & Wallen, 2000 and Crowl, 1996).

6.7.2 CODING OF DATA

Data produced by the questionnaire was scored and aggregated to produce composite scores using the *Microsoft Excel Version 2000* spreadsheet application. Care was taken to transfer each individual's questionnaire self-report using the exact same procedures and criteria.

Before we describe the scoring procedure, it is necessary to explain how the wording of the questions affected the scoring methodology. Items 15 to 46 were stated either positively or negatively, meaning that for some items, a 'Strongly agree' (code 1) indicated a positive attribute on that variable, while for other items, a 'Strongly agree' indicated a negative attribute on that variable. For the sake of an example, let us consider item 39 (*My decisions are based on what others would have done in the same situation*). A code of 1 ('Strongly agree') indicated that the respondent had a positive attribute on this variable. A code of 5 indicated a negative attribute. On the other hand, item 19 (*Even when I am self-confident, I lack the ability to control social situations*), showed that a code of 5 ('Strongly disagree') indicated a strong attribute on that variable while a code of 1 ('Strongly agree') indicated a weak attribute. Item 39 was therefore, positively stated while item 19 was negatively stated. This was done to prevent the creation of a mindset that could influence student responses in a particular way.

In order to calculate composite scores for each of the factors in section B (**Table 6.1**), we wanted a high score to be associated with a positive attribute and a low score to be associated with a negative attribute on a variable. This implied that the codes produced by several items from 15 to 46, namely items 15 – 16, 18, 20 – 21, 23 – 27, 29 – 31, 35, 39 – 41 and 43 – 46 had to be reversed for scoring as they were all positively stated. In other words, a 'Strongly agree' (initially coded 1) was scored 5. Similarly, 'Agree' (coded 2) equalled a score of 4 and 'Uncertain' (coded 3) remained unchanged. A code of 4 or 'Disagree' equalled a score of 2 and 'Strongly disagree' (5) equalled a score of 1.

All items that were already negatively stated and yielded high scores of 4 and 5 indicated a positive attribute on that variable. For scoring these items (17, 19, 22, 28, 32 – 38 and 42), we utilised the coding value.

The above alteration allowed us to produce composite scores in which the higher the score, the greater the probability of observing that variable's attribute in the respondent. This process was completed for all affected items before composite scores were calculated.

6.7.3 SCORING OF DATA

Social environment was operationally defined to represent the social dependency and social awareness of respondents during their decision process. Five items were constructed to measure the predictor variable social dependency: item 17 (*I prefer to do my own thing despite the expectations of others*), item 36 (*I rely on my judgement at the moment that I make a decision*), item 39 (*My decisions are based on what others would have done in the same situation*), item 40 (*On any sort of test or competition, I like to know how well I related to everyone else*) and item 45 (*When I make a decision, I ask advice from people who made a similar decision*).

The variable social environment awareness was measured with item 22 (*I feel confident about my decision, regardless of what the implication may be*).

To measure the factor social environment, the scores of items 17, 22, 36, 39, 40 and 45 were aggregated, giving a composite range of possible scores between 6 and 30, with 6 indicating less dependency on social environment and 30 indicating high dependency on social relationships. Similarly, high scores indicated that the social environment was influential in the decision behaviour of the respondent, while a low score indicated that social environment was not a major influence in the decision behaviour of the student.

Attitude was operationally defined to represent the student's mental state towards books (item 23: *I find books a lot of fun*) and computers (item 16: *Computers are stimulating*). As it is possible to hold a positive attitude towards one tool and a negative attitude towards the other, we treated these as separate entities for the statistical analysis. Hence, high scores (4 – 5) constituted a positive attitude towards books or towards computers. Low scores (1 – 2) showed a negative attitude towards these tools.

The learning style latent factor was operationally defined to include kinaesthetic learning, auditory learning and individual or group learning preference. Three items, namely items 18 (*Doing things is the best way to learn*), 27 (*I have to move around while I am learning*) and 28 (*I learn best when I am stationary*) measured the variable kinaesthetic learning and item 29 (*I learn best when I hear things*) measured auditory learning.

Individual or group learning preference was measured by item 35 (*I prefer to learn new things on my own rather than in groups*). Again, the variables that constituted the factor learning style were treated as separate entities for statistical analysis. High composite scores on each of the variables (maximum of 15 for kinaesthetic learning and 5 each for auditory learning and individual or group learning preference) indicated that the respondent favoured that particular learning style alternative. Similarly, low scores indicated less preference for each learning style.

The operational definition of the latent factor self-concept measured the respondent's risk-taking, perception in the eyes of others and self-confidence. One item was constructed for each of the variables risk-taking and perception in the eyes of others: item 34 (*I prefer games involving luck to games requiring skill*) and item 37 (*I try to hide the implication of my decisions if things did not go according to plan*).

Self-confidence was measured with six items: item 19 (*Even when I am feeling self-confident, I lack the ability to control social situations*), item 24 (*I find it easy to guide the course of conversation in most group situations*), item 32 (*I often feel uncertain about the results of my decision*), item 33 (*I often remain secretive about my decision until I have evidence of the result*), item 38 (*My choice is based purely on my personal preference at the time of making a decision*) and item 42 (*The immediate rewards of my choice are more important than long-term implications*). The scores on each of these items were aggregated to produce composite scores that varied between 6 and 30. Thirty implied a positive self-concept and 6 suggested that the respondent had a negative self-concept.

Following the same procedure for the optimal decision-making latent factor, seven items were constructed to measure the extent to which the respondent's decision-making was optimal or inclined to produce favourable results. These included items measuring each of the phases of the decision-making process with the exception of the phase decision act: problem definition (item 46: *When I make a decision, I gather as much information on the problem as possible*); identifying alternatives (item 30: *I make sure I understand my alternatives before I decide*); quantifying alternatives (item 21: *When I decide, I compare my alternatives and eliminate options that seem less attractive* and item 43: *When I decide, I think what the effect in the long run will be*); decision aids (item 20: *I apply specific techniques in my decision process* and item 44: *When I get what I want it is usually because I worked hard for it*) and finally, implementation (item 31: *I normally take responsibility for the result of my actions*). A composite score of 35 indicated that the

respondent adhered to the processes of optimal decision-making and were therefore, more likely to experience optimal results from his choice. Similarly, a low score of 7 indicated that the respondent failed to adhere to the various processes of optimal decision-making and was more likely to experience negative payoffs from the resulting choice of his decision act.

Conflict was operationally defined to represent the extent to which the respondent was attracted by both alternatives (item 25: *I found all the delivery modes to be equally attractive*), repelled by both alternatives (item 41: *The delivery mode alternatives between which I could choose were all equally unattractive*), simultaneously attracted and repelled by the alternatives (item 26: *I had a delivery mode preference, but I could not choose it*) or the extent to which he associated positive and negative attributes with each alternative (item 15: *All delivery modes have advantages and drawbacks*). As only one type of conflict can dominate a decision, we decided not to generate composite scores for the four types, but measure each independently and evaluate each score separately in the statistical analysis. A score of 5 for a particular type of conflict indicated that the respondent experienced more of that conflict than a type of conflict on which he scored low.

Once all items measuring a particular latent factor were adjusted to account for the positive and negative statement of items, grouped and aggregated, the software applications *Statistical Package for the Social Sciences Version 11.5 for Windows* and *Minitab for Windows Version 13.32* were used to perform all the descriptive statistics (Appendix 6). These applications calculated the minimum and maximum values, mean and mode values, standard deviation, alpha, number of items per category and graphical representations. Depending on the skewness, kurtosis and Anderson-Darling normality test results of each factor and variable, we determined whether our results were normally distributed or skewed and whether we would use parametric or non-parametric measures for further analyses.

6.8 PROCEDURES FOR MAXIMISING INTERNAL AND EXTERNAL VALIDITY AND RELIABILITY

6.8.1 VALIDITY

As the results of a research study are only useful to the extent that it can be accurately and confidently interpreted, we took special care in controlling internal and

external threats to validity, defined as “*the degree to which correct inferences can be made from the results of the research study*” (Bieger & Gerlach, 1996: 77).

Threats to internal validity, defined as the extent to which the results obtained in a research study is a function of the variables that were systematically manipulated, were controlled through standardising the conditions under which the research study was carried out. This was achieved by administering the questionnaire via e-mail to all respondents allowing respondents to complete the questionnaire in their own time and in the comfort of an environment they found least threatening. This measure minimised the threats to internal validity from history and instrumentation. Secondly, we attempted to obtain as much as possible information about participants to aid in minimising threats to internal validity from mortality and selection.

Internal validity was further controlled by choosing an appropriate research design that previously proved to be effective for this type of research. Our research design did not include pre-testing. This, together with careful specification and control of the measurement procedures, eliminated most of the instrumentation threats.

McMillan (2000) concludes that there are five sources for validity evidence, based on logic and data: test content, internal structure, relations to other variables, response processes and consequences of testing. Following Crow’s (1996) conclusion that only the first two of these are most closely related to conducting and reporting research, we provide evidence based on test content, internal structure and evidence based on relation to the variables, which will be discussed after the necessary statistical methods have been applied.

We referenced previous research and relied upon their research instruments before constructing our own questionnaire. This ensured that the items in our questionnaire represented the appropriate universe or domain of content or tasks, which contributed evidence based on test content. Only after several iterations of altering tests and evaluation, a final draft copy was presented to a panel of experts at UNISA. The experts examined the content and were, after their suggested alterations had been made, confident that the questionnaire provided sufficient evidence of validity.

Evidence based on internal structure was provided through an empirically consistent relationship indicated by means of a factor analysis between items of the questionnaire and theory.

6.8.2 RELIABILITY

The extent to which scores are free from error is referred to in statistical context as reliability – “*a synonym for consistency and applicability over time, over instrument and over group of respondents*” (McMillan, 2000: 161). An important limiting factor to the adequacy of scores generated by our instrument was the fact that “*there was never a perfect indication of trait, skills, knowledge or attitude*” (McMillan, 2000: 161) – all of these variables were central to the scores yielded and analysed in our survey. Despite all efforts to control construction and administration error, we had little control over threats such as anxiety generated by the instrument, controlling reactions to specific items, lack of motivation, positive attitude or negativism towards the survey due to mood, fatigue etc.

In order to enhance reliability, all subjects were given the same directions for completion of the questionnaire. They had the same time frame in which to respond to the questions and we limited the number of people involved in administering the questionnaire (all questionnaires were mailed from one terminal by the same operator). In addition, we limited the amount of time needed to complete the questionnaire to less than one sixth of an hour, which, according to McMillan (2000) and Fraenkel and Wallen (2000) was the maximum tolerance to yield reliable results.

Finally, we limited the survey to only one instrument, which eliminated reliability suffering due to completion of several instruments over a long period of time (Mertens, 1998 and Fraenkel & Wallen, 2000).

6.9 STATISTICAL RESEARCH PROCEDURES

The data produced and processed in Section A of the instrument was of nominal nature and therefore, data produced by this section was non-parametric, defined as “*no assumptions are made about the distribution of the population or the characteristics of the population*” (Cohen *Et al.*, 2000: 77). For the quantitative data produced by Section B, we employed a combination of techniques to analyse the data. These included, content analysis of qualitative data, seeking patterns within responses, looking for casual pathways and connections and constant comparison (Cohen *Et al.*, 2000).

As the choice of which statistical procedures to employ is not arbitrary, we were compelled by the nature of our nominal and ordinal measurement scales to apply three statistical analysing techniques, namely:

- Descriptive research statistics of frequencies to determine whether the distribution occurred evenly across categories or whether the responses were skewed towards one end of the rating scale. The descriptive statistics data analysis technique also enabled the researcher to meaningfully describe data with numerical indices or in graphic form.
- Internal consistency methods or procedures for estimating reliability of scores as we only administered the instrument once, and
- Correlation methods that involved scrutinising the data in order to determine the degree to which relationships existed between two or more variables.

The following section investigates specific techniques associated with each of these statistical approaches and research questions stated in section 6.1.

6.9.1 DESCRIPTIVE TECHNIQUES

Prior to any statistical test procedures, the assumptions for normality based on the testing for outliers and imbalance within and across groups, were examined utilising descriptive statistics. The specific procedures included measurement of the following key features.

6.9.1.1 MEAN

Defined as “*the arithmetic average of all scores*” (McMillan, 2000: 127), the mean – the most commonly used measure of central tendency – was calculated by adding all the scores in the distribution and then dividing this sum by the total number of scores. This average allows for the summarising of data in the frequency distribution with a single number.

6.9.1.2 MODE

The mode or “*the score that occurs most frequently in a distribution of scores*” (Fraenkel and Wallen, 2000: 667), was used to ascertain the score attained by more students than any other score.

Although the mean and median as measures of central tendency were excellent statistical values of the most typical score in a distribution, to obtain a full description of the scores, we also needed to determine how the scores were clustered around the calculated mean. For this purpose, we reverted to two measures of variability indicating

the measure of dispersion or scatter in our distribution, namely range and standard deviation.

6.9.1.3 RANGE

The range represents the numerical difference between the highest and lowest scores in the distribution. As the range is a crude measure of dispersion due to its reliance on only two scores in the distribution, care was taken not to overemphasise the significance of this value (Fraenkel & Wallen, 2000 and McMillan, 2000).

6.9.1.4 STANDARD DEVIATION

Standard deviation, defined by Crowl (1996: 138) as *‘the square root of the average squared difference between each score and the mean square’* and *“average distance of scores from the mean”* (McMillan, 2000: 128), was used to indicate ‘average’ variability of scores.

6.9.2 FACTOR ANALYSIS

The factor analysis was employed to test research question 5:

Which motivational or decision factors described a positive or negative choice preference towards either print or on-line modalities?

The classification of the criterion variable ‘choice’ between print-based and on-line was assigned by previous research (Feasley, 1992, Bosworth, 1991 and Kramer, 2002). The motivational decision factors (henceforth referred to as motivation for choice indicators listed as factors in **Table 6.1**) previously proven to be influentially dominant during the decision process were identified in chapter 5. These were also operationally defined as latent factors in terms of specific questionnaire items that measured each factor.

To measure how adequately the items included in section B of the questionnaire represented the content to be assessed, we relied on a variant of factor analysis, called *principal axis factoring*. Factor Analysis identifies underlying variables, or factors, that explain the pattern of correlations within a set of observed variables. This procedure is primarily used for data reduction or structure detection (the latter being the focus of our application). The purpose of data reduction is to remove redundant (highly correlated) variables from the data, perhaps replacing the entire data set with a smaller number of

uncorrelated variables (Kline, 1994). Structure detection examines the underlying (or latent) relationships between the variables. This application progresses further than data reduction by adding the assumption that some of the variability in the data cannot be explained by the components (usually called factors in other extraction methods). As a result, the total variance explained by the solution is smaller. However, the addition of this structure to the factor model made this method ideal for examining relationships between the measured variables.

Factor analysis can also be used to generate hypotheses regarding causal mechanisms or to screen variables for subsequent analysis, such as identifying co-linearity prior to performing a linear regression analysis.

The factor analysis structure detecting method was used to identify categories of items (factors) that could be tested for construct validity by means of a reliability analysis – a measure of whether the data collected, fitted the categories indicated from theory. There are several measures of personality tests and optimal decision-making, but none of these specifically related to the choice between print-based and on-line delivery modes. In an attempt to measure the influential factors identified in Section 6.5.3, we developed, using items of various existing measuring tools, an instrument (Section B of the questionnaire) that represented our theoretical model. The theoretical model (illustrated in **Table 6.1**) hypothesised that the 32 items in section B would accurately measure eighteen variables, which could be structured by means of a factor analyses into six factors (optimal decision-making, self-concept, learning styles, social environment, attitude and conflict).

A factor analysis requires the realisation of certain assumptions in order to yield reliable results. The variables should be quantitative at the interval or ratio level. In addition, the data should have a bivariate normal distribution for each pair of variables, and observations should be independent. The computed estimates are based on the assumption that all unique factors are uncorrelated with each other and with the common factors. According to Tang, Furnham and Wu Davis (2002), a sample size to parameter ratio of 5:1 or more is required to achieve reliable estimates. When a theoretical model does not fit the data adequately, the interpretation of the specific factor estimates in the model may be inappropriate (Tang *Et al.*, 2002). The extent to which our data satisfied these conditions of the factor analysis was determined by the Keiser-Meyer-Olkin test of sampling adequacy and the Barlett's test of sphericity.

6.9.3 ONE-WAY ANALYSIS OF VARIANCE

A one-way analysis of variance was performed to test research question 5.1:

Which of the factors identified in question 5 would significantly distinguish between the sample means of print-based students and on-line students?

This question asked whether there would be differences between the sample means of the print-based group and on-line group when their scores were compared on each of the motivation for choice indicators. The one-way ANOVA produces a one-way analysis of variance for a quantitative dependent variable by a single factor (independent) variable. The dependent variable in our analysis was choice, while the hypothesised factors identified by the factor analysis constituted the independent variables.

Analysis of variance is used to test the hypothesis that several means are equal. In addition to determining that differences exist among the means, this procedure also allows investigation into which means differ. The one-way ANOVA tested the null hypothesis that there were no differences between the means of the group who preferred printed materials and the group who preferred the on-line instructional mode of delivery. The alternative hypothesis was that the on-line group would be different from the print-based group with respect to at least one motivation for choice indicator.

6.9.4 UNIVARIATE AND MULTIVARIATE ANALYSIS OF VARIANCE

A univariate and multivariate analysis of variance (MANOVA) tested research question 5.2 posed in this chapter:

What was the relative contribution of each factor to a particular choice preference?

The parametric univariate analysis of variance and MANOVA tested the continuous data in section B of our questionnaire, while the non-parametric chi-square analysed the categorical data in section A relating to the factors physical environment and previous experience (the chi-square is discussed separately in the next section).

MANOVA was employed, as none of the non-parametric tests allowed for the investigation of the relationship of multiple independent variables (measured on a continuous scale) on a dependant variable. Mann-Whitney U-test analyses ranked data and both the Sign test and Friedman 2-way analysis of variance incorporates related and not

independent groups. Also, the Friedman 2-way analysis of variance is limited in the number of variables it can control.

Several authors (Howell, 1998, McGrath, 1997 and Fraenkel & Wallen, 2000) recommend the factorial analysis of variance as the appropriate test for this question. However, according to McGivern and Tvorik (1998), who referred to the works of Sproull (1995), MANOVA can be utilised to measure relationships between one dependent measure and two or more independent measures – thus our use of this procedure was justified.

The univariate ANOVA and MANOVA investigates two or more independent variables simultaneously asking not only about the individual effect of each variable, but also about interaction effects of two or more variables (Howell, 1998). These effects can either be classified as *main effects*, defined as “*the effect of one independent variable averaged across the levels of the other independent variables*” or *simple effects* – “*the effect of one independent variable at one level of another independent variable*” (Howell, 1998: 340). For this analysis, the dependent variable was choice preference and contained two levels, namely print and on-line. The independent variables were the respective motivation for choice indicators or latent factors in section B of the questionnaire: optimal decision-making, self-concept, learning styles, social environment, attitude and conflict (**Table 6.1**).

MANOVA had two added advantages that made it particularly appropriate for use in our study. Firstly, like the ANOVA, the general linear MANOVA does not require the same amount of observations per group. This was a required attribute as our print-based group was considerably larger than the on-line group. Secondly, MANOVA is robust against violations of the normality assumptions (had this been the case in our research), provided that the groups are not bimodal or skewed in different directions (Howell, 1998). The drawback of these violations however, is that it only makes for tentative interpretation of the results.

6.9.5 CHI-SQUARE TEST FOR THE CATEGORICAL DATA

The univariate ANOVA and MANOVA only tested the hypothesis on the continuous data accumulated in section B of our questionnaire. We were also interested in testing the hypothesis for the categorical data in section A, as this would allow comments on the physical environment and experience latent factors. The null hypothesis that was

tested was that the variable choice and the physical environment latent factor and choice and the previous experience latent factor were independent of each other. The applicable statistical test recommended and applied was the Chi-square test, “*a statistical test used for analysing categorical data*” (Howell 1998: 373 and Fraenkel & Wallen, 2000: 261).

The chi-square test, represented by χ^2 , required the construction of a contingency table, a 2-dimensional table in which each observation is classified on the basis of two variables simultaneously. This table showed the distribution of one variable at each level of the other.

For a contingency table, the expected frequency for a given cell is the quotient obtained from the product of the totals for the row and the column in which the cell is located and the total sample size.

6.9.6 REGRESSION ANALYSIS

A regression analysis was performed for testing research question 5.3:

What was the relationship between the identified motivational decision factors that related to personality and optimal decision-making?

We included this question based on the evidence produced by previous research discussed in chapter 5, section 5.8, entitled ‘personality traits and decision-making’. This section commented on research that showed strong positive relations between each of the personality traits and optimal decision-making. We were interested in verifying whether our results confirmed these relations.

The above question called for a regression analysis – “*a statistical procedure for which the primary purpose is the estimation of scores on one variable from scores on other variables*” (McGrath, 1997: 125). Regression analysis estimates the coefficients of a linear equation, involving one or more independent variables, which best predict the value of the dependent variable.

The primary advantage of a regression analysis was the potential predictions it allowed on future choices of students.

Due to constraints on the length of the questionnaire to produce optimal response rates, only two of the personality traits mentioned, namely self-concept and dependency on social environment, could be measured. Section 5.8 concluded that people with a strong

self-concept are more inclined to be less dependent on social assistance and adhere to the different stages of the decision-making process. As a result, students with a strong self-concept are more likely to engage in optimal decision-making behaviour. Based on this, we anticipated the regression analysis to show a positive relationship between self-concept and optimal decision-making and a negative relationship between self-concept and social environment. Such a result would also support construct validity.

As we intended inclusion of more than two factors in the regression analysis (optimal decision-making, self-concept and social environment, with the latter two representing the predictor variables), the anticipated procedure would be representative of a multiple regression. This procedure is defined as a “*regression analysis involving multiple predictor variables*”, (McGrath, 1997: 126).

6.10 RESULTS

If not stated otherwise, all results in this section were produced using *Statistical Package for the Social Sciences Version 11.5 for Windows*.

6.10.1 DESCRIPTIVE STATISTICS

The results of the descriptive procedures (calculated with the aid of *Minitab for Windows 2000 version 13.32*) are summarised in Appendix 6.

The first objective with the descriptive statistics was to determine whether data was normally distributed, as this would determine whether parametric (if data was normally distributed) or non-parametric (if data was not normally distributed) statistics would be employed. Three tests governed this decision, namely the Anderson-Darling Normality-test, the skewness of the distribution and finally, the peakness (kurtosis) of the distribution.

The Anderson-Darling test determines whether a sample comes from a normally distributed population. The test calculates a p-value that should be interpreted as follow:

- p-value < 0.05: results are not normally distributed, or
- p-value > 0.05: results are normally distributed.

The Anderson-Darling normality test produced p-values significantly close to 0 for all factors with the only exceptions being the optimal decision-making factor for both groups and the self-concept factor for the on-line group (Appendix 6.2 and 6.3 respectively). These exceptions varied between 0.013 (self-concept) and 0.05 (optimal decision-making), but was still less than the required 0.05 to justify parametric procedures.

Skewness is a measure of the symmetry of a distribution around the mean. The skewness value can be interpreted as follow:

- $= 0$: distribution is symmetrical about the mean;
- > 0 : distribution has a right tail skew, that is, more observations occur in the left tail, and
- < 0 : distribution has a left tail skew (more observations occur in the right tail).

Skewness scores calculated for our results varied between -1.66 for the print-based group's attitude towards computers variable (Appendix 6.13) and 0.82 for the on-line group's conflict avoid-avoid variable (Appendix 6.10).

Kurtosis (a measure of the peakness of a distribution) can be interpreted as follow:

- $= 0$: distribution is normal;
- > 0 : distribution is more peaked than normal (more observations are clustered around the mean, with fewer in the tails), and
- < 0 : distribution is squatter than normal with more observations in the tails and less clustered around the mean (Fraenkel & Wallen, 2000).

Kurtosis scores ranged from -1.12 (conflict approach-approach variable of the print-based group) to 4.48 for the variable attitude towards computers of the print-based group.

Based on the results of the three measures described above, we made the conclusion that our results did not satisfy the normality assumptions about the shape of the distribution necessary for parametric tests. This had implications for the statistical procedures anticipated for testing research questions 5.1, 5.2 and 5.3. However, despite the fact that the ANOVA and MANOVA are parametric procedures for normally distributed results, both are robust against violations of the normality assumptions, provided that non-normality is not because of bimodal distributions or as a result of groups that are skewed in opposite directions (Howell, 1998). The results from Appendix 6 illustrated that our two samples were homogenous (skewed in the same direction for all factors and variables and lacked bimodality). Additionally, the differences between their variances were less than the 1:4 ratio specified by Howell (1998) for appropriate use of these tests (our highest variance ration occurred for the attitude towards computers variable and equalled 1:1.847). The use of ANOVA and MANOVA tests were therefore, justified

despite the fact that the results yielded only tentative interpretations. Regarding the regression analysis for research question 5.3, the non-parametric Spearman's correlation coefficient for ranked data (r_s) was the appropriate test.

Analysis of the individual group results indicated that the print-based group were more depended upon social assistance when they were confronted with the decision to choose. However, the results of the on-line group were much more clustered around the mean than the print-based group, providing a more reliable interpretation. This factor also showed the greatest discrepancy between the means of the two groups. From this we concluded that social dependency was a possible motivational factor which could be used to distinguish between the choice preference of the print-based group and the on-line group (Appendix 6.4).

The results also showed that both groups scored relatively high scores for optimal decision-making (Appendix 6.2). This time however, the results of the on-line group were much more spread around the mean (variance of 11.7 compared to the print-based group's 7.9).

Both groups showed strong self-concepts: 24.132 for the on-line group and 24.036 for the print-based group. For this factor, the on-line group showed responses that were more clustered around the mean (variance of 16.4 compared to 19.3).

The on-line group scored higher on kinaesthetic learning preference and auditory learning preference: 9.338 versus only 8.733 and 3.265 versus 3.121 respectively (Appendix 6.5 and 6.6). Regarding individual group learning preference, the print-based group outscored the on-line group 3.515 to 3.368.

The variables that showed the greatest deviation from normality with respect to skewness, related to the factor attitude (Appendix 6.12 and 6.13): both groups showed strong positive attitudes towards books (3.75 and 4.049 for the on-line and print-based groups respectively) and even stronger attitudes towards computers (4.471 and 4.333 for the on-line and print-based groups respectively). Although the skewness favoured a strong attitude towards books for both groups, the distribution of results were more spread around the mean when compared to the attitude towards computers factor. Interesting to note, was that each group showed higher means for the factor corresponding to their respective choices: the on-line group scored higher for their attitude towards computers and the print-based group scored higher for their attitude towards books.

Regarding conflict, the groups did not differ significantly from each other.

The descriptive statistics showed that social dependency would probably be the best indicator to distinguish between print-based and on-line decision behaviour relating to a choice between print and on-line technologies. The next section comments on the factor analysis that was used to test the theoretical model and identifies motivational factors that would best distinguish between the two groups.

6.10.2 RESULTS OF THE FACTOR ANALYSIS

The application of the factor analysis was governed by three operational decisions (Virtual research methods agenda, 2003):

- Were the data suitable for a factor analysis?
- Which questionnaire items should be included in the factor analysis?
- How many factors should be extracted for further analysis?

The results of the factor analysis are portrayed in Appendix 7.

The appropriate procedures for testing the suitability of data for a factor analysis are the Kaiser-Meyer-Olkin statistic of sampling adequacy and the Bartlett's test for sphericity. The Kaiser-Meyer-Olkin measure of sampling adequacy indicates the proportion of variance in the variables that might be caused by underlying factors. Values close to 1.0 indicate that the data is appropriate for a factor analysis to be performed. However, if the calculated value is less than 0.50, the data may not be appropriate for a factor analysis and results will not be reliable. Our calculated value (0.681) exceeded this minimum requirement.

Bartlett's test of sphericity measures the hypothesis that the correlation matrix is an identity matrix, which indicates that the variables are unrelated and therefore, unsuitable for structure detection. Significance values less than 0.05 indicate that a factor analysis may be useful with the data. Our calculated value was 0.000 for Bartlett's test (Appendix 7.2).

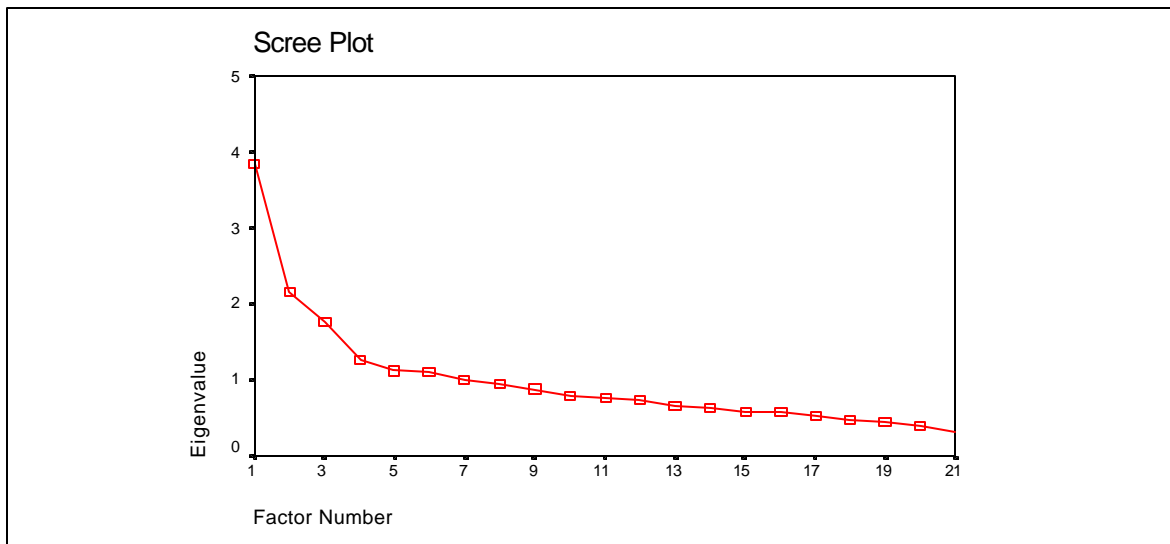
An additional indicator for data adequacy is the sample size to parameter ratio. The sample size to parameter ratio for the whole sample was 12.3:1. As this value satisfied the recommended minimum requirement specified in section 6.9.2 (5:1), the sample size was adequate for this factor analysis.

Satisfied that we had support in favour of the data collected being adequate for the application of a factor analysis, the next step involved interpretation of the initial and extraction communalities table (Appendix 7.3). Initial communalities are the proportion of variance accounted for in each variable by the rest of the variables. Extraction communalities estimate the variance in each variable accounted for by the factors in the factor solution. Small values indicate items that do not fit well with the factor solution, and should possibly be dropped from the analysis. Rendering values less than 0.12 as insignificant, the communalities (initial and extraction) table (Appendix 7.3) indicated that eleven items should be excluded from further analyses. These items were 15 – 16, 18, 23 – 29 and 35.

The next decision comprised the number of factors to be extracted. Three criteria can be used to govern this decision (Virtual research methods agenda, 2003). Firstly, the number can be predetermined by theory. This criterion was not suitable as we applied the factor analysis to test whether the results of this procedure supported the six factors contained in our theoretical model. The decision can also be governed by the Kaiser test (StatSoft, 2002). The Kaiser test, developed in 1960 by a gentleman with the same name, proposes that, unless a factor extracts at least as much as the equivalence of one original variable (Eigenvalue of 1), it can be disregarded. However, the Kaiser test is more appropriate when a large number of variables (25 – 50) are included in the analysis and the results of the Kaiser test are often conservative when less than 25 variable are used. After the exclusion of the eleven items indicated above, we had 21 items that could be included. We therefore, relied on the third alternative, namely a scree plot to indicate the pertinent number of factors to be retained. The scree plot is illustrated in **Figure 6.1**.

Interpretation of the scree plot is based on the slope of the graph. The graph has a different slope between each of the items. The point where the slope deviates away from being close to 0 (the less steep portion of the graph), is the appropriate indicator. Only factors that are located on the portion of the graph where the absolute value of the slope is not close to 0 should be retained. **Figure 6.1** indicates that, considered from left to right, the slope deviates away from 0 between the third and fourth factors. According to this criterion, only three factors had to be extracted.

Figure 6.1: Scree plot



Knowing exactly how many factors to retain, we were now in a position to do a principal axis factor analysis, with varimax rotation, to test our theoretical model. The varimax rotation spreads the variances equally across the factors, making for a more reliable estimation (StatSoft, 2002). The factor loadings after varimax rotation are shown in **Table 6.3**.

Table 6.3: Rotated Factor Loadings with Varimax Rotation

Item number	Factor		
	1	2	3
17	-.088	.138	.414
19	.167	.354	-.092
20	.352	.064	-.007
21	.353	.045	-.170
22	-.227	.049	.560
30	.574	.151	-.068
31	.534	.100	-.228
32	.197	.464	-.336
33	.082	.631	.004
34	.097	.493	-.063
36	-.308	-.053	.295
37	.206	.496	-.109
38	-.068	.317	.163
39	-.066	-.225	.370

Table 6.3: Rotated Factor Loadings with Varimax Rotation (continued)

Item number	Factor		
	1	2	3
40	.157	-.166	.301
41	-.028	-.357	.070
42	.115	.603	.011
43	.571	.216	.018
44	.568	-.036	.031
45	.298	-.190	.393
46	.629	.239	.035

Extraction Method: Principal Axis Factoring

As a rule of thumb, the authors of *the Virtual research methods agenda* (2003) suggest that loadings of 0.3 and higher should be considered significant. Associating the highest loading of variables with the respective factors, the following interpretation regarding the identified factor numbers was made:

- Factor 1 represented the optimal decision-making factor – all of the items indicated by the theoretical model loaded high only on factor 1.
- Factor 2 represented the self-concept factor. With the exception of item 24, which was removed from the analysis based on its insignificant extraction communality, the remaining items of the theoretical model all loaded significantly on factor 2.
- Factor 3 could be regarded as the social environment factor, with five of the six theorised items loading on this factor.

Investigation of the correlation matrix (Appendix 7.1) indicated that the respondents did not perceive the items to be conceptually independent. Moderate correlations higher than 0.3 were determined between a number of items. The highest correlations existed between items 43 and 44 (0.44), followed by 0.422 between item 30 and item 49, 0.42 between items 33 and 37 and 0.409 between item 30 and item 31.

The factor transformation matrix (Appendix 7.6) describes the specific rotation applied to the factor solution. This matrix is used to compute the rotated factor matrix from the original (unrotated) factor matrix. Smaller off-diagonal elements correspond to smaller rotations, whereas larger off-diagonal elements correspond to larger rotations. The

matrix in Appendix 7.6 indicates that factor 3 was largely unaffected by the transformation, whereas both factors 1 and 2 were affected by the transformations. After the rotation, Factor 1 and 2 made for easier and more reliable interpretations.

In order to measure construct validity of the categories (factors) identified by the factor analysis, a reliability analysis was performed on each of the item groupings associated with the three factors. This procedure allows for the study of properties of measurement scales and the items that make them up. Using reliability analysis, we could determine the extent to which the items in our questionnaire related to each other, and we obtained an overall index of the repeatability or internal consistency of the scale as a whole. In addition, reliability analysis identifies problem items that should be excluded from or included in the factor categories. The results from the reliability analysis (shown in Appendix 8) were as follow:

- items contained in Factor 1: Alpha = 0.707
- items contained in Factor 2: Alpha = 0.6832
- items contained in Factor 3: Alpha = 0.491.

Item 36 only just did not satisfy the requirement of loading higher than 0.3. We were interested in knowing how this item would influence the reliability analysis if included with the other items in this category. The reliability analysis confirmed that item 36 should indeed be included and increased the alpha reliability coefficient to 0.5027.

We can thus conclude that the results of the principal axis factoring with varimax rotation showed construct validity. Items, which did not perform significantly in the first phase of the analysis, were excluded from the principal axis factor analysis. These items related to three factors in our theoretical model, namely conflict, attitude and learning styles. These factors will be disregarded from further statistical analyses.

6.10.3 RESULTS OF THE ONE-WAY ANALYSIS OF VARIANCE

In determining which factors identified in research question 5 would significantly distinguish between the sample means of groups favouring either print-based or on-line delivery modes, a one-way ANOVA was performed. The results of the ANOVA are portrayed in Appendix 9.

We applied a one-way ANOVA for each of the factors optimal decision-making, self-concept and social environment in order to test the hypothesis that the means of the two groups were not significantly different when compared according to each factor.

An important first step in the analysis of variance is establishing the validity of assumptions for the application of this procedure. These assumptions include:

- the dependent variable(s) must be normally distributed, and
- the two groups should have approximately equal variance on the dependent variable.

Regarding the first assumption, the use of the ANOVA was appropriate, because the data was “*not seriously skewed, bimodal, or even more important, skewed in different directions*” (Howell, 1998: 310).

The second assumption was tested with the Levene’s test of homogeneity of variances. This test was necessary as the descriptive statistics did show slight differences between the variances of the two groups. If the calculated Levene’s statistic is significant (the significance is less than 0.05), the two variances are significantly different. If it is insignificant (significance is greater than 0.05), we can conclude that the two variances are approximately equal and we have met the second assumption. The calculated Levene’s statistics and significance for the three factors were as follow:

- optimal decision-making: Levene’s statistic = 3.639 (significance = 0.534);
- self-concept: Levene’s statistic = 0.962 (significance = 0.534) and
- social environment: Levene’s statistic = 0.040 (significance = 0.842).

These results confirmed that the second assumption was satisfied.

An additional decision factor favouring the one-way ANOVA, apart from being robust against violations of the normality assumptions, is that this test allows comparison of unequal sample sizes (Howell, 1998).

The results from the descriptive statistics indicated that the print-based group averaged a higher mean than the on-line group for both optimal decision-making (29.7697 versus 29.5000) and social environment (16.3879 versus 15.6471). However, for self-concept (24.0364 versus 24.1324) the result was reversed. The table labelled ‘Descriptives’ in Appendix 9.1.1 confirms these results. In order to comment on the significance of these means, we investigated the calculated F-statistics for each factor.

ANOVA formally tests a difference between the means of more than one independent group using a technique that partitions the total variance (variance of observations around the grand mean) into the components due to the variation *between* the groups as well as the variation *within* the groups. The variation between groups is then compared against the error variance to test whether it is significantly different. We compared our F-values to the appropriate critical values of the F distribution using $\alpha = 0.05$. We had 1 degree of freedom (*df*) for the numerator and 232 *df* for the denominator. As the critical value table (McGrath, 1997: p404 – 409) contained no row with 232 degrees of freedom we used the closest value to our denominator, namely 200, which shows the critical value of F as 3.89. We would expect to exceed an F of 3.89 only 5% of the time if H_0 was true.

In our attempt to compare the motivation for choice means for two groups showing different preferences for the choice of instructional content, the ANOVA results were:

- optimal decision-making ($F_{1, 232} = 0.389$, significance = 0.534);
- self-concept ($F_{1, 232} = 0.024$, significance = 0.877), and
- social environment ($F_{1, 232} = 3.309$, significance = 0.070).

Based on the calculated F values produced by the ANOVA, we could not reject the null hypothesis and concluded that there were no statistical significant differences between the motivation for choice means of students who preferred print-based instruction and the motivation for choice means of students who preferred on-line instruction.

The one-way ANOVA only compared means of the samples and did not allow for investigation of possible interactions between the independent factors. In order to comment on these, if any, research question 3 was formulated and tested with the use of the univariate ANOVA, general MANOVA and chi-square tests.

6.10.4 RESULTS OF THE UNIVARIATE AND MULTIVARIATE ANOVA

A univariate ANOVA and general MANOVA was performed to determine the relative contribution of each factor to a particular choice preference. The output, shown in Appendix 10 and 11, is for the model term Choice, representing our dependent variable.

Appendix 10.1.2 contains the results of the univariate ANOVA that was calculated to investigate the presence of choice main effects. The results were as follow:

- optimal decision-making: $F_{1, 232} = 0.723$, significance = 0.396;

- self-concept: $F_{1, 232} = 0.006$, significance = 0.938, and
- social environment: $F_{1, 232} = 3.521$, significance = 0.062.

As none of the significance levels were less than the required 0.05, we concluded that there was not significant support for optimal decision-making, self-concept or social environment main effects on the model term choice. The table labelled ‘Parameter Estimates’ (Appendix 10.1.3) indicates the slopes of the interaction lines between the independent variables. Lines with similar slopes will be parallel and are indicative of a lack of interaction between the independent variables. Clearly, the factors decision-making, self-concept and social environment had different slopes indicating that despite the lack of a significant result, interaction between the factor did contribute to a particular choice preference. However, since the result was not significant, a line plot was not constructed.

We repeated this procedure and replaced the model term choice by the dependent variable decision-making. This allowed for investigating possible main effects between self-concept and social environment on the decision behaviour of students. The results are portrayed in Appendix 10.2. This second univariate ANOVA procedure did reveal a significant result:

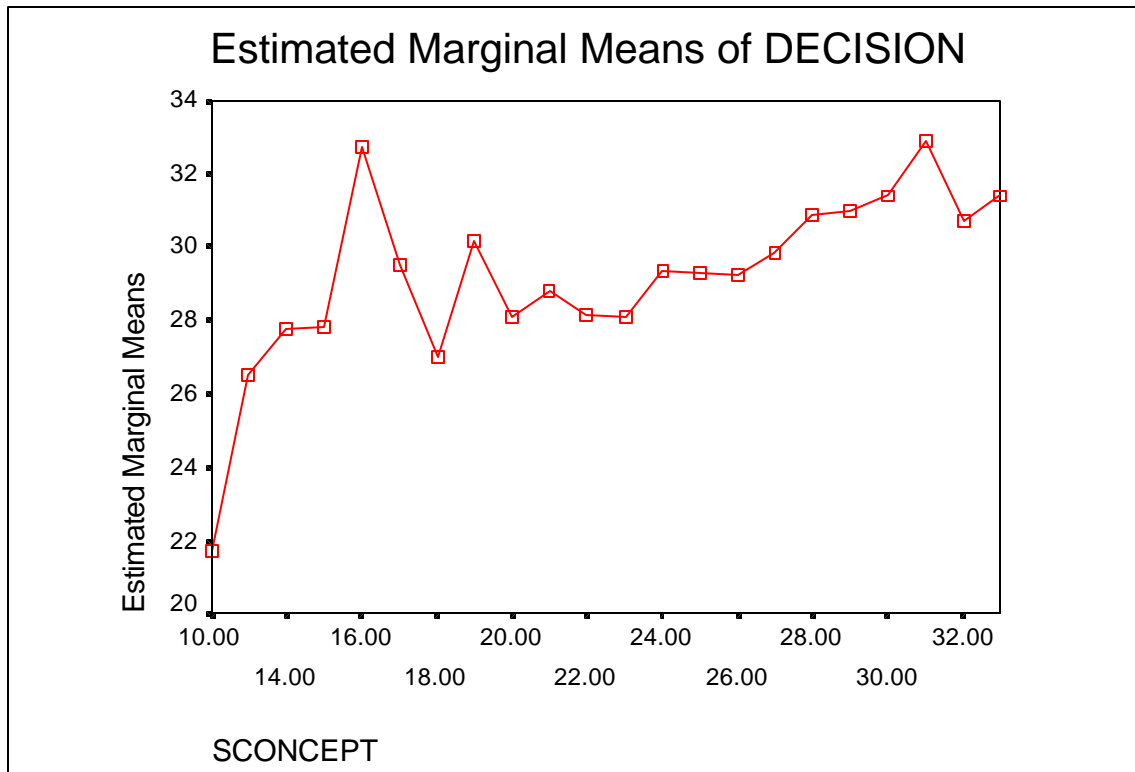
- self-concept: $F_{1, 232} = 21.415$, significance = 0.000, and
- social environment: $F_{1, 232} = 1.592$, significance = 0.208.

Since the self-concept factor showed significant main effects on decision-making, we decided to construct a line plot to investigate the specific effect. The line plot is illustrated in **Figure 6.2**.

The line plot illustrates that respondents with higher self-concepts were more inclined to make optimal decisions.

Appendix 11 contains the results from the multivariate analysis of variance. The ‘Multivariate Tests’ (Appendix 11.3) section simultaneously tested each factor’s effect on the dependent groups. This section indicates that each factor had a main effect. Interactions among the factors are also assessed. Four alternative multivariate significance tests are provided. Hotelling’s Trace is commonly used for two groups and was the applicable test for our results.

The calculated F statistic ($F_{3, 229} = 1.349$, significance = 0.259) showed that the



influence on choice due to interaction between the factors was insignificant.

Figure 6.2: Optimal decision-making versus self-concept line plot

6.10.5 RESULTS OF THE CHI-SQUARE

As the physical environment latent factor and experience latent factor was measured according to a nominal scale, a chi-square test with the aid *Analyse-It General and Clinical Laboratory Statistics – version 1.65* was applied to verify the null hypothesis. The chi-square examined differences between the observed proportions and expected proportions of our two independent samples. We tested the H_0 that there was no difference between the observed frequencies and the expected number of responses associated with each of the item categories responsible for the variables of the factors physical environment and previous experience indicated in **Table 6.1**. If H_0 was true, there would be no difference between the observed and expected frequencies, suggesting that the variable choice was independent of experience or physical environment – alternatively stated, experience and physical environment did not significantly contributed to the final choice. Observations for the chi-square test are summarised in Appendix 12.

The particular design that was employed varied for each of the physical environment and previous experience indicators. A 2 X (by) 3 design was employed for

the indicator experience with computers. Time responsibilities and type of transport were evaluated using a 2 X 4 design, while a 2 X 5 table evaluated the indicators access to a computer and access to the Internet. Distance from university utilised a 2 X 6 contingency table.

To measure the interdependence of choice and the factor previous experience based on the indicator experience with current mode, we had 1 df and the critical value of χ^2 is 3.84. As our obtained value ($\chi^2 = 8.73$) was more than the critical value, we rejected the null hypothesis. Hence, choice and previous experience was dependent on each other or previous experience with their current mode did contribute significantly to the final choice between print and on-line modalities.

The rest of the results are summarised below and will be interpreted in the same way as the critical value for the indicator experience with current mode.

For the choice X experience with computers contingency table, the $df = 2$, and the critical $\chi^2 = 5.99$. The obtained value was as follows: $\chi^2 = 0.9$.

For the choice X time responsibilities and choice X type of transport contingency tables, the $df = 3$, and the critical $\chi^2 = 7.82$. The obtained values were:

- time responsibilities: $\chi^2 = 2.86$
- type of transport: $\chi^2 = 1.99$

For a 2 X 5 contingency table format, the $df = 4$, and the critical $\chi^2 = 9.48$. We constructed two tables according to this format obtaining the following values:

- choice X access to computer: $\chi^2 = 1.82$
- choice X access to Internet: $\chi^2 = 1.82$

For the 2 X 6 contingency table, the $df = 5$, and the critical $\chi^2 = 11.07$. The obtained values were:

- choice X distance from university: $\chi^2 = 9.12$

From the above, it was clear that none of the obtained χ^2 values for the indicators of the factor physical environment exceeded the critical values. Thus, we concluded that choice is independent of the factor physical environment. The same conclusion can be made for the dependency of choice with respect to the variable experience with computers.

However, choice was dependent on the factor previous experience with respect the variable previous experience with current mode. In this case, we concluded that the probability of a student choosing a particular mode depended on his experience with that mode. If he had experience with that mode, the chi-square test showed some evidence that he would choose that mode above other alternatives, particularly if the experience involved print-based modalities.

6.10.6 TESTING THE INITIAL HYPOTHESIS

The foregoing results suggested that the print-based and on-line groups were not significantly different from the perspective of motivational factors that affected their choice between print and on-line delivery modes. However they did show significant correlations between optimal decision behaviour and self-concept.

In order to test the initial hypothesis that the group preferring print-based modes of delivery and the group preferring on-line delivery technology came from the same population, an independent-samples t-test was applied to measure the significance of the difference between two sample means. The results are shown in **Table 6.4** (detailed results appear in Appendix 13).

Table 6.4: Independent samples t-test

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
SOCIAL ENVIRONMENT	1.819	231	.070	.7408	.4072	-6.15E-02	1.5432
SELF-CONCEPT	-.155	231	.877	-9.59E-02	.6190	-1.3155	1.1235
DECISION-MAKING	.623	231	.534	.2697	.4327	-.5828	1.1222

The t-column displays the observed t-statistic for each sample, calculated as the ratio of the difference between sample means divided by the standard error of the difference. The column labelled 'Sig. (2-tailed)' displays a probability for the t-distribution with 231 degrees of freedom. The value listed is the probability of obtaining an absolute value greater than or equal to the observed t statistic, if the difference between the sample means is purely random. Since all three the significance values of the test are more than 0.05, we concluded that the average difference between the means of the two groups was due to chance. We could not reject the null hypothesis that the two groups were in fact representing two significantly different populations.

Based on the results of the above procedures and the insignificance thereof, the application of a regression analysis between the predictor variables optimal decision-making, self-concept and social environment and the dependent variable choice, was not justified. The following section investigates a regression analysis between optimal decision-making as the dependent variable and self-concept and social environment as the independent variables.

6.10.7 RESULTS OF THE REGRESSION ANALYSIS

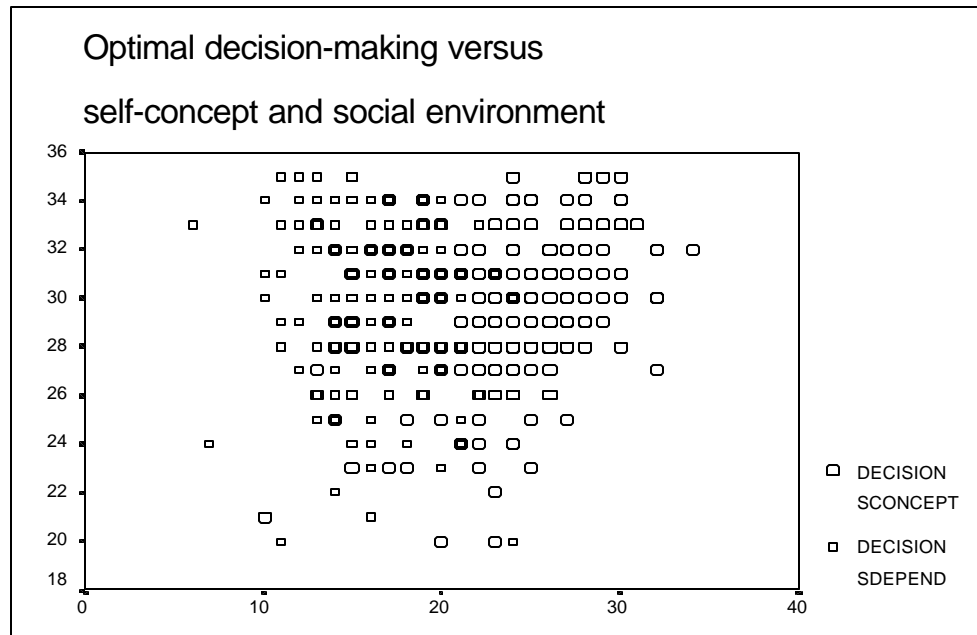
Previous research proved that a strong relationship exists between optimal decision-making behaviour and a number of personality traits. As we were not interested in the difference between the two groups for this question, data collected on the traits optimal decision-making, self-concept and social environment from the two samples were combined. The combined sample scores were then used to test the degree to which our results supported previous research.

As the data in our study were not parametric, the Pearson Product-moment correlation coefficient was not appropriate. Instead, we ranked the data for each subject according to their numerical ranks from lowest to the highest in order to correlate the variables. For the ranked data, a bivariate correlation computed the Spearman's r_s with significance levels, which measured how variables or rank orders were related (McMillan, 2000 and Howell, 1998).

Spearman's correlation coefficient is the same procedure as the Pearson Product-moment correlation coefficient, and they yield very similar results. However, as the correlation is based on ranked data, outliers have less of an effect on Spearman's r_s . The value r_s is a measure of two distinct aspects of the ranks: linearity of the relationship between the ranks and the monotonic relationship between the original variables. A monotonic relationship is defined as "*a relationship represented by a regression line that is continually increasing or decreasing, but perhaps not in a straight line*" (Howell, 1998: 155). Hence, the calculated r_s only told us directly about the relationship between variables on which it was calculated (this is particularly true for any correlation on ranked data). We could thus not expect to give precise interpretation on variables that was not included in the correlation, despite the fact that the correlation might have been due to interaction between more than the measured variables.

As the correlation coefficient for combined groups can be importantly affected by extremities in non-linearly and the use of heterogeneous samples (samples that can be subdivided into two distinct sets on the basis of some other variable), a scatter diagram of the total data set was constructed (Howell, 1998). This diagram is illustrated in **Figure 6.3**.

Figure 6.3: Scatter plot comparing optimal decision-making with self-concept and social environment



The scatter diagram indicated lack of clearly defined sub-groups within the sample. This condition satisfied the first criterion of linearity. The results from the hypothesis test did not reveal significant differences between the groups, hence the populations, from which their samples were drawn, were homogenous – there was no threat from heterogeneous sub-samples. Thus, we had sufficient support that combining the data for print and on-line were justified in verifying the assumptions made by previous research.

The results from the Spearman's correlation procedure are summarised in **Table 6.5**.

Table 6.5: Spearman's rank-ordered correlation matrix

Spearman's r_s		RANK of Social environment	RANK of self-concept	RANK of optimal decision-making
RANK of Social environment	Correlation Coefficient	1.000	-.161(*)	-.130(*)
	Sig. (2-tailed)	.	.014	.048
	N	233	233	233
RANK of self-concept	Correlation Coefficient	-.161(*)	1.000	.299(**)
	Sig. (2-tailed)	.014	.	.000
	N	233	233	233
RANK of optimal decision-making	Correlation Coefficient	-.130(*)	.299(**)	1.000

	Sig. (2-tailed)	.048	.000	.
	N	233	233	233

• Correlation is significant at the 0.05 level (2-tailed).

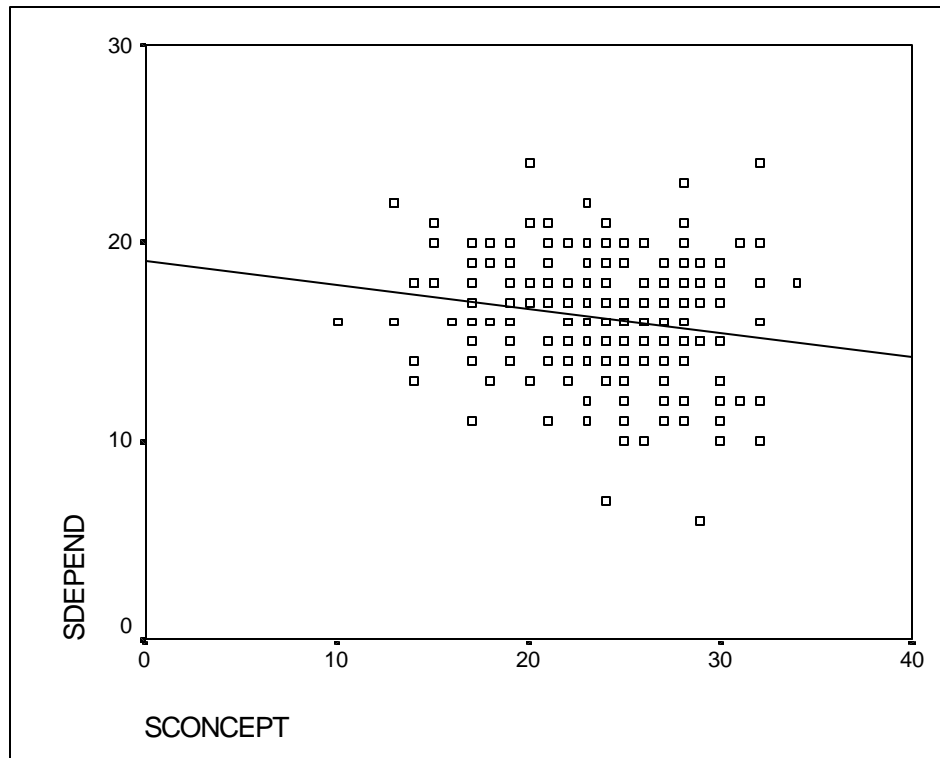
** Correlation is significant at the 0.01 level (2-tailed).

From the above it is clear that our results showed support for previous research stating that relationships exist between self-concept, social environment and optimal decision-making. However, the correlations, despite being significant at $p = 0.01$ and $p = 0.05$, were only moderate. Social environment showed a significant negative relationship with self-concept and optimal decision-making, while self-concept showed a significant positive correlation with optimal decision-making.

In order to investigate the correlation between self-concept and social environment, we constructed another scatter plot, which is displayed in **Figure 6.4**.

The scatter plot's line of best fit has a low negative slope confirming a moderate relationship between self-concept and social environment. Students with stronger self-concepts were less dependent on social assistance than students with weaker perceptions of themselves. This result confirmed our anticipation stated in section 6.9.6.

Figure 6.4: Self-concept versus social environment scatter plot with line of best fit



6.11 DISCUSSION

The descriptive statistics revealed that our sample had exceptional skills in the art of optimal decision-making and held very strong positive attitudes towards books and even stronger attitudes towards computer technologies. We believe that this result was a direct repercussion of the weakness associated with a convenience sample as described in section 6.6.2 and was therefore, a realisation of the anticipated bias described in section 6.6.3 due to the type of respondents that participated in our survey. The high averages of the sample on these factors (29.7 out of a possible of 35 for decision-making, 4.37 out of a possible 5 for attitude towards computers and 3.96 for attitude towards books) can be put into perspective if understood against the backdrop of Crawl's (1996) conclusion that voluntary respondents tend to be more intelligent and often hold better education. A review of our respondent education levels indicated that more than 50 percent of the sample had academic qualifications beyond a secondary school diploma. The section on our respondent characteristics also concluded with a statement on the similarities of our sample and the content of our theoretical description of the distance education student, which showed that students in this format of education are often older and economically active. Both Van den Aardweg and Van den Aardweg (1988) and Reber and Reber (2001) describe people in this phase of their life as being more aware of their social status and role

in society. As such, they are more sensitive towards the implications of their actions (decisions). Hence, we concluded that the sample had more experience in the art of decision-making and were more cautious of the outcome of their decision behaviour, spurring engagement in all the different phases of optimal decision-making process.

The high scores on the factor attitude can be understood in the light that we only mailed our questionnaire to students with access to e-mail addresses. We expected that, if students had an e-mail address, they had access to computer technologies. Despite the fact that the majority of respondents represented the print-based group, only 2 respondents (both from the print-based group) indicated that they did not use computers frequently, while 5 students indicated that they did not have convenient access to the Internet. Interestingly, one student who studied through on-line delivery methods also indicated not having convenient access to the Internet. We can conclude that choosing print-based delivery above on-line delivery did not mean that respondents had a negative attitude towards the latter mode. Most probably, a survey amongst the print-based representatives regarding the use of computers will indicate that the majority of print-based students rely on computers for their studies. A realisation of the value of this technology could therefore, explain the positive attitude towards this tool.

The results of our factor analysis supported the hypothesised model illustrated in **Table 6.1**. This model theorised that the 32-item motivation for choice section of the questionnaire (section B) could be interpreted in terms of six factors. Three factors, namely optimal decision-making, self-concept and social environment were well represented. In addition, the factor analysis confirmed the factors our variables were designed to measure, thus enhancing construct validity of the applied questionnaire.

The factor analysis suggested that our sample did receive the questionnaire items as being representative of conceptually independent factors as the majority of items only loaded high on one factor. Since the communalities of the variables associated with attitude, learning styles and conflict were not high, they were excluded from further statistical analyses.

Research question 5.1 investigated the means of our two samples based on the constructs identified in question 5. The objective was to identify significant motivational factor differences between the print-based and on-line groups. We found that the two groups did not differ significantly with regard to any of the hypothesised factors. However, the fact that the results were insignificant, should not lead to a generalisation that

the two groups are exactly similar. Our research did show interesting correlations with previous research regarding kinaesthetic learning and social environment.

The descriptive statistics suggested that the on-line group was more inclined towards kinaesthetic learning than the print-based group (mean of 9.34 compared to only 8.73). This result supported research from two independent studies that people with a kinaesthetic learning preference favour on-line technologies in delivery modes. A study done by Carbo, Dunn and Dunn (1986) suggested that kinaesthetic learners are more successful when they are actively engaged with the learning activity or that they acquire information better when they are participating actively. Another study done on computer-based training (a variant of on-line delivery modes) confirms that participants are ‘*by nature of this delivery method, active participants in the training*’ (Multimedia training applications, 2002, 09H27, 15/12/2002). This study boasts that it is the ongoing interaction between the learner and the nature of the delivery mode that increases the student’s interest in the education process. Tempted to say that our result was thus to be expected, the result must be interpreted against the backdrop of substantial sample size differences, which, according to Howell (1998) may yield only tentative interpretations.

Another interesting result from our study related to research from a 1993 study by Stafford and Kenneth (FamilyEducation.com, 2002, 09H39, 15/12/2002) that the learning style preference changes with age and sex:

Most of the school population excels through kinaesthetic means: touching, feeling, (and) experiencing the material at hand. Children enter kindergarten as kinaesthetic and tactual learners, moving and touching everything as they learn. By second or third grade, some students have become visual learners. During the late elementary years some students, primarily females, become auditory learners. Yet, many adults, especially males, maintain kinaesthetic and tactual strengths throughout their lives.

Considering that our sample (by nature of being adults) were dominated by males (58.8 percent), a result that kinaesthetic learning means for the entire sample would be higher than auditory learning means for the entire sample, was expected. However, our results showed the contrary: kinaesthetic learning only averaged 60.3 percent while auditory learning averaged 64 percent. Despite the lack of significance in the results, our

study suggests that the entire sample retained more auditory learning preference despite the fact that males dominated the sample.

The results also showed that the students preferring print-based delivery modes were more dependent on social assistance during decision-making (averaged 16.4 for social dependency versus the 15.6 of on-line students). This result can be interpreted from two different perspectives. Firstly, the print-based group showed lower self-concept than the on-line group, despite the fact that the self-concept result was not significant. Secondly, it can be understood in the light that the print-based group included better decision-makers.

Research has shown that self-concept influences decision-making behaviour. Section 5.8.5 defined self-concept as a person's view of himself in his own eyes and in the eyes of others. Since people with low self-concept have greater concern about how they look in the eyes of others, these decision-makers may be unduly sensitive to social pressure resulting in them not doing what they believe to be right, but rather what they believe others perceive as right (Taylor, 1984). Our results suggest that print-based students, having lower self-concepts, engaged in social interaction, because they feared that the result of their own independent decision might have negatively influenced other peoples' perception regarding them.

However, the result that print-based students were more dependent on their social environment, could also be interpreted in the light of optimal decision behaviour: print-based students showed better optimal decision-making behaviour than the on-line students. This might have been as a result that print-based students relied more than on-line students did on asking advice from others during the phase information gathering that is a prerequisite for optimal decision-making. As such, print-based students interacted more with their social environment before they made a decision. On the other hand, on-line students, having a better self-concepts, were more prone towards risky situations and as such, did not rely on their social environment or engaged socially to the extend print-based students did during the phase information gathering.

A statistical measure that did yield a significant difference between the two groups related to the chi-square tests. Based on the means of the factor conflict approach-approach for the two groups, we concluded that the students preferring print-based delivery modes were more prone to being attracted by both modes. Reber and Reber (2002) showed that the decision-maker resolves approach-approach conflict with proximity: when

he gets closer to one of two alternatives, desirability increases for the closest option. The problem with their study is that 'closeness' or proximity is not defined. Our results suggest that proximity can be defined in terms of previous experience. Previous experience showed significantly higher ratios for the print-based group to choose their delivery mode based on previous encounters with that mode (76 percent who chose this mode declared that they had previous experience with this mode while only 55 percent of on-line students claimed they had previous experience with their choice option). This result suggested that print-based students did not necessarily regard this option as being better. Rather, because neither option was significantly more attractive, they chose the option based on being of closer proximity, in other words, based on familiarity as a result of previous experience. This result also correlates with the lower self-concepts of the print-based group. Since they are less prone to engage in risky situations as a result of their lower self-concepts, the familiar territory of a previously experienced delivery tool was more attractive.

Research question 5.2 inquired about the relative contribution of each of the motivation for choice indicators identified by the factor analysis to a particular choice preference. The univariate and multivariate ANOVA tests yielded insignificant results. Does this mean that the factors optimal decision-making, self-concept and social environment did not interact or contributed to the final choices of students? Again, an insignificant result should not lead to a generalisation. The univariate ANOVA did show main effects for all three factors towards the choice students made despite being insignificant. In order from the most to the least main effects, the results were social environment, followed by optimal decision-making and then self-concept. A possible explanation for this result was in the fact that our motivation for choice indicators were based on a theoretical model that was derived from measures identified through previous research, which proved to be influential during the decision process. We have also shown in chapter 5 that choice involves a comparison among alternative and which, together with judgement, is related to decision-making. The results from research question 5.2 demonstrated that the influential decision factors identified in chapter 5 were transferable to the choices that students made when they chose between print and on-line delivery methods, but the extent to which their effects were apparent was less noticeable.

The final research question examined the relationship between optimal decision-making, self-concept and social environment. The scores yielded by our instrument showed that a significant positive correlation is evident between optimal decision-making and self-concept and a significant negative correlation existed between self-concept and

social environment. These results confirm previous research of Wright (1984), Taylor (1984) and Goldstein and Hogarth (1997) that these constructs are related. As such, this result provides convergent evidence regarding our instrument content (McMillan, 2000).

6.12 SUMMARY

This chapter investigated the underlying themes of our research project through empirically investigating the motivational factors that affected the decision behaviour of distance education students when they had to choose between the modalities of print and on-line instructional content. As its primary objective, this chapter attempted to answer four research questions. Question 5, regarding which motivational decision factors structured within section B of the questionnaire described a positive or negative preference for either print or on-line modalities, confirmed that the instrument succeeded in measuring the target factors designed for each variable. This question identified three factors that could potentially describe a choice preference for either print or on-line modalities, namely optimal decision-making, self-concept and social environment.

From the three factors identified in question 5, research question 5.1 did not show any significant results that the means of the two groups were different when compared on each of the factors. This result suggested that the group who preferred the print-based mode were representative of the same population as the group who preferred the on-line mode. This result was echoed by the multivariate analysis of variance (question 5.2), which also yielded insignificant results.

Regarding the categorical data in section A, a chi-square test measured two factors to investigate the populations from which the samples were drawn. This test showed a significant difference between the groups with regard to previous experience. The result suggested that print-based students were more inclined to choose their mode based on previous experience associated with that mode than the on-line students were.

Finally, research question 5.3 augmented convergent evidence of our instrument. A regression analysis between optimal decision-making, self-concept and social environment showed a significant positive interaction between optimal decision-making and self-concept and a significant negative interaction between self-concept and social environment.

The final chapter of this dissertation will synthesise all the findings in a brief synopsis of each of the research questions stated in chapter 1. This synopsis will be

followed by comments on the implications of our results. Finally this chapter will make recommendations for further study.

7 CONCLUSION

The research perspective of the study focused on the identification of motivational decision factors that were influential in the decision process of distance education students when they were faced with the decision to choose between print and on-line delivery modes. In exploring these motivational factors, five themes were identified, each of which related to a specific research question. This chapter synthesises the results of the themes through means of a synopsis on the findings related to each question. Following the synopsis, we comment on the implications of our study for the domain of Psychology of Education. A review of recommendations for further study concludes this dissertation.

7.1 SYNOPSIS OF THE FINDINGS

In an attempt to investigate and assess the motivational decision factors affecting a student's choice between print-based and on-line modalities, we articulated five research questions. This section presents each of the questions and summarises the most important significant results.

Research question 1 asked what characteristic attributes of distance education distinguish this mode from its traditional classroom variant.

As the first phase in answering this question, we attempted to define this mode as a distinct alternative to classroom education. Our definition focused on this mode as a universal phenomenon that is distinctively characterised by separation between student and teacher and the presence of technological media, which serves as the primary communication between the parties involved therein. Because of the various faces through which distance education reveals itself, formulation of this definition was not an easy endeavour, but the content of the definition suggested distinct differences from other modes of teaching. A comparison to classroom teaching yielded that separation is the primary distinguishing factor. Secondly, distance education educators often experience fewer exigencies in their education task relating to issues of discipline, motivation and time management. A third difference related to the role distance education plays in the education system. From a distance education perspective, this role mainly pertains to the promotion of student freedom, creation of independent study and commitment to community involvement.

Due to the significant role of technology in distance education as stated in our definition, we were curious about various technologies that constituted the need for choice.

This curiosity gave rise to research question 2: what constitute the choice alternatives of the distance education student? Examination of this question yielded three notable results. The first related to the liberation of the distance education student in terms of the variety of modes that the student can choose between. The second pertained to the existence of a misconception regarding the conceptual constructs of educational technology and educational modes of delivery, and finally, that the techniques involved in the delivering of instructional material are becoming more and more electronically slanted. The relevant chapter to this research question showed that there are four modes that can be identified in distance education: print-based, audio-based, video-based and on-line delivery modes. Each of these modes incorporates its own set of media tools that can range from one-way, non-electronic to the fully electronic 'continuous presence' tools of conferencing technology. Our results also revealed that the textbook, despite of being the least sophisticated technological tool, frequently emerges in conjunction with other tools across all four modes.

If the context of distance education differed from classroom instruction, we anticipated that the distance education student as a decision-maker, and who practices choices, would portray different attributes than traditional classroom attending students. This anticipation led to the formulation of research question 3: how do the social and physical decision environments of the distance education student differ from the traditional student? As with question 1, we engaged in the dangerous process of defining the distance education student. This definition focused on the age and economic role of the student. We separated the distance education student from the classroom student in terms of being older, often economically active and portraying stronger attributes on motivation, autonomy and self-directedness. The latter three attributes are often geared towards job-related skill enhancement. Our results acknowledged the student as a decision-maker based on his need to choose between the alternatives of print and on-line modalities. This choice manifested a conflict that resulted in the selection of either the print-based or the on-line option. This conflict is affected by a subjective space (decision environment) often characterised by uncertainty, complexity or 'openness' depending on how the student reacts to the stimulus that constituted the conflict. Our results also revealed that students who dominated their environment were more motivated by the conflict and as a result, were more inclined to engage in all the components of the decision process.

In order to investigate the motivational factors that affected the choice of students, we needed a clear understanding about the concept 'choice'. The fourth question satisfied

this need: what process is attributed to the making of choices? Our investigation revealed that choice, judgement and decision-making are closely related concepts. Choice is a form of decision-making and can be regarded as an open system containing six distinct procedures: problem definition, alternative identification, alternative quantification, decision aids, decision act and decision implementation. We concluded that it is the extent to which the student adheres to each of these procedures that will yield optimal results. In our venture to understand the motivational decision factors that affected choice, we investigated particular personality traits that previous research has shown to be influential in the decision behaviours of individuals. Eight personality traits, namely beliefs, self-actualisation, tolerance for ambiguity, self-concept, motivation, interest, locus of control and risk-taking each proved to have a unique effect on the final result of the decision process.

The first four research questions constituted the foundation for our empirical investigation of research question 5: which motivational or decision factors described a positive or negative choice preference towards either print or on-line modalities? The perspective of this question focused on identifying motives or influential decision factors that might influence the distance education student's choice to select either print-based or on-line instructional content. Data generated in response to our survey questionnaire was subjected to statistical testing and yielded the following results:

- a factor analysis yielded three factors that positively correlated with indicator variables designed to measure each factor;
- the results from the one-way analysis of variance test was not significant and suggested that our sample did not represent two distinct populations based on optimal decision-making, self-concept and social environment;
- the overall MANOVA was insignificant, but did show variances with regard to the contribution of each factor to choice – results identified social environment to contribute the most to choice, followed by optimal decision-making and self-concept;
- the chi-square test showed significant differences between the two groups based on the factor previous experience, with the print-based group showing more inclination towards having based their decision to choose their particular option because of previous experience associated with that option;

- optimal decision-making positively correlated with the personality trait self-concept, and
- self-concept negatively correlated with social environment.

7.2 IMPLICATIONS

Furthering our understanding of the motivational decision factors affecting the choices of distance education students, has four particular implications for distance education providers.

The first implication involves a continued investigation into the changing nature of distance education. We have shown that distance education is a real competitor in the provision of life-long learning. As such, participants in this mode should continually investigate and expand the important role that this mode of education has to offer. With the advent of the technological era, the face of distance education changed yet again. It is the task of distance education providers to ensure that this mode stays on the forefront of education delivery and paves the way for competitors to follow. This task gives rise to the second implication of our research, namely that distance education should enthusiastically pursue the realisation of ‘continuous presence’ as a realistic alternative to classroom instruction.

This second implication is a direct result of the continuing importance that computer technology plays in our daily existence. As computers become more and more advanced and the Internet more readily available, it seems that ‘continuous presence’ is becoming a realistic alternative to the challenges of classroom education. The potential of this medium is clearly visible in an article in the *Nashville Medical News* that appeared in April 1999 (a section of the article appears in Appendix 14). Authors of the article particularly focussed on the financial advantage in that it drastically reduces travelling costs, but also makes better use of time.

As a third implication, our research challenges distance education institutions to better conceptualise the students involved in this mode of education. Not only are distance education students accumulators of knowledge, but they are decision-makers in the midst of conflict. Reality is that not all students (individuals) are optimal decision-makers (Leigh, 1983). However, students are able, with the necessary assistance, to manipulate their environments and therefore, have the potential to make decisions that yield more optimal results. In the context of distance education, optimal results can be interpreted as

being a more pleasant study experience in which content delivery positively correlates with personality traits, learning style and the like. Our study, therefore, implies a better understanding of what constitutes an optimal decision-maker, as this will enable distance education institutions to assist the student in taking control of his decision process and as a result, make the choice between print and on-line modalities less ominous.

A final implication of our research implies that institutions should be more effective in their guidance of students through the problems we stated in section 4.6:

- What is the decision problem? or What is the choice that I have to make?
- What resources are available for solving the problem?
- What events may affect the outcome of my choice?, etc.

This implication is a direct response to the comments made by students who took part in our survey. Several students indicated that they were not aware of alternative delivery options at the time they enrolled at their institution. Research, like the present study, allows institutions to prepare students for their choices. The implication is that institutions should better invest in their advertising campaign to make sure that all students are presented with the total array of delivery mode alternatives provided by the institution.

The above implications will not be easy as our results showed that the student in the distance education format is very diverse and difficult to conceptualise.

7.3 RECOMMENDATIONS FOR FURTHER RESEARCH

We recommend a replica of this study utilising a larger overall sample size, but more importantly, more evenly distributed sample subgroups, as this would increase the stability of results, which, because of the size of our on-line group, remains tentative.

Additional research is also necessary to identify alternative motivation for choice factors that will distinguish between the choice patterns resulting in either print or on-line modalities. Further analyses should aim at adding a predictive quality to each factor in order to help students make optimal choices or allow institutions to prepare quantitatively for the number of students associated with each mode.

Our study revealed relatively high optimal decision-making scores for the decision behaviour of the entire sample. Yet upon closer investigation of the individual responses, we realised that several students acknowledged that they were not aware of ever having a choice between the options of print and on-line modes. This raises two questions: are

institutions successful in communicating the choice alternatives to the students? Alternatively, were the students really optimal decision-makers in the sense that they engaged in each of the processes of optimal decision-making, especially those phases pertaining to problem definition, alternative quantification and alternative qualification? We recommend detailed investigations into students' commitment to engage in each phase of the decision process in order to arrive at the origin of this lack of knowledge.

A final recommendation emanates from our efforts to define distance education and the student engaged in this mode. Why are descriptive statements of these concepts so difficult to formulate? We believe it is because of the magnitude and dynamic nature of distance education. What really constitutes distance education? What are the characteristics of this mode and of those associated with it? Who is the distance education student? These questions desperately require research to add to the existing knowledge stream and provide insight for both the theorists and practitioners involved in distance education.

The above extensions to this research project will assist in closing the gap and provide missing elements into the present body of knowledge – especially with respect to identifying motivational factors affecting the student's decision in choosing between print and on-line delivery modes in distance education.

Therefor, since the best way to predict the future is to invent it, let us stop writing and let our affections distil into actions that yield results...

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8 ABBREVIATIONS USED IN TABLES

<i>SC</i>	Self-concept
<i>AB</i>	Attitude Books
<i>AC</i>	Attitude Computers
<i>Al</i>	Auditory Learning
<i>AltId</i>	Alternative Identification
<i>AltQuan</i>	Alternative Quantification
<i>CAPap</i>	Conflict Approach-Approach
<i>CAPav</i>	Conflict Approach-Avoid
<i>CAvAv</i>	Conflict Avoid-Avoid
<i>CDAp</i>	Conflict Double Approach
<i>DecAct</i>	Decision Act
<i>DecAid</i>	Decision Aids
<i>DecImp</i>	Decision Implementation
<i>IGP</i>	Individual VS. Group Learning Preference
<i>KL</i>	Kinesthetic Learning
<i>Motivati</i>	Motivation
<i>ODM</i>	Optimal decision making
<i>PDef</i>	Problem Definition
<i>rankBeli</i>	Ranked data for Beliefs variable
<i>rankMot</i>	Ranked data for Motivation variable
<i>rankRisk</i>	Ranked data for Risk variable
<i>rankSC</i>	Ranked data for Self-concept variable
<i>rankTolA</i>	Ranked data for Tolerance for Ambiguity variable
<i>RT</i>	Risk taking
<i>SE</i>	Social Environment
<i>TfA</i>	Tolerance for ambiguity

9 LETTER OF REQUEST

Date

To whom it may concern

My name is Marko Labuschagne. I apologize if you are not the correct person to speak to, and kindly request direction towards the appropriate channel for my inquiry. I have also directed this email to Mr. Papadolias.

I am a qualified teacher who is now a full-time M.Ed. (Research) student in the Distance Education program of the University of South Africa (I am a recent immigrant to Canada who did not want to switch in the middle of my academic studies). The focus of my research is decision theory and the title of my thesis is **Motivational factors affecting a student's decision when choosing between print or on-line modes of instructional content**.

Having just completed the theoretical component of my research, I now want to begin my empirical research which involves the completion of a questionnaire by students who engage in a distance education program and have the choice to choose between print or on-line modes for accessing their learning content. For my research I need an institution which offers distance education and print or on-line choice possibilities and Algonquin College satisfies both these requirements.

My request: Would I be allowed to use the students associated with your institution? If the answer is yes, I would like to make an appointment with the appropriate person/s to present a formal letter of request and discuss the methods for administering my questionnaire and also to present the background to my study (research proposal) and my current progress. My questionnaire is currently under review by my promoter, but I do have a copy that will form the basis of the type of questions contained on the questionnaire.

I sincerely hope that I will be allowed to make use of your institution and will endeavor to make all my research conclusions available to your institution. I would like to complete this research as soon as possible (my plan is to complete the research project by the end of November 2002). I can be reached at (613) 592-7921 all day or mmlabuschagne@hotmail.com

Kind regards,

Marko Labuschagne

University of South Africa Student #: 3160-177-4

10 LETTER OF TRANSMITTAL

UNIVERSITY OF SOUTH AFRICA FACULTY OF EDUCATION

Date

Dear Student:

The attached survey instrument, concerned with the influential factors affecting choice between print and online delivery modes, is part of an M. Ed. (Research) study conducted by the Faculty of Education under the supervision of Professor E. O. Mashile. This project is concerned specifically with determining the decision behaviour and choice preferences of present distance education students at the University of South Africa.

We are particularly interested in your participation, because your experience in choosing between different delivery modes will contribute significantly towards solving some of the challenges confronting us within this important area of distance education. The enclosed questionnaire, with instructions for the appropriate completion, have been tested and revised in order to make it possible for us to obtain all necessary data while optimising the use of your time and resources. Two options for participation (each of which will take less than 15 minutes to complete) are provided:

Students with Internet access: The questionnaire, located at the following site (one will be indicated) can be completed via the Internet. After completion, simply click the "Submit" button to conclude your participation in this research project.

Students without convenient access to the Internet: The survey can be completed on an Excel spreadsheet. Once completed, we request that you kindly email the file as an attachment to the following address (one will be indicated), using the phrase "Decision Survey" in the subject line.

It will be appreciated if you will complete one of the options prior to October 1st, as other phases of this research cannot be completed until the survey data has been analysed. Your response will be held in the strictest of confidence and once submitted or mailed, no attempt will or can be made to trace the responses back to you.

Thank you for your participation in this important research project.

Sincerely yours,

Marko Labuschagne

11 EXCEL VERSION OF QUESTIONNAIRE

DISTANCE EDUCATION SURVEY

INFLUENTIAL FACTORS AFFECTING CHOICE BETWEEN PRINT AND ONLINE DELIVERY MODES IN DISTANCE EDUCATION

The purpose of this study is to investigate motivational factors that are influential during the decision process of students when choosing between print-based or on-line modalities (delivery methods or channels) in Distance Education. Please help us in completing this study by filling in the questions below. This is not a test and therefore there is no wrong or right answer. We would therefore request you to answer the questions as honestly as possible. Your responses are confidential and will not be passed on to anyone else. No attempt will also be made to trace the responses to this questionnaire back to you. Please answer all the questions.

Thank you for participating in this very important research project!

SECTION A: BACKGROUND INFORMATION

Type the number of the option that describes your current situation best in the shaded "answer" block next to the question. If you choose the "Other" option, please specify where necessary the condition that best describes your situation by typing your condition in the shaded space provided. Carefully consider the following example:

<u>EXAMPLE:</u>	<u>OPTION:</u>	<u>TYPE YOUR</u>	<u>AN</u>
0. Which computer do you use at home? I (1) Pentium II (2) Pentium (3) Other Specify: Pentium V			
1. Which delivery mode did you choose to receive your instructional content? based (1) Print- (2) On-line (3) Other Specify:			
2. Have you used your current mode of instruction during previous studies? Yes (1) No (2)			
3. What is your status as a student? Full time (1) Part time (2)			
4. Gender: (1) Male (2) Female			
5. What was your highest level of education before enrolling for your current program? High School (1) a (2) Diplom (3) Degree Post Graduate (4) s (5) Master ate (6) Doctor			
6. Apart from studying, what other responsibilities compete for your time? Full-time work (1) Part-time work (2) (3) Family (4) Other : Specify Combination of responsibilities (5) Specify: (e.g. 1, 2, 4)			
7. Which of the following best describes the approximate distance between your residence and your current education institution (< = less than ; > = more than) (1) <10 km km (2) 10 - 20 21 - 30 km (3)			

	31 - 40 km (4)	41 - 50 km (5)	> 50 km (6)	
8. What is your primary mode of transportation?				
	Own vehicle (1)	Public Transport (2)	Car pulling (3)	
	Other (4) :		Specify	
9. Which of the following best describes your age at last birthday?				
(1)	< 20	21-30 (2)	31- 40 (3)	
(4)	41-50	> 50 (5)		
10. What is your current marital status?				
	Never married (1)	Married (2)	Married with children (3)	
	Single with children (4)		Other (5) :	Specify
11. What is your native language?				
(1)	Afrikaans (2)	English (3)	isiNdebele (4)	
(5)	isiXhosa (6)	isiZulu (7)	Northern Sotho (8)	
(9)	Sesotho (10)	Setswana (11)	Siswati (12)	
(13)	Tshivenda (14)	Xitsonga (15)	Other (16) :	Specify
12. Which of the following best describes your previous experience with a computer?				
	I seldom or never use computers (1)		I occasionally use computers (2)	
	I frequently use computers (3)			
13. Which of the following best describe your access to a computer?				
	I do not have access to a computer (1)		I have my own computer at home (2)	
	I share a computer at home (3)		I have my own computer at work (4)	
	I share a computer at work (5)		Other (6) :	
			Specify	
14. Which of the following best describes your access to the Internet?				
	I do not have access to the Internet (1)		I access the Internet from my home (2)	
	I access the Internet from my work (3)		Other (4) :	
			Specify	

SECTION B: Decision Process

We are interested in knowing WHAT FACTORS, e.g. decision process, personality, learning styles or attitude, may influence your DECISION when making CHOICES. Bear in mind that choice is highly personal and there are no "right" or "wrong" answers! Please read each of the following statements and indicate the extent to which you AGREE or DISAGREE.

Write the number of the option that describes the extent of your agreement or disagreement in the block next to the question.

STRONGLY AGREE (1) ; AGREE (2) ; UNCERTAIN (3) ; DISAGREE (4) ; STRONGLY DISAGREE (5)

EXAMPLE:

ANSWER:

<i>I am participating in this research survey.</i>	
15. All delivery modes have advantages and drawbacks.	
16. Computers are stimulating.	
17. I prefer to do my own thing despite the expectations of others.	
18. Doing things is the best way to learn.	
19. Even when I am feeling self-confident, I lack the ability to control social situations.	
20. I apply a specific technique in my decision process.	
21. When I decide, I compare my alternatives and eliminate options that seem less attractive.	
22. I feel confident about my decisions, regardless of what the implication may be.	
23. I find books a lot of fun.	
24. I find it easy to guide the course of conversation in most group situations.	
25. I found all the delivery mode alternatives to be equally attractive.	
26. I had a delivery mode preference, but I could not choose it.	
27. I have to move around while I am learning.	
28. I learn best when I am stationary, e.g. sitting or lying down.	
29. I learn best when I hear things.	
30. I make sure that I understand my options before I decide.	
31. I normally take responsibility for the result of my actions.	
32. I often feel uncertain about the results of my decision.	
33. I often remain secretive about my decision until I have evidence of the result.	
34. I prefer games involving some luck to games requiring skill.	
35. I prefer to learn new things on my own, rather than in groups.	
36. I rely on my judgement at the moment that I make a decision.	
37. I try to hide the implication of my decisions if things did not go according to plan.	
38. My choice is based purely on my personal preference at the time of making a decision.	
39. My decisions are based on what others would have done in the same situation.	
40. On any sort of test or competition, I like to know how well I related to everyone else.	
41. The delivery mode alternatives between which I could choose were all equally unattractive.	
42. The immediate rewards of my choice are more important than long-term implications.	
43. When I decide, I think what the effect in the long run will be.	
44. When I get what I want it is usually because I worked hard for it.	
45. When I make a decision, I ask advice from people who made a similar decision.	
46. When I make a decision, I gather as much information on the problem as possible.	

We appreciate your participation in this research survey.

Thank you!

12 INTERNET VERSION OF QUESTIONNAIRE

Distance Education Survey - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History No! Print

Address <http://members.sagepub.com/desurvey/local.htm> Go Links

DISTANCE EDUCATION SURVEY
INFLUENTIAL FACTORS AFFECTING CHOICE BETWEEN PRINT AND ONLINE DELIVERY MODES IN DISTANCE EDUCATION

The purpose of this study is to investigate motivational factors that are influential during the decision process of students when choosing between print-based or on-line modalities (delivery methods or channels) in Distance Education. Please help us in completing this study by filling in all the questions below, and selecting the SUBMIT button on completion. This is not a test and therefore there is no wrong or right answer. We would therefore request you to answer the questions as honestly as possible. Your responses are confidential and will not be passed on to anyone else. No attempt will also be made to trace the responses to this questionnaire back to you.

Please answer ALL the questions. Submitting incomplete questionnaires will result in an error message indicating which question was not answered. In case of an Error message - please use the BACK button of your Internet Browser and complete the question indicated in the error message. Then select the SUBMIT button at the end of the questionnaire again.

Thank you for participating in this very important research project!

SECTION A: BACKGROUND INFORMATION

Click the option that describes your current situation best. If you choose the "Other" option, please specify where necessary the condition that best describes your situation by typing your condition in the white text box provided. Carefully consider the following example:

Example. Which computer do you use at home?

☐ Pentium I ☐ Pentium II ☐ Other

Specify:

1. Which delivery mode did you choose to receive your instructional content?

☐ Print-based ☐ On-line ☐ Other

Specify:

2. Have you used your current mode of instruction during previous studies?

☐ Yes ☐ No

Distance Education Survey - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History No! Print

Address <http://members.sagepub.com/desurvey/local.htm> Go Links

3. What is your status as a student?

☐ Full time ☐ Part time

4. Gender:

☐ Male ☐ Female

5. What was your highest level of education before enrolling for your current program?

☐ High School ☐ Diploma ☐ Degree ☐ Post Graduate ☐ Masters ☐ Doctorate

6. Apart from studying, what other responsibilities compete for your time?

☐ Full-time work ☐ Part-time work ☐ Family ☐ Other or Combination of responsibilities

Specify: (e.g. Full-time work, Family)

7. Which of the following best describes the approximate distance between your residence and your current education institution?

☐ less than 10 km ☐ 10 - 20 km ☐ 21 - 30 km ☐ 31 - 40 km ☐ 41 - 50 km ☐ more than 50 km

8. What is your primary mode of transportation?

☐ Own vehicle ☐ Public Transport ☐ Car pooling ☐ Other

Specify:

9. Which of the following best describes your age at last birthday?

☐ 20 or younger ☐ 21-30 ☐ 31-40 ☐ 41-50 ☐ older than 50

10. What is your current marital status?

☐ Never married ☐ Married ☐ Married with children ☐ Single with children ☐ Other

Specify:

Distance Education Survey - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Mail Print

Address <http://members.sagepub.com/dedsurvey/local.htm> Go Links

11. What is your native language?

☐ Afrikaans ☐ English ☐ IsiNdebele ☐ IsiXhosa ☐ IsiZulu ☐ Northern Sotho ☐ Sesotho ☐ Setswana ☐ Sirwan ☐ Tshivenda ☐ Xitsonga ☐ Other

Specify:

12. Which of the following best describes your previous experience with a computer?

☐ I seldom or never use computers ☐ I occasionally use computers ☐ I frequently use computers

13. Which of the following best describe your access to a computer?

☐ I have no access to a computer ☐ I access a computer at home ☐ I access a computer at work ☐ I access a computer at home and at work ☐ Other

Specify:

14. Which of the following best describes your access to the Internet?

☐ I have no access to the Internet ☐ I access the Internet from home ☐ I access the Internet from work ☐ I access the Internet from home and work ☐ Other

Specify:

SECTION B: DECISION PROCESS

We are interested in knowing WHAT FACTORS, e.g. decision process, personality, learning styles or attitude, may influence your DECISION when making CHOICES. Keep in mind that choice is highly personal and there are no "right" or "wrong" answers! Please read each of the following statements and indicate the extent to which you AGREE or DISAGREE by clicking the appropriate option.

Example. I am participating in this research survey.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

15. All delivery modes have advantages and drawbacks.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

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16. Computers are stimulating.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

17. I prefer to do my own thing despite the expectations of others.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

18. Doing things is the best way to learn.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

19. Even when I am feeling self-confident, I lack the ability to control social situations.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

20. I apply a specific technique in my decision process.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

21. When I decide, I compare my alternatives and eliminate options that seem less attractive.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

22. I feel confident about my decisions, regardless of what the implication may be.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

23. I find books a lot of fun.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

24. I find it easy to guide the course of conversation in most group situations.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

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25. I found all the delivery mode alternatives to be equally attractive.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

26. I had a delivery mode preference, but I could not choose it.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

27. I have to move around while I am learning.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

28. I learn best when I am stationary, e.g. sitting or lying down.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

29. I learn best when I hear things.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

30. I make sure that I understand my options before I decide.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

31. I normally take responsibility for the result of my actions.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

32. I often feel uncertain about the results of my decision.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

33. I often remain secretive about my decision until I have evidence of the result.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

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34. I prefer games involving some luck to games requiring skill.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

35. I prefer to learn new things on my own, rather than in groups.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

36. I rely on my judgement at the moment that I make a decision.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

37. I try to hide the implication of my decisions if things did not go according to plan.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

38. My choice is based purely on my personal preference at the time of making a decision.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

39. My decisions are based on what others would have done in the same situation.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

40. On any sort of test or competition, I like to know how well I related to everyone else.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

41. The delivery mode alternatives between which I could choose were all equally unattractive.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

42. The immediate rewards of my choice are more important than long term implications.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

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Address <http://members.sagepub.com/dedsurvey/local.htm> Go Links

39. My decisions are based on what others would have done in the same situation.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

40. On any sort of test or competition, I like to know how well I related to everyone else.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

41. The delivery mode alternatives between which I could choose were all equally unattractive.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

42. The immediate rewards of my choice are more important than long-term implications.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

43. When I decide, I think what the effort in the long run will be.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

44. When I get what I want it is usually because I worked hard for it.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

45. When I make a decision, I ask advice from people who made a similar decision.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

46. When I make a decision, I gather as much information on the problem as possible.

☐ Strongly Agree ☐ Agree ☐ Uncertain ☐ Disagree ☐ Strongly Disagree

Submit Answers

Done Internet

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Thank you for taking the time to complete the questionnaire.

Done My Computer

13 DESCRIPTIVE STATISTICS

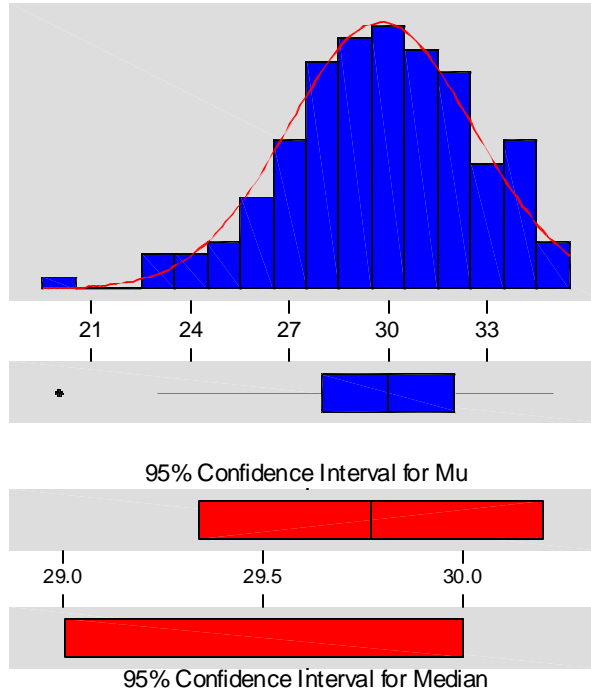
All statistical analysis in this section done utilizing Minitab for Windows 2000 - version 13.32 and Statistical Package for Social Sciences Version 11.5 for Windows

13.1 DESCRIPTIVE STATISTICS FOR INDIVIDUAL ITEMS

	MEAN	STD. DEVIATION	ANALYSIS N
V15	4.2146	.5771	233
V16	4.3734	.7087	233
V17	2.0000	.8857	233
V18	4.6094	.6869	233
V19	3.3519	1.1802	233
V20	3.7554	.8883	233
V21	4.1931	.7777	233
V22	2.1416	.8568	233
V23	3.9614	1.0640	233
V24	3.6369	1.6353	233
V25	2.9785	1.0645	233
V26	2.4077	1.0386	233
V27	2.4721	1.1892	233
V28	1.8283	.8885	233
V29	3.1631	1.1330	233
V30	4.3004	.6531	233
V31	4.5279	.5496	233
V32	3.4464	.9817	233
V33	3.0300	1.1832	233
V34	3.9185	.9726	233
V35	3.4721	1.1746	233
V36	1.8970	.7057	233
V37	3.6781	.9305	233
V38	2.9185	1.0936	233
V39	2.5622	.9545	233
V40	3.6352	1.0297	233
V41	2.1330	.8064	233
V42	3.7210	.9212	233
V43	4.2618	.6792	233
V44	4.3348	.7006	233
V45	3.9356	.8357	233
V46	4.3176	.6839	233
N = NUMBER			

13.2 OPTIMAL DECISION MAKING

Descriptive Statistics



Variable: DECISION
Choice: 1

Anderson-Darling Normality Test

A-Squared: 1.145
P-Value: 0.005

Mean 29.7697
StDev 2.8125
Variance 7.91005
Skewness -4.2E-01
Kurtosis 0.205627
N 165

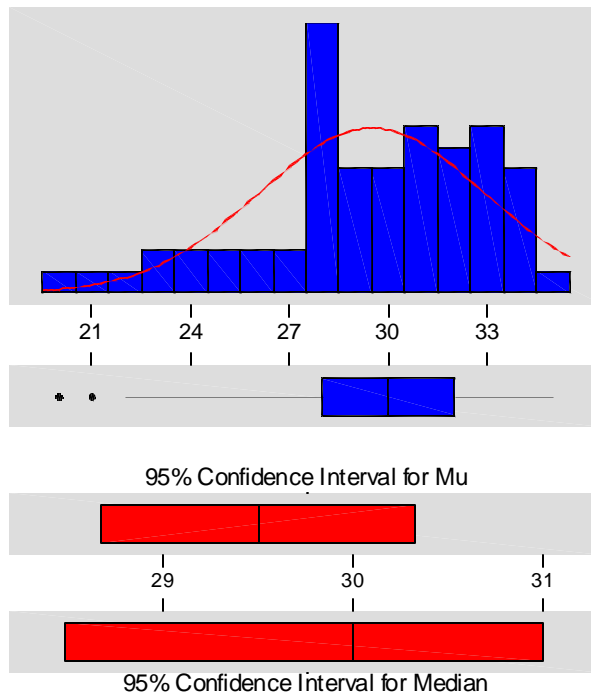
Minimum 20.0000
1st Quartile 28.0000
Median 30.0000
3rd Quartile 32.0000
Maximum 35.0000

95% Confidence Interval for Mu
29.3374 30.2020

95% Confidence Interval for Sigma
2.5383 3.1537

95% Confidence Interval for Median
29.0000 30.0000

Descriptive Statistics



Variable: DECISION
Choice: 2

Anderson-Darling Normality Test

A-Squared: 1.140
P-Value: 0.005

Mean 29.5000
StDev 3.4229
Variance 11.7164
Skewness -7.4E-01
Kurtosis 0.200474
N 68

Minimum 20.0000
1st Quartile 28.0000
Median 30.0000
3rd Quartile 32.0000
Maximum 35.0000

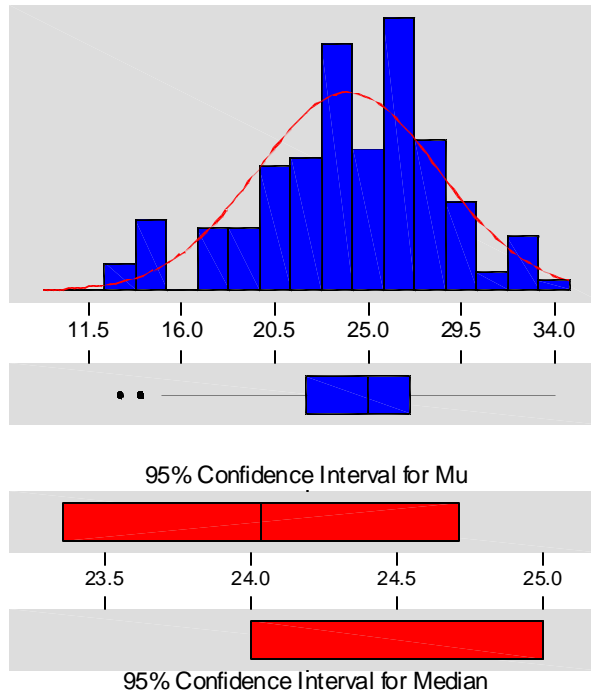
95% Confidence Interval for Mu
28.6715 30.3285

95% Confidence Interval for Sigma
2.9287 4.1193

95% Confidence Interval for Median
28.4787 31.0000

13.3 SELF CONCEPT

Descriptive Statistics



Variable: SCONCEPT

Choice: 1

Anderson-Darling Normality Test

A-Squared: 1.563
P-Value: 0.000

Mean 24.0364
StDev 4.3922
Variance 19.2914
Skewness -5.1E-01
Kurtosis 0.110443
N 165

Minimum 13.0000
1st Quartile 22.0000
Median 25.0000
3rd Quartile 27.0000
Maximum 34.0000

95% Confidence Interval for Mu

23.3612 24.7115

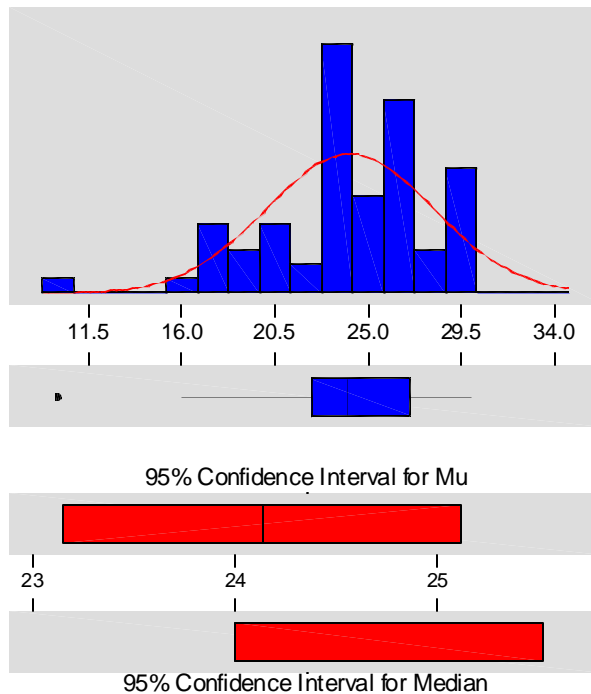
95% Confidence Interval for Sigma

3.9639 4.9250

95% Confidence Interval for Median

24.0000 25.0000

Descriptive Statistics



Variable: SCONCEPT

Choice: 2

Anderson-Darling Normality Test

A-Squared: 0.984
P-Value: 0.013

Mean 24.1324
StDev 4.0479
Variance 16.3852
Skewness -8.1E-01
Kurtosis 1.07996
N 68

Minimum 10.0000
1st Quartile 22.2500
Median 24.0000
3rd Quartile 27.0000
Maximum 30.0000

95% Confidence Interval for Mu

23.1526 25.1121

95% Confidence Interval for Sigma

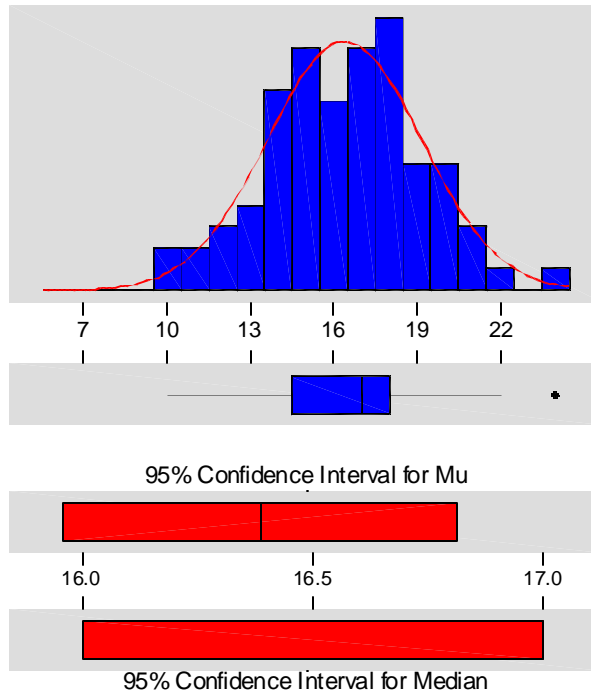
3.4634 4.8714

95% Confidence Interval for Median

24.0000 25.5213

13.4 SOCIAL ENVIRONMENT

Descriptive Statistics



Variable: SDEPEND

Choice: 1

Anderson-Darling Normality Test

A-Squared: 1.064
P-Value: 0.008

Mean 16.3879
StDev 2.7753
Variance 7.70229
Skewness -2.6E-02
Kurtosis -4.8E-02
N 165

Minimum 10.0000
1st Quartile 14.5000
Median 17.0000
3rd Quartile 18.0000
Maximum 24.0000

95% Confidence Interval for Mu
15.9613 16.8145

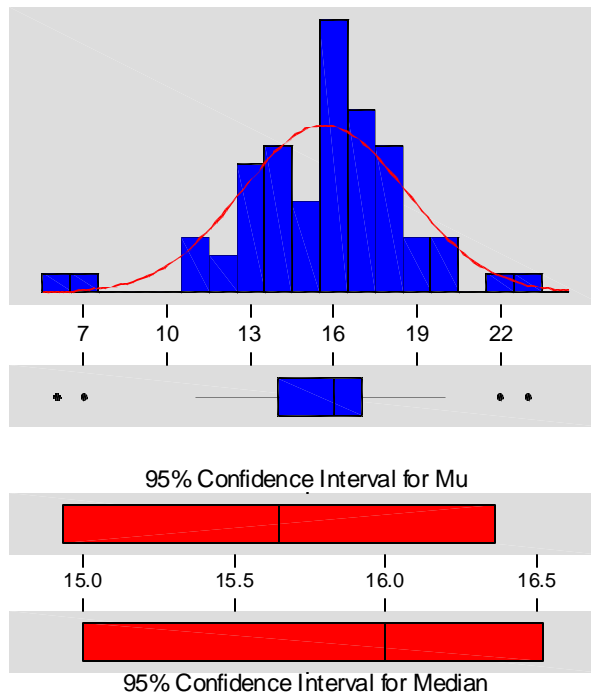
95% Confidence Interval for Sigma

2.5047 3.1120

95% Confidence Interval for Median

16.0000 17.0000

Descriptive Statistics



Variable: SDEPEND

Choice: 2

Anderson-Darling Normality Test

A-Squared: 0.988
P-Value: 0.012

Mean 15.6471
StDev 2.9461
Variance 8.67954
Skewness -5.8E-01
Kurtosis 1.77867
N 68

Minimum 6.0000
1st Quartile 14.0000
Median 16.0000
3rd Quartile 17.0000
Maximum 23.0000

95% Confidence Interval for Mu

14.9339 16.3602

95% Confidence Interval for Sigma

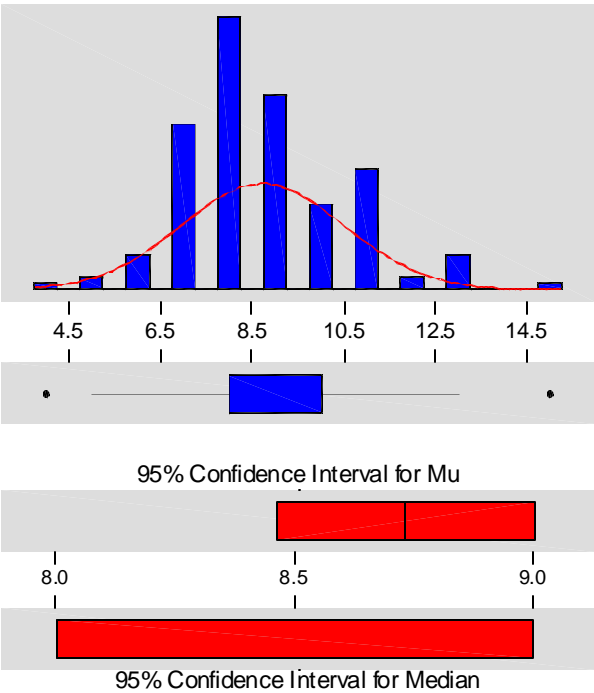
2.5207 3.5455

95% Confidence Interval for Median

15.0000 16.5213

1.1 KINESTHETIC LEARNING

Descriptive Statistics



Variable: KL
Choice: 1

Anderson-Darling Normality Test

A-Squared: 4.278
P-Value: 0.000

Mean 8.73333
StDev 1.76736
Variance 3.12358
Skewness 0.620472
Kurtosis 0.738225
N 165

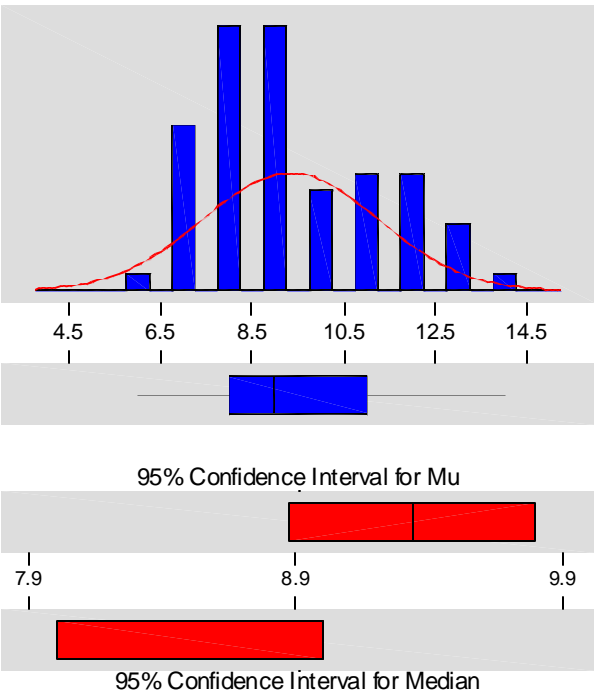
Minimum 4.0000
1st Quartile 8.0000
Median 8.0000
3rd Quartile 10.0000
Maximum 15.0000

95% Confidence Interval for Mu
8.4617 9.0050

95% Confidence Interval for Sigma
1.5950 1.9818

95% Confidence Interval for Median
8.0000 9.0000

Descriptive Statistics



Variable: KL
Choice: 2

Anderson-Darling Normality Test

A-Squared: 2.033
P-Value: 0.000

Mean 9.33824
StDev 1.90530
Variance 3.63016
Skewness 0.577110
Kurtosis -5.7E-01
N 68

Minimum 6.0000
1st Quartile 8.0000
Median 9.0000
3rd Quartile 11.0000
Maximum 14.0000

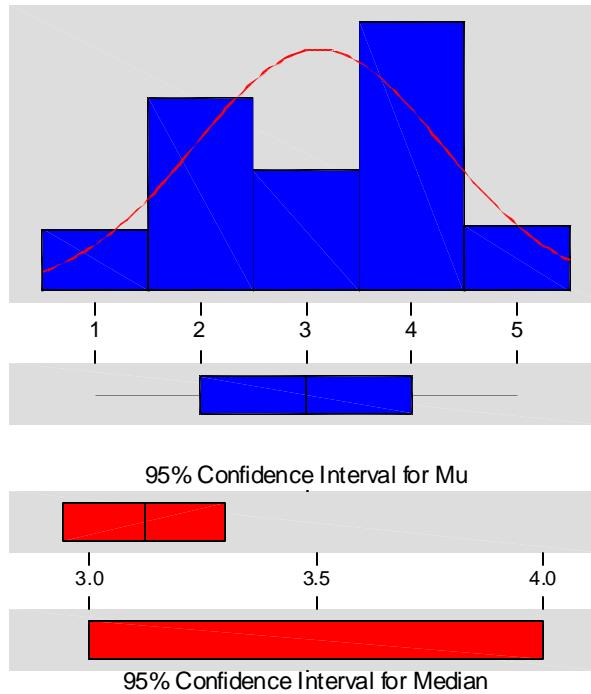
95% Confidence Interval for Mu
8.8771 9.7994

95% Confidence Interval for Sigma
1.6302 2.2929

95% Confidence Interval for Median
8.0000 9.0000

13.5 AUDITORY LEARNING

Descriptive Statistics



Variable: AL

Choice: 1

Anderson-Darling Normality Test

A-Squared: 8.450
P-Value: 0.000

Mean 3.12121
StDev 1.16236
Variance 1.35107
Skewness -2.2E-01
Kurtosis -1.04938
N 165

Minimum 1.00000
1st Quartile 2.00000
Median 3.00000
3rd Quartile 4.00000
Maximum 5.00000

95% Confidence Interval for Mu

2.94254 3.29989

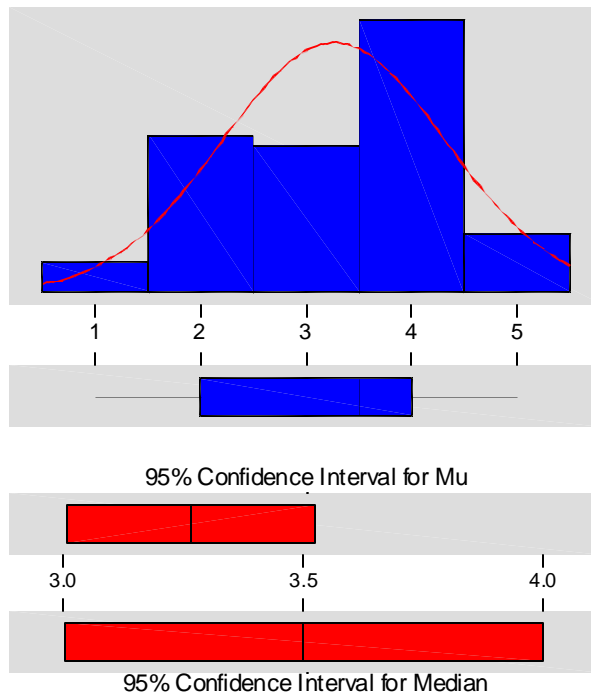
95% Confidence Interval for Sigma

1.04902 1.30336

95% Confidence Interval for Median

3.00000 4.00000

Descriptive Statistics



Variable: AL

Choice: 2

Anderson-Darling Normality Test

A-Squared: 3.629
P-Value: 0.000

Mean 3.26471
StDev 1.05968
Variance 1.12291
Skewness -3.2E-01
Kurtosis -7.8E-01
N 68

Minimum 1.00000
1st Quartile 2.00000
Median 3.50000
3rd Quartile 4.00000
Maximum 5.00000

95% Confidence Interval for Mu

3.00821 3.52120

95% Confidence Interval for Sigma

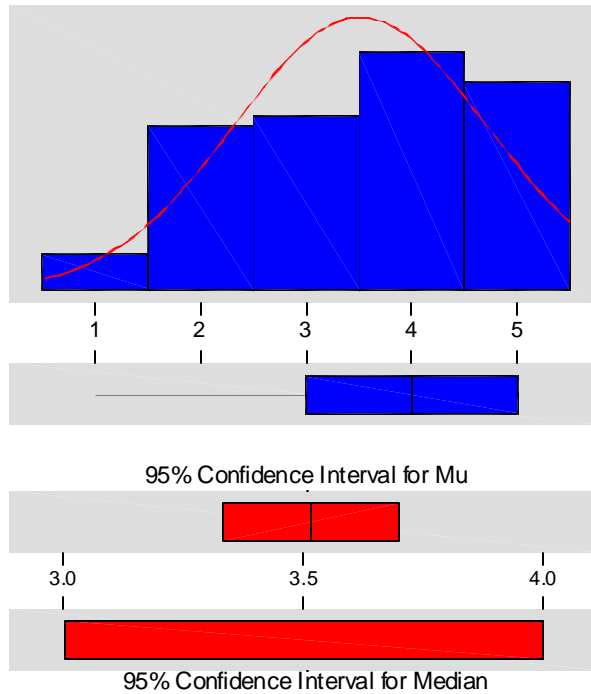
0.90668 1.27527

95% Confidence Interval for Median

3.00000 4.00000

13.6 INDIVIDUAL VERSUS GROUP LEARNING

Descriptive Statistics



Variable: IGP

Choice: 1

Anderson-Darling Normality Test

A-Squared: 6.790
P-Value: 0.000

Mean 3.51515
StDev 1.19249
Variance 1.42203
Skewness -3.2E-01
Kurtosis -9.8E-01
N 165

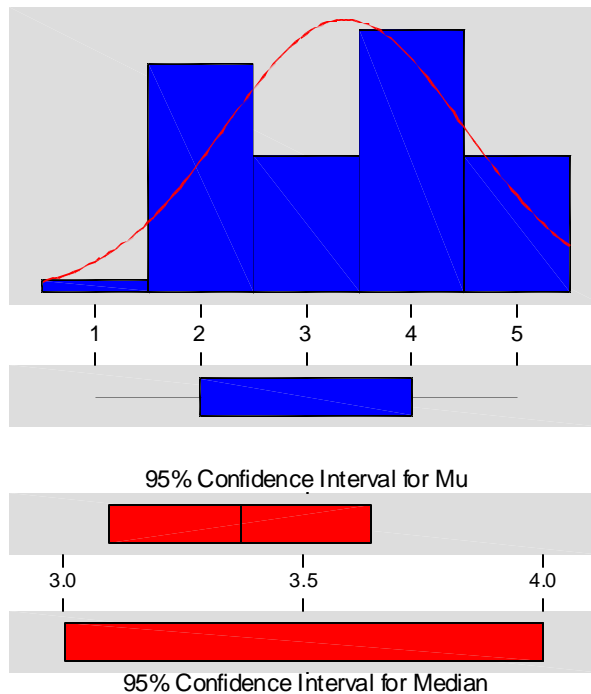
Minimum 1.00000
1st Quartile 3.00000
Median 4.00000
3rd Quartile 5.00000
Maximum 5.00000

95% Confidence Interval for Mu
3.33185 3.69846

95% Confidence Interval for Sigma
1.07621 1.33715

95% Confidence Interval for Median
3.00000 4.00000

Descriptive Statistics



Variable: IGP

Choice: 2

Anderson-Darling Normality Test

A-Squared: 3.574
P-Value: 0.000

Mean 3.36765
StDev 1.13169
Variance 1.28073
Skewness -7.4E-02
Kurtosis -1.24337
N 68

Minimum 1.00000
1st Quartile 2.00000
Median 4.00000
3rd Quartile 4.00000
Maximum 5.00000

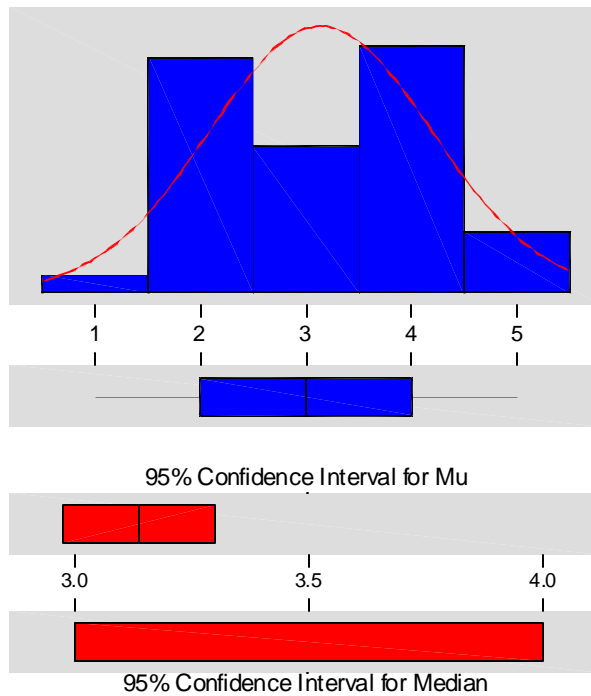
95% Confidence Interval for Mu
3.09372 3.64158

95% Confidence Interval for Sigma
0.96830 1.36194

95% Confidence Interval for Median
3.00000 4.00000

1.2 CONFLICT APPROACH-APPROACH

Descriptive Statistics



Variable: CApAp
Choice: 1

Anderson-Darling Normality Test

A-Squared: 9.654
P-Value: 0.000

Mean 3.13939
StDev 1.05285
Variance 1.10850
Skewness 3.45E-02
Kurtosis -1.11978
N 165

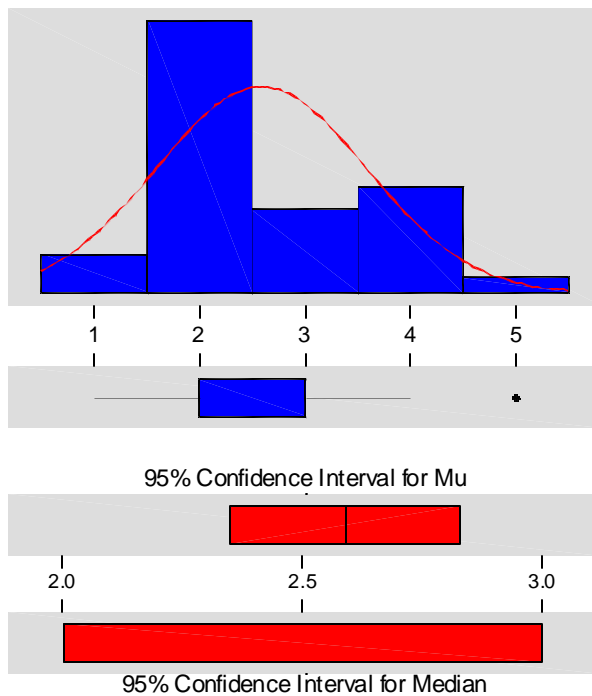
Minimum 1.00000
1st Quartile 2.00000
Median 3.00000
3rd Quartile 4.00000
Maximum 5.00000

95% Confidence Interval for Mu
2.97755 3.30124

95% Confidence Interval for Sigma
0.95019 1.18058

95% Confidence Interval for Median
3.00000 4.00000

Descriptive Statistics



Variable: CApAp
Choice: 2

Anderson-Darling Normality Test

A-Squared: 5.815
P-Value: 0.000

Mean 2.58824
StDev 0.99604
Variance 0.992098
Skewness 0.635824
Kurtosis -4.9E-01
N 68

Minimum 1.00000
1st Quartile 2.00000
Median 2.00000
3rd Quartile 3.00000
Maximum 5.00000

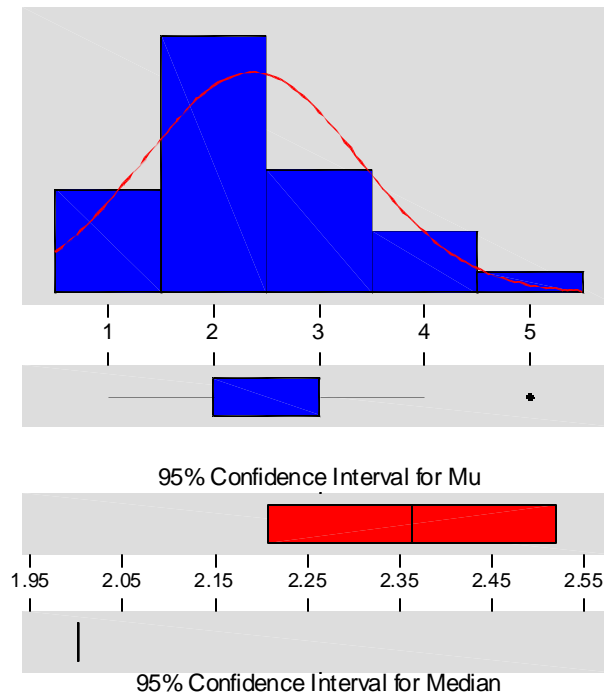
95% Confidence Interval for Mu
2.34714 2.82933

95% Confidence Interval for Sigma
0.85223 1.19869

95% Confidence Interval for Median
2.00000 3.00000

13.7 CONFLICT APPROACH-AVOID

Descriptive Statistics



Variable: CAPAv
Choice: 1

Anderson-Darling Normality Test

A-Squared: 8.966
P-Value: 0.000

Mean: 2.36364
StDev: 1.01867
Variance: 1.03769
Skewness: 0.691431
Kurtosis: 5.65E-02
N: 165

Minimum: 1.00000
1st Quartile: 2.00000
Median: 2.00000
3rd Quartile: 3.00000
Maximum: 5.00000

95% Confidence Interval for Mu

2.20705 2.52022

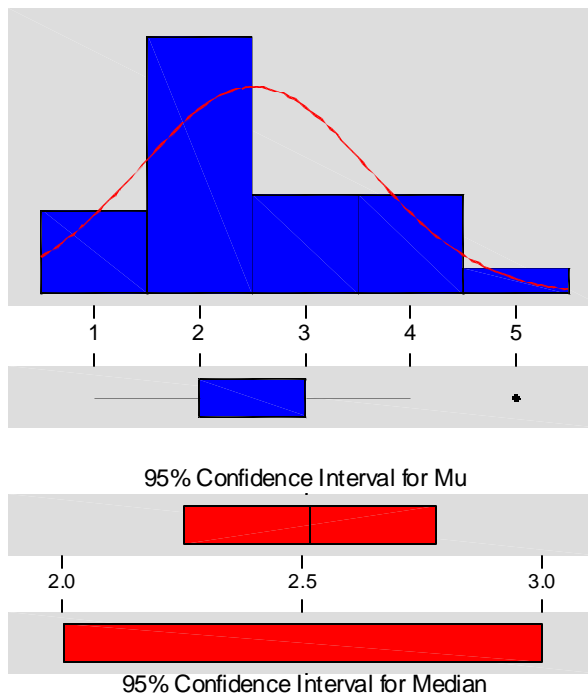
95% Confidence Interval for Sigma

0.91935 1.14225

95% Confidence Interval for Median

2.00000 2.00000

Descriptive Statistics



Variable: CAPAv
Choice: 2

Anderson-Darling Normality Test

A-Squared: 3.922
P-Value: 0.000

Mean: 2.51471
StDev: 1.08576
Variance: 1.17888
Skewness: 0.573844
Kurtosis: -4.6E-01
N: 68

Minimum: 1.00000
1st Quartile: 2.00000
Median: 2.00000
3rd Quartile: 3.00000
Maximum: 5.00000

95% Confidence Interval for Mu

2.25189 2.77752

95% Confidence Interval for Sigma

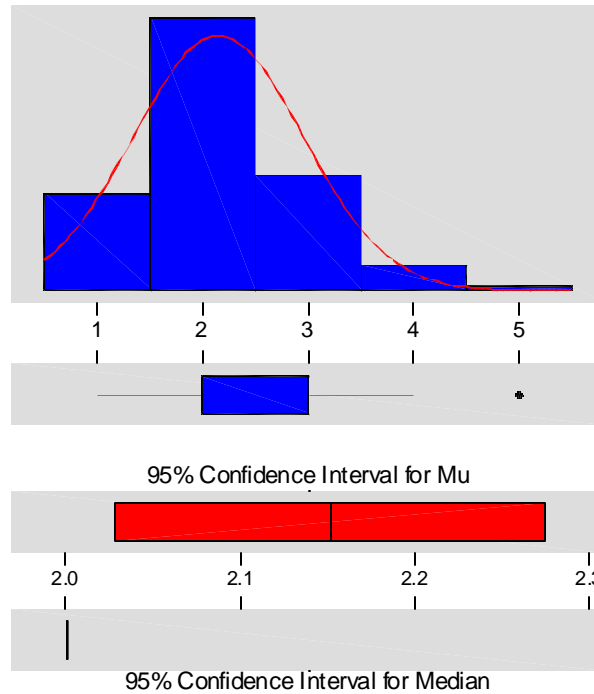
0.92900 1.30667

95% Confidence Interval for Median

2.00000 3.00000

13.8 CONFLICT AVOID-AVOID

Descriptive Statistics



Variable: CAVAv
Choice: 1

Anderson-Darling Normality Test

A-Squared: 11.945
P-Value: 0.000

Mean: 2.15152
StDev: 0.80096
Variance: 0.641537
Skewness: 0.583818
Kurtosis: 0.524408
N: 165

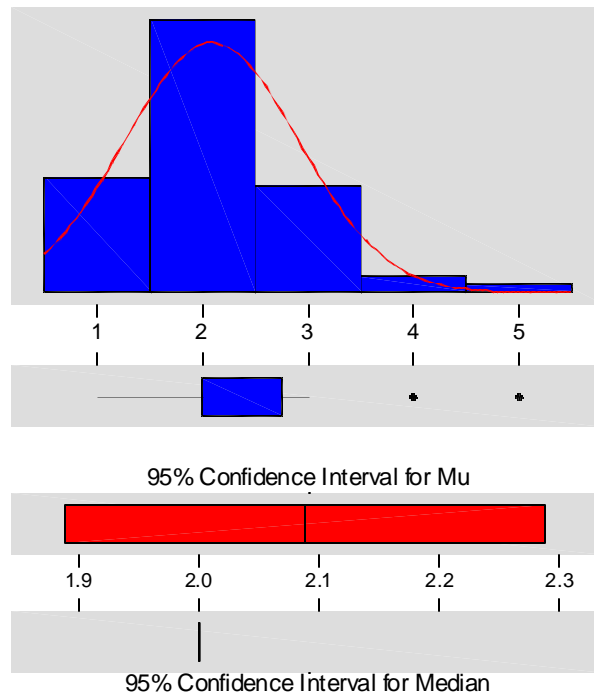
Minimum: 1.00000
1st Quartile: 2.00000
Median: 2.00000
3rd Quartile: 3.00000
Maximum: 5.00000

95% Confidence Interval for Mu
2.02839 2.27464

95% Confidence Interval for Sigma
0.72286 0.89813

95% Confidence Interval for Median
2.00000 2.00000

Descriptive Statistics



Variable: CAVAv
Choice: 2

Anderson-Darling Normality Test

A-Squared: 4.868
P-Value: 0.000

Mean: 2.08824
StDev: 0.82381
Variance: 0.678665
Skewness: 0.822856
Kurtosis: 1.44391
N: 68

Minimum: 1.00000
1st Quartile: 2.00000
Median: 2.00000
3rd Quartile: 2.75000
Maximum: 5.00000

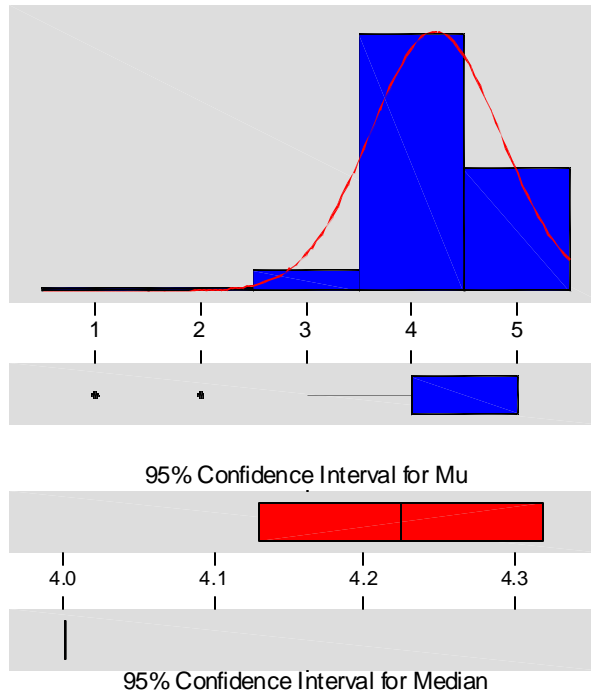
95% Confidence Interval for Mu
1.88883 2.28764

95% Confidence Interval for Sigma
0.70487 0.99142

95% Confidence Interval for Median
2.00000 2.00000

13.9 CONFLICT DOUBLE APPROACH

Descriptive Statistics



Variable: CDap
Choice: 1

Anderson-Darling Normality Test

A-Squared: 20.889
P-Value: 0.000

Mean 4.22424
StDev 0.61833
Variance 0.382336
Skewness -9.7E-01
Kurtosis 4.25172
N 165

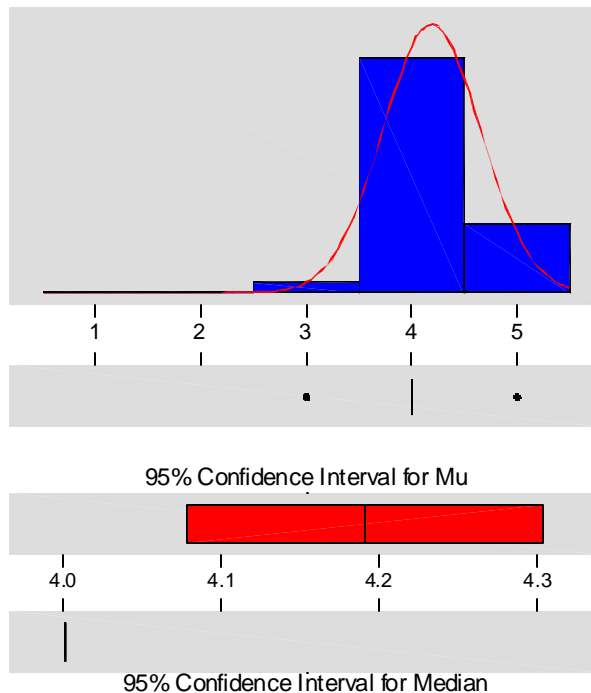
Minimum 1.00000
1st Quartile 4.00000
Median 4.00000
3rd Quartile 5.00000
Maximum 5.00000

95% Confidence Interval for Mu
4.12919 4.31929

95% Confidence Interval for Sigma
0.55804 0.69334

95% Confidence Interval for Median
4.00000 4.00000

Descriptive Statistics



Variable: CDap
Choice: 2

Anderson-Darling Normality Test

A-Squared: 13.734
P-Value: 0.000

Mean 4.19118
StDev 0.46544
Variance 0.216637
Skewness 0.640569
Kurtosis 0.517948
N 68

Minimum 3.00000
1st Quartile 4.00000
Median 4.00000
3rd Quartile 4.00000
Maximum 5.00000

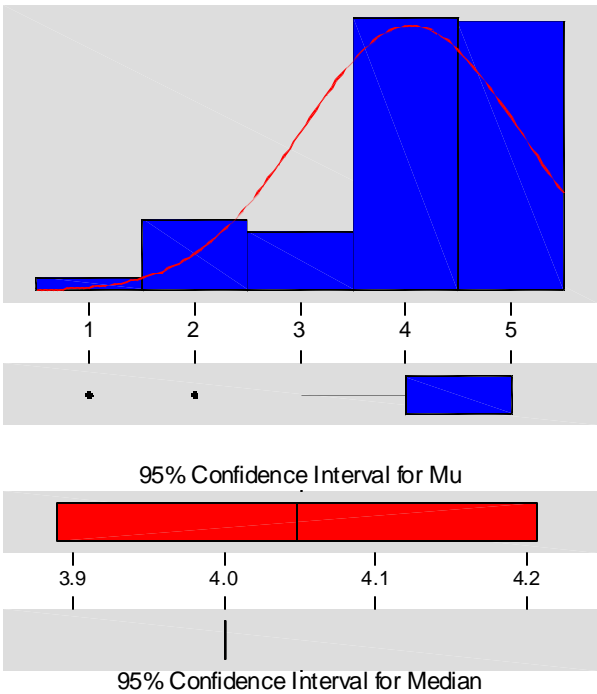
95% Confidence Interval for Mu
4.07852 4.30384

95% Confidence Interval for Sigma
0.39824 0.56014

95% Confidence Interval for Median
4.00000 4.00000

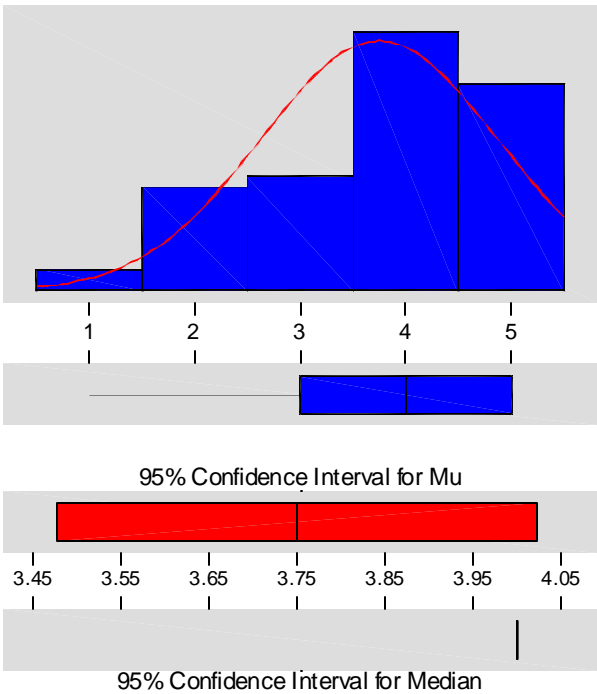
1.3 ATTITUDE TOWARDS BOOKS

Descriptive Statistics



Variable: AB	
Choice: 1	
Anderson-Darling Normality Test	
A-Squared:	12.831
P-Value:	0.000
Mean	4.04848
StDev	1.02889
Variance	1.05861
Skewness	-1.08392
Kurtosis	0.492293
N	165
Minimum	1.00000
1st Quartile	4.00000
Median	4.00000
3rd Quartile	5.00000
Maximum	5.00000
95% Confidence Interval for Mu	
3.89033	4.20664
95% Confidence Interval for Sigma	
0.92857	1.15370
95% Confidence Interval for Median	
4.00000	4.00000

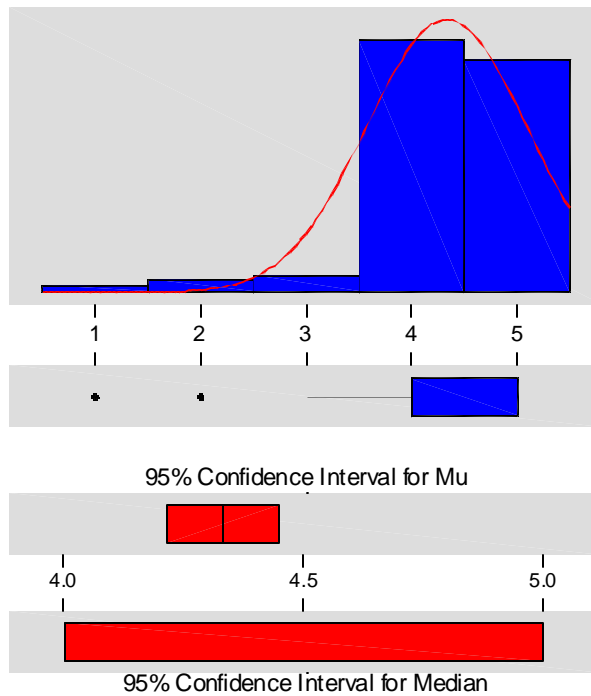
Descriptive Statistics



Variable: AB	
Choice: 2	
Anderson-Darling Normality Test	
A-Squared:	3.557
P-Value:	0.000
Mean	3.75000
StDev	1.12469
Variance	1.26493
Skewness	-6.5E-01
Kurtosis	-4.8E-01
N	68
Minimum	1.00000
1st Quartile	3.00000
Median	4.00000
3rd Quartile	5.00000
Maximum	5.00000
95% Confidence Interval for Mu	
3.47777	4.02223
95% Confidence Interval for Sigma	
0.96231	1.35351
95% Confidence Interval for Median	
4.00000	4.00000

13.10 ATTITUDE TOWARDS COMPUTERS

Descriptive Statistics



Variable: AC
Choice: 1

Anderson-Darling Normality Test

A-Squared: 17.086
P-Value: 0.000

Mean 4.33333
StDev 0.75976
Variance 0.577236
Skewness -1.65762
Kurtosis 4.47803
N 165

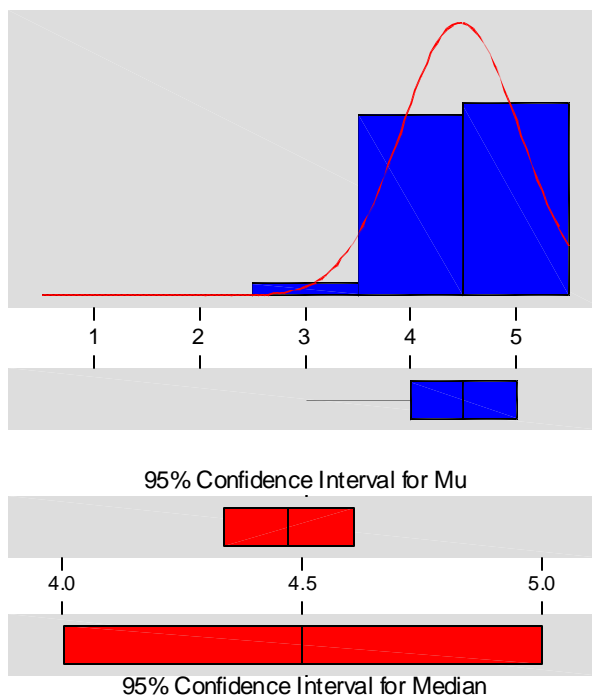
Minimum 1.00000
1st Quartile 4.00000
Median 4.00000
3rd Quartile 5.00000
Maximum 5.00000

95% Confidence Interval for Mu
4.21655 4.45012

95% Confidence Interval for Sigma
0.68568 0.85193

95% Confidence Interval for Median
4.00000 5.00000

Descriptive Statistics



Variable: AC
Choice: 2

Anderson-Darling Normality Test

A-Squared: 9.662
P-Value: 0.000

Mean 4.47059
StDev 0.55907
Variance 0.312555
Skewness -4.1E-01
Kurtosis -8.7E-01
N 68

Minimum 3.00000
1st Quartile 4.00000
Median 4.50000
3rd Quartile 5.00000
Maximum 5.00000

95% Confidence Interval for Mu
4.33527 4.60591

95% Confidence Interval for Sigma
0.47835 0.67281

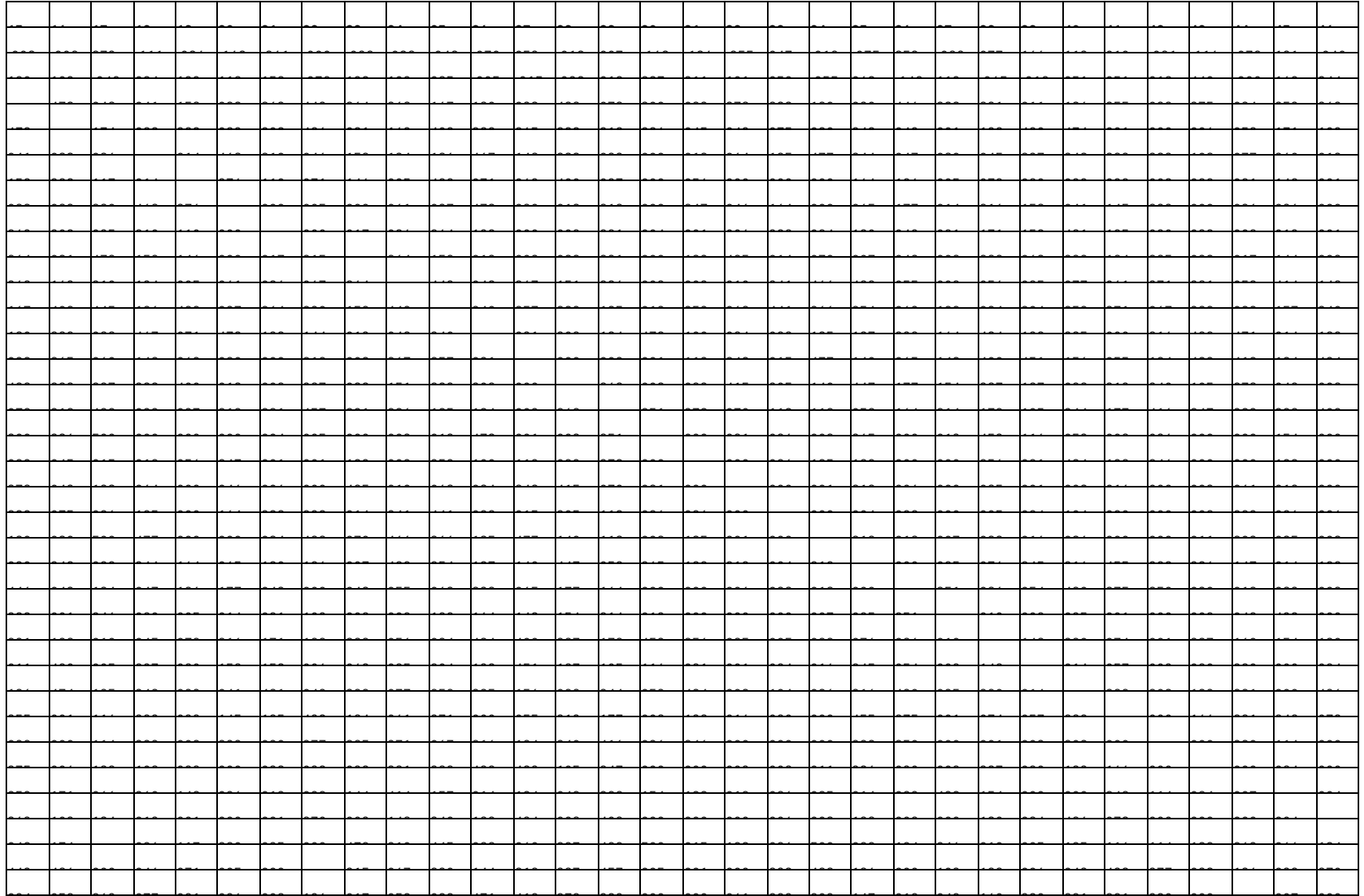
95% Confidence Interval for Median
4.00000 5.00000

14 FACTOR ANALYSIS

Statistical analysis in this section done utilizing Statistical Package for Social Sciences Version 11.5 for Windows

14.1 CORRELATION MATRIX(A)

This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are no margins, text, or other markings on the page.



14.2 KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.681
Bartlett's Test of Sphericity	Approx. Chi-Square	1355.256
	df	496
	Sig.	.000

14.3 COMMUNALITIES

	initial	Ext raction
V15	174	2.756E-02
V16	214	6.429E-02
V17	224	.220
V18	184	7.428E-02
V19	257	.163
V20	363	.184
V21	286	.164
V22	285	.266
V23	235	.103
V24	171	6.740E-02
V25	127	3.937E-02
V26	208	4.609E-02
V27	324	7.127E-02
V28	228	.107
V29	135	2.286E-02
V30	447	.408
V31	417	.348
V32	360	.364
V33	429	.422
V34	350	.237
V35	238	8.033E-02
V36	293	.207
V37	373	.324

V38	198	7	.12
V39	230	7	.20
V40	149	5	.15
V41	302	8	.14
V42	419	2	.37
V43	426	1	.30
V44	338	9	.26
V45	269	0	.28
V46	422	8	.38
Extraction Method: Principal Axis Factoring.			

1.4 TOTAL VARIANCE EXPLAINED

	Initial Eigenvalues				Extraction Sums of Squared Loadings				Rotation Sums of Squared Loadings			
	total	variance	%	Cu mulative%	total	Variance	% of Cu mulative%	T	total	% of Variance	Cu mulative%	
	.151	2.971	1	12.9	.438	5	10.74	45	.639	2	7	8.24
	.320	.249	7	20.2	.584		4.949	94	.234	2	2	6.98
	.033	.352	6	26.5	.237		3.866	60	.386	1	1	4.33
	.613	.042	5	31.6								
	.461	.564	4	36.1								
	.352	.225	4	40.4								
	.308	.089	4	44.4								
	.285	.014	4	48.5								
	.178	.681	3	52.1								
0	.090	.406	3	55.5								
1	.026	.206	3	58.8								
2	.008	.149	3	61.9								
3	.952	.976	2	64.9								
4	.924	.886	2	67.8								
5	.910	.845	2	70.6								
6	.843	.635	2	73.2								
7	.783	.448	2	75.7								
8	.777	.427	2	78.1								
9	.747	.335	2	80.5								
0	.644	.013	2	82.5								
1	.617	.929	1	84.4								
2	.597	.865	1	86.3								
3	.581	.815	1	88.1								
4	.535	.672	1	89.7								
5	.499	.560	1	91.3								
6	.482	.507	1	92.8								
7	.469	.467	1	94.3								
8	.422	.318	1	95.6								
9	.402	.257	1	96.9								
0	.378	.181	1	98.0								
1	.318	.995	.	99.0								
2	.295	.922	.	100.								

Extraction Method: Principal Axis Factoring.

14.4 FACTOR MATRIX(A)

	Factor		
	1	2	3
V15	8.260E-02	-7.863E-02	-.121
V16	.225	-4.812E-02	.106
V18	.186	.165	-.112
V19	.371	-.159	-6.835E-03
V20	.325	.222	.169
V21	.357	.192	1.021E-02
V23	.283	.110	.107
V24	.224	6.447E-02	-.115
V25	8.986E-03	.178	8.631E-02
V26	-.111	7.832E-02	-.166
V27	-.205	-4.018E-02	-.166
V28	-.175	-.183	-.205
V29	-6.408E-02	.136	1.598E-02
V30	.558	.308	4.845E-02
V31	.518	.230	-.164
V32	.511	-.271	-.172
V33	.446	-.432	.191
V34	.386	-.289	7.017E-02
V35	-1.425E-02	7.150E-02	-.274
V36	-.349	-.134	.259
V37	.506	-.251	6.558E-02
V38	8.361E-02	-.282	.201
V39	-.279	.175	.315
V40	-5.954E-02	.255	.294
V41	-.286	.249	-5.873E-02
V42	.447	-.388	.146
V43	.515	.177	6.686E-02
V45	1.167E-02	.355	.392
V46	.574	.219	.103
V47	-7.977E-02	-.118	.446
V48	-.274	-.132	.417
V49	.377	.356	6.176E-03
Extraction Method: Principal Axis Factoring.			
3 factors extracted. 5 iterations required.			

14.5 FACTOR TRANSFORMATION MATRIX

Factor	1	2	3
1	.757	.600	-.258
2	.636	-.768	.079
3	.151	.224	.963
Extraction Method: Principal Axis Factoring.			
Rotation Method: Varimax with Kaiser Normalization.			

15 RELIABILITY

15.1 RELIABILITY ANALYSIS - DECISION-MAKING

		Mean	Std Dev	Cases
1.	V20	3.7554	.8883	233.0
2.	V21	4.1931	.7777	233.0
3.	V23	3.9614	1.0640	233.0
4.	V30	4.3004	.6531	233.0
5.	V31	4.5279	.5496	233.0
6.	V43	4.2618	.6792	233.0
7.	V46	4.3176	.6839	233.0
8.	V49	4.3348	.7006	233.0

N of Cases = 233.0

Statistics for Mean Variance Std Dev Variables
Scale 33.6524 11.8829 3.4472 8

Item Means Mean Minimum Maximum Range Max/Min Variance
4.2065 3.7554 4.5279 .7725 1.2057 .0583

Inter-item

Correlations Mean Minimum Maximum Range Max/Min Variance
.2430 .0449 .4512 .4063 10.0400 .0126

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
V20	29.8970	9.1014	.3718	.2234	.6686
V21	29.4592	9.7322	.3186	.1569	.6788
V23	29.6910	8.9903	.2759	.1119	.7070
V30	29.3519	9.5049	.4846	.3026	.6453
V31	29.1245	10.2646	.3738	.2690	.6697
V43	29.3906	9.4977	.4596	.3370	.6491
V46	29.3348	9.2754	.5137	.3315	.6375
V49	29.3176	9.6056	.4113	.2578	.6585

Reliability Coefficients 8 items

Alpha = .6933 Standardized item alpha = .7197

15.2 RELIABILITY ANALYSIS - SOCIAL ENVIRONMENT

		Mean	Std Dev	Cases
1.	V36	1.8970	.7057	233.0
2.	V39	2.5622	.9545	233.0
3.	V40	3.6352	1.0297	233.0
4.	V45	3.9356	.8357	233.0
5.	V47	2.0000	.8857	233.0
6.	V48	2.1416	.8568	233.0

N of Cases = 233.0

Statistics for Mean Variance Std Dev Variables
Scale 16.1717 8.0652 2.8399 6

Item Means Mean Minimum Maximum Range Max/Min Variance
2.6953 1.8970 3.9356 2.0386 2.0747 .7734

Inter-item

Correlations Mean Minimum Maximum Range Max/Min Variance
.1455 .0133 .2726 .2593 20.4749 .0058

Item-total Statistics

	Scale Mean	Scale Variance	Corrected Item- Total	Squared	Alpha
--	---------------	-------------------	-----------------------------	---------	-------

	if Item Deleted	if Item Deleted	Total Correlation	Multiple Correlation	if Item Deleted
V36	14.2747	6.8897	.1829	.0747	.4901
V39	13.6094	5.7735	.3010	.1023	.4326
V40	12.5365	5.9739	.2048	.0671	.4913
V45	12.2361	6.1466	.2945	.1083	.4390
V47	14.1717	6.2032	.2442	.0919	.4637
V48	14.0300	5.9603	.3276	.1491	.4211

Reliability Coefficients 6 items

Alpha = .5027 Standardized item alpha = .5054

15.3 RELIABILITY ANALYSIS - SELF-CONCEPT

	Mean	Std Dev	Cases
1. V19	3.3519	1.1802	233.0
2. V32	3.4464	.9817	233.0
3. V33	3.0300	1.1832	233.0
4. V34	3.9185	.9726	233.0
5. V37	3.6781	.9305	233.0
6. V38	2.9185	1.0936	233.0
7. V42	3.7210	.9212	233.0

N of Cases = 233.0

Statistics for Mean Variance Std Dev Variables
Scale 24.0644 18.3708 4.2861 7

Item Means Mean Minimum Maximum Range Max/Min Variance
3.4378 2.9185 3.9185 1.0000 1.3426 .1354

Inter-item

Correlations Mean Minimum Maximum Range Max/Min Variance
.2405 .0903 .4199 .3297 4.6523 .0094

Item-total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Squared Multiple Correlation	Alpha if Item Deleted
V19	20.7124	14.0937	.3255	.1356	.6704
V32	20.6180	14.1250	.4448	.2392	.6351
V33	21.0343	12.5505	.5273	.3107	.6060
V34	20.1459	14.5648	.3853	.1917	.6507
V37	20.3863	14.4105	.4381	.2538	.6382
V38	21.1459	15.3062	.2184	.0587	.6969
V42	20.3433	14.4161	.4440	.2244	.6370

Reliability Coefficients 7 items

Alpha = .6832 Standardized item alpha = .6891

16 ONEWAY ANOVA

16.1 SOCIAL ENVIRONMENT

16.1.1 DESCRIPTIVES

		Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
.00	65	.3879	2.7753	.161	15.9613	16.8145	.00	.24
.00	8	.6471	2.9461	.573	14.9339	16.3602	.00	.23
total	33	.1717	2.8399	.861	15.8051	16.5382	.00	.24

16.1.2 TEST OF HOMOGENEITY OF VARIANCES

Levene Statistic	f1	f2	sig.
.040		31	.842

1.4.1 ANOVA

	Sum of Squares	f	Mean Square	F	sig.
Between Groups	26.428		26.428	.3093	.070
Within Groups	1844.705	31	7.986		
Total	1871.133	32			

1.5 SELF-CONCEPT

16.1.3 DESCRIPTIVES

		Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
.00	65	4.0364	4.3922	.419	23.3612	24.7115	.00	.34
.00	8	4.1324	4.0479	.909	23.1526	25.1121	.00	.30
total	33	4.0644	4.2861	.808	23.5111	24.6176	.00	.34

16.1.4 TEST OF HOMOGENEITY OF VARIANCES

Levene Statistic	f1	f2	sig.
.962			

		31	328
--	--	----	-----

16.1.5 ANOVA

	Sum of Squares	f	Mean Square		ig.
Between Groups	.444		.444	024	877
Within Groups	4261.591	31	18.448		
Total	4262.034	32			

1.6 OPTIMAL DECISION-MAKING

16.1.6 DESCRIPTIVES

		Mean	Standard Deviation	Standard Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
.00	65	9.7697	2.8125	.2190	29.3374	30.2020	.00	.35
.00	8	9.5000	3.4229	.4151	28.6715	30.3285	.00	.35
total	33	9.6910	2.9984	.1964	29.3040	30.0780	.00	.35

16.1.7 TEST OF HOMOGENEITY OF VARIANCES

Levene Statistic	f1	f2	sig.
3.639		31	.058

16.1.8 ANOVA

	Sum of Squares	df	Mean Square		sig.
Between Groups	3.503		3.503	.389	.534
Within Groups	2082.248	31	9.014		
Total	2085.751	32			

17 UNIVARIATE ANALYSIS OF VARIANCE

17.1 CHOICE AS INDEPENDENT VARIABLE

17.1.1 DESCRIPTIVE STATISTICS

Mean	Std. Deviation	
1.2918	.4556	33

17.1.2 TESTS OF BETWEEN-SUBJECTS EFFECTS

Source	Type III Sum of Squares	df	Mean Square		Sig.	Eta Squared
Corrected Model	.836(a)		.279	.349	259	.017
Intercept	4.974		4.974	4.072	.000	.095
SE	.728		.728	.521	.062	.015
SC	1.243E-03		1.243E-03	.006	.938	.000
ODM	.149		.149	.723	.396	.003
Error	47.318	29	.207			
Total	437.000	33				
Corrected Total	48.155	32				
R Squared = .017 (Adjusted R Squared = .004)						

17.1.3 PARAMETER ESTIMATES

	B	Std. Error		Sig.	95% Confidence Interval		Eta Squared
					Lower Bound	Upper Bound	
Intercept	1.868	.381	.906	.000	1.118	2.619	.095
SE	-.2012E-02	.011	1.876	.062	4.124E-02	1.007E-03	.015
SC	.5745E-04	.007	.078	.938	1.402E-02	1.517E-02	.000
ODM	-.8926E-03	.010	.850	.396	2.961E-02	1.175E-02	.003

17.1.4 GENERAL ESTIMABLE FUNCTION(A)

Parameter	Contrast			
	L1	L2	L3	L4
Intercept	1	0	0	0
SE	0	1	0	0
SC	0	0	1	0
ODM	0	0	0	1
Design: Intercept + SE + SC + ODM				

17.2 OPTIMAL DECISION-MAKING AS DEPENDANT VARIABLE

17.2.1 DESCRIPTIVE STATISTICS

C HOICE	n	Mea	Std. Deviation	
1. 00	97	29.76	2.8125	65
2. 00	00	29.50	3.4229	8
T otal	10	29.69	2.9984	33

1.6.1 TESTS OF BETWEEN-SUBJECTS EFFECTS

Source	Type III Sum of Squares	df	Mean Square		Sig.	Eta Squared
Corrected Model	215.929(a)		71.976	.815	.000	.104
Intercept	1982.582		1982.582	42.810	.000	.515
SE	13.002		13.002	.592	.208	.007
SC	174.856		174.856	1.415	.000	.086
CHOICE	5.906		5.906	.723	.396	.003
Error	1869.822	29	64.477			
Total	207488.000	33				
Corrected Total	2085.751	32				

R Squared = .104 (Adjusted R Squared = .092)

17.2.2 PARAMETER ESTIMATES

	B	Std. Error		Sig.	95% Confidence Interval		Eta Squared
					Lower Bound	Upper Bound	
Intercept	25.864	.171	5.423	.000	22.560	29.168	.509
SE	-.0008540E-02	.000068	1.262	.208	-.000219	.0004795	.007
SC	.000206	.000045	.628	.000	.000118	.000294	.086
[CHOICE = 1.00]	.000353	.000415	.850	.396	-.000464	.001170	.003
[CHOICE = 2.00]	.000(a)	.000			.000	.000	.000

a = This parameter is set to zero because it is redundant.

17.2.3 GENERAL ESTIMABLE FUNCTION(A)

Parameter	Contrast			
	L1	L2	L3	L4
Intercept	1.000	.000	.000	.000
SE	.000	1.000	.000	.000
SC	.000	.000	1.000	.000
[CHOICE = 1.00]	.000	.000	.000	1.000
[CHOICE = 2.00]	1.000	.000	.000	-1.000

Design: Intercept + SE + SC + CHOICE

18 GENERAL LINEAR MODEL

18.1 DESCRIPTIVE STATISTICS

	C HOICE	Mea n	Std. Deviation	
SE	1. 00	16.38 79	2.7753	65
	2. 00	15.64 71	2.9461	8
	T otal	16.17 17	2.8399	33
SC	1. 00	24.03 64	4.3922	65
	2. 00	24.13 24	4.0479	8
	T otal	24.06 44	4.2861	33
ODM	1. 00	29.76 97	2.8125	65
	2. 00	29.50 00	3.4229	8
	T otal	29.69 10	2.9984	33

18.2 BARTLETT'S TEST OF SPHERICITY(A)

Likelihood Ratio	.000
Approx. Chi-Square	82.387
df	5
Sig.	.000
Tests the null hypothesis that the residual covariance matrix is proportional to an identity matrix.	
Design: Intercept + CHOICE	

18.3 MULTIVARIATE TESTS(B)

Effect		alue	F	Hypot hesis df	E rror df	ig. ig.	Eta Squared
Intercept	Pillai's Trace	.993	10284 .729(a)	3.000	29.000	2 000	.993
	Wilks' Lambda	.007	10284 .729(a)	3.000	29.000	2 000	.993
	Hotelling's Trace	34.734	10284 .729(a)	3.000	29.000	2 000	.993
	Roy's Largest Root	34.734	10284 .729(a)	3.000	29.000	2 000	.993
	Pillai's Trace	.017	1.349 (a)	3.000	29.000	2 259	.017
CHOICE	Wilks' Lambda	.983	1.349 (a)	3.000	29.000	2 259	.017
	Hotelling's Trace	.018	1.349 (a)	3.000	29.000	2 259	.017
	Roy's Largest Root	.018	1.349 (a)	3.000	29.000	2 259	.017
a. Exact statistic							
Design: Intercept + CHOICE							

18.4 TESTS OF BETWEEN-SUBJECTS EFFECTS

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Corrected Model	SE	26.428(a)		26.428	3.070	.014	.0
	SC	.444(b)		.444	.0877	.000	.0
	ODM	3.503(c)		3.503	.3534	.02	.0
Intercept	SE	49417.947		49417.947	6188.277	.000	.9
	SC	111729.302		111729.302	6056.299	.000	.9
	ODM	169161.820		169161.820	18766.435	.000	.9
OICE	SE	26.428		26.428	3.070	.014	.0
	SC	.444		.444	.0877	.000	.0
	ODM	3.503		3.503	.3534	.02	.0
Error	SE	1844.705	31	86.6			
	SC	4261.591	31	144.8			
	ODM	2082.248	31	9.0			
Total	SE	62806.000	33				
	SC	139191.000	33				
	ODM	207488.000	33				

Corrected Total	SE	1871.133	32				
	SC	4262.034	32				
	ODM	2085.751	32				
R Squared = .014 (Adjusted R Squared = .010)							
R Squared = .000 (Adjusted R Squared = -.004)							
R Squared = .002 (Adjusted R Squared = -.003)							

18.5 PARAMETER ESTIMATES

Dependent Variable	Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Eta Squared
						Lower Bound	Upper Bound	
SE	Intercept	15.647	343	5.659	.000	14.972	16.322	.90
	[CH OICE=1.00]	.741	407	.819	.070	-6.154E-02	1.543	.01
	[CH OICE=2.00]	0(a)						

M	SC	Intercept	24.132	521	6.3314	000	.10623	.15925	3.90
		[CHOICE=1.00]	-9.599E-02	619	.155	877	1.316	1.124	.00
		[CHOICE=2.00]	0(a)						
	OD	Intercept	29.500	364	1.0248	000	.78328	.21730	6.96
		[CHOICE=1.00]	.270	433	623	534	.583	1.122	.00
		[CHOICE=2.00]	0(a)						

a = This parameter is set to zero because it is redundant.

18.6 GENERAL ESTIMABLE FUNCTION(A)

Parameter	Contrast	
	L1	L2
Intercept	1	0
[CHOICE = 1.00]	0	1
[CHOICE = 2.00]	1	-1
Design: Intercept + CHOICE		

18.7 TRANSFORMATION COEFFICIENTS (M MATRIX)

Dependent Variable	Transformed Variable		
	SE	SC	ODM
SE	1	0	0
SC	0	1	0
ODM	0	0	1

18.8 BETWEEN-SUBJECTS SSCP MATRIX

sis	Hypothe	pt	Interce	SE		SC		ODM		
				SE	947	49417.	4	74306.34	2	91431.01
				SC	344	74306.	02	111729.3	79	137478.4
	M	OD	012	91431.	79	137478.4	20	169161.8		
	CE	CHOI	SE		26.428		-3.424		9.621	
			SC		-3.424		.444		-1.247	
			M	OD		9.621		-1.247		3.503
Error			SE	05	1844.7		-513.151		-263.261	
			SC	513.151	-		4261.591		921.882	
			M	OD	263.261	-		921.882		2082.248
Based on Type III Sum of Squares										

18.9 RESIDUAL SSCP MATRIX

		SE	SC	ODM
Sum-of-Squares and Cross-Products	SE	705.1844	513.151	263.261

	SC	- 513.151	4261. 591	921.8 82
	ODM	- 263.261	921.8 82	2082. 248
Covariance	SE	7.986	- 2.221	- 1.140
	SC	- 2.221	18.44 8	3.991
	ODM	- 1.140	3.991	9.014
Correlation	SE	1.000	-.183	-.134
	SC	-.183	1.000	.309
	ODM	-.134	.309	1.000
Based on Type III Sum of Squares				

18.10 LACK OF FIT

18.10.1 MULTIVARIATE TESTS

Dependent Variables		Value		Hypothesis df	Error df	Significance	Total Squared
SE, SC, ODM	Pillai's Trace	.000		.000	.000		
	Wilks' Lambda	.000		.000	30.000		
	Hotelling's Trace	.000		.000	.000		
	Roy's Largest Root	.000	.000(a)	.000	28.000	.000	.000
	Pillai's Trace	.000		.000	.000		
SE, SC	Wilks' Lambda	.000		.000	30.500		
	Hotelling's Trace	.000		.000	.000		
	Roy's Largest Root	.000	.000(a)	.000	29.000	.000	.000
	Pillai's Trace	.000		.000	.000		
SE, ODM	Wilks' Lambda	.000		.000	30.500		
	Hotelling's Trace	.000		.000	.000		
	Roy's Largest Root	.000	.000(a)	.000	29.000	.000	.000
	Pillai's Trace	.000		.000	.000		
SC, ODM	Wilks' Lambda	.000		.000	30.500		
	Hotelling's Trace	.000		.000	.000		
	Roy's Largest Root	.000	.000(a)	.000	29.000	.000	.000
	Pillai's Trace	.000		.000	.000		
SE	Wilks' Lambda	.000		.000	31.000		
	Pillai's Trace	.000		.000	.000		

	Hotelling's Trace	.000		.000	.000	2		
	Roy's Largest Root	.000	.000(a)	.000	.000	1	30.000	.000
SC	Pillai's Trace	.000		.000	.000			
	Wilks' Lambda	.000		.000	.000	2	31.000	
	Hotelling's Trace	.000		.000	.000	2		
	Roy's Largest Root	.000	.000(a)	.000	.000	1	30.000	.000
ODM	Pillai's Trace	.000		.000	.000			
	Wilks' Lambda	.000		.000	.000	2	31.000	
	Hotelling's Trace	.000		.000	.000	2		
	Roy's Largest Root	.000	.000(a)	.000	.000	1	30.000	.000
	Pillai's Trace	.000		.000	.000			
	Wilks' Lambda	.000		.000	.000	2	31.000	
	Hotelling's Trace	.000		.000	.000	2		
	Roy's Largest Root	.000	.000(a)	.000	.000	1	30.000	.000
a = Exact statistic								

18.10.2 UNIVARIATE TESTS

Dependent Variable	Source	Sum of Squares	df	Mean Square		ig.	Eta Squared
SE	Lack of Fit	.000		.			.000
	Pure Error	1844.705	31	7.986			
SC	Lack of Fit	.000		.			.000
	Pure Error	4261.591	31	18.44	8		
ODM	Lack of Fit	.000		.			.000
	Pure Error	2082.248	31	9.014			

18.10.3 SSCP MATRIX

Lack of Fit	SE	.000	.000	.000
	SC	.000	.000	.000
	ODM	.000	.000	.000
Pure Error	SE	5	1844.70	513.151
	SC	513.151	1	4261.59
	ODM	263.261	921.882	8

19 CHI-SQUARE TESTS: PRINT-BASED GROUP VS. ON-LINE GROUP

All statistical analysis in this section done utilizing Analyse-It General and Clinical Laboratory Statistics version 1.65

19.1 PREVIOUS EXPERIENCE

Choice	Yes	No
Print-based	126 (116.1)	39 (48.9)
Online	38 (47.9)	30 (20.1)
Total	164	69
X²	8.73	
statistic p	0.0031	

Value in () indicate expected frequencies

19.2 COMPUTER EXPERIENCE

Choice	I seldom or never use computers	I occasionally use computers	I frequently use computers
Print-based	2 (1.4)	6 (6.4)	157 (157.2)
Online	0 (0.6)	3 (2.6)	65 (64.8)
Total	2	9	222
X²	0.90		
statistic p	0.6376		

19.3 TIME RESPONSIBILITIES

Choice	Full-time work	Part-time work	Family	Other or Combination
Print-based	85 (89.9)	11 (10.6)	12 (9.9)	57 (54.5)
Online	42 (37.1)	4 (4.4)	2 (4.1)	20 (22.5)
Total	127	15	14	77
X²	2.86			
statistic p	0.4134			

19.4 DISTANCE FROM EDUCATIONAL INSTITUTION

Choice	Less than 10 km	10 - 20 km	21 - 30 km	31 - 40 km	41 - 50 km	more than 50 km
Print-based	16 (14.9)	39 (35.4)	12 (10.6)	17 (16.3)	22 (18.4)	59 (63.7)
Online	5 (6.1)	11 (10.6)	11 (10.7)	6 (6.7)	4 (7.6)	31 (26.3)
Total	21	50	23	23	26	90

X²	9.12
statistic	
p	0.1045

19.5 MODE OF TRANSPORT

Choice	Own	Public	Car	Other
	vehicle	Transport	pooling	
Print-based	129	24	5	7
	(125.3)	(27.6)	(5.0)	(7.1)
Online	48	15	2	3
	(51.7)	(11.4)	(2.0)	(2.9)
Total	177	39	7	10
X²	1.99			
statistic				
p	0.5736			

19.6 COMPUTER ACCESS

Choice	I have no	I access a	I access a	I access a	ther
	access to a	computer at home	computer at work	computer at home	
	computer			and at work	
Print-based	0	22	36	102	5.7)
	(0.7)	(20.5)	(36.1)	(102.0)	
Online	1	7	15	42	2.3)
	(0.3)	(8.5)	(14.9)	(42.0)	
Total	1	29	51	144	
X²	3.05				
statistic					
p	0.5490				

19.7 INTERNET ACCESS

Choice	I have no	I access	I access	I access	ther
	access to the	the Internet from	the Internet from	the Internet from	
	Internet	home	work	home and work	
Print-based	5	23	72	58	8.5)
	(4.2)	(22.7)	(69.4)	(60.2)	
Online	1	9	26	27	3.5)
	(1.8)	(9.3)	(28.6)	(24.8)	
Total	6	32	98	85	2
X²	1.98				
statistic					
p	0.7386				

20 HYPOTHESIS TESTS

20.1 GROUP STATISTICS

	C		Mea	Std. Deviation	Std. Error Mean
HOICE	n				
SE	10	65	879 16.3	2.7753	.2161
	20	8	471 15.6	2.9461	.3573
SC	10	65	364 24.0	4.3922	.3419
	20	8	324 24.1	4.0479	.4909
ODM	10	65	697 29.7	2.8125	.2190
	20	8	000 29.5	3.4229	.4151

20.2 INDEPENDENT SAMPLES TEST

		Levene's Test for Equality of Variances		t-test for Equality of Means						
			ig.		f	ig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SE	Equal variances assumed	.040	.842	.819	31	.070	.08	.74	6.1539E-02	.5432
	Equal variances not assumed			.774	18.493	.079	.08	.74	8.5943E-02	.5676
SC	Equal variances assumed	.962	.328	.155	31	.877	9.5989E-02	.190	1.3155	.1235
	Equal variances not assumed			.160	34.825	.873	9.5989E-02	.982	1.2791	.0871
ODM	Equal variances assumed	.639	.058	.623	31	.534	.97	.26	.5828	.1222
	Equal variances not assumed			.575	06.114	.567	.97	.26	.6607	.2001

21 VIDEO CONFERENCING CHANGING HEALTHCARE

From the NASHVILLE MEDICAL NEWS

April, 1999

The distance between Brentwood, TN and Assen, The Netherlands has become much shorter for Cytometry Associates, Inc.

The worldwide laboratory group uses video/data conferencing to collaborate on analysis of tissue samples on a real time basis between the two sites. According to Greg Stelzer, Ph. D., chief scientific officer of Cytometry, the cutting edge technology has many advantages.

"In the pharmaceutical and clinical trial support of our business, each project is very different. This requires significant training and data analysis," said Dr. Stelzer. "A 45-minute conference allows us to discuss the data analysis face-to-face. Since the software is live on the screen, we have the ability to demonstrate and interact from either side."

Along with the increased training capabilities, there is tremendous savings in international travel costs and personnel time to update employees, share expertise, and maintain administrative functions, added Dr. Stelzer.

The push for the advanced technology comes from Continuous Presence, a Nashville-based firm that began two years ago. Continuous Presence provides the video conferencing hardware, software, and support using Intel video conferencing products. Its entire package includes consulting with clients for their video conferencing needs, coordinating with the local telephone company, and providing a fully integrated personal computer (PC) with video conferencing, hardware maintenance, and software support.

Founder and CEO Jeff Williams said that Continuous Presence has more than 250 systems in use throughout the U.S. and Canada as well as in The Netherlands and Germany. Clients range from industries including hospital management firms, bio-pharmaceuticals, automotive suppliers, financial services, and software companies.

Williams noted that the functionality of video/data conferencing took several giant leaps forward when Intel added simultaneous, interactive data sharing technology. The ability to use any Windows-based or Windows-emulated program during a conference provided all of the tools of the PC for application in a conference call. *"With the click of a button, two separate workplaces can come closer together,"* said Williams.

According to Mike Wales, general manager at Continuous Presence, video/data conferencing is very fast because the data is not going back and forth. It's more like having the two sites sharing the same PC.

"As a trainer, it gives you the ability to look at the same thing and see on someone's face if they are really grasping what's going on," said Wales. *"In addition, I can see every keystroke that is made. I can follow every move or take control of the system and let the student watch."*

John Doss, executive vice president of Healthcare Management Systems, Inc., uses the conferencing system for initial and ongoing training of hospital personnel. *"Seventy-five percent of our clients are in a one-*

to-three hour radius of a metropolitan area. Travel costs can be high, and once you get there, the cheapest thing to do is stay all week."

With video/data conferencing, Doss can do the same types of training over a two-day period in shorter sessions. Overall, it allows for more frequent contact at a fraction of the cost while reducing or eliminating travel costs associated with training. Doss likes the ability to share the keyboard between sites to link the two computers. The system also gives his clients an opportunity to learn tasks without necessarily meeting the prerequisite of having computer files built.

"It's much more effective than training by phone and less expensive than being there in person," added Doss.

By S. Lynn Maxwell (<http://www.continuouspresence.com/news/index.html>, 5/02/2003, 16H39)