Dissertation presented towards the completion of a Masters in Social Science

Political Studies Department

University of Cape Town

The Politics of Technology in Higher Learning: The Role of Information Technology in the Transformation of Higher Education in South Africa

By Franz Rodenacker

Student Number: RDNFRA001

Supervisor: Mary Simons

(Political Studies Department, UCT)

August 1998

Abstract

The objective of this research is to investigate the effects of the increasing use of IT for learning in HE generally, and with respect to the aims for the transformation of HE in South Africa specifically. This informs the formulation of principles for a socially-compatible implementation and use of IT in HE in SA. The central question guiding this research is what are likely effects of the increasing use of IT in HE, and how they relate to the aims for HE as set out by South African policy makers.

This objective is achieved through a review of the theoretical work pertaining to the relationship between technology and society; an examination of the arguments for IT brought forwards by proponents; a thorough examination and critique of IT by use of writings of substántivist, educationalists and educational technology experts; and by an examination of the aims for HE as formulated by South African policy makers, the reasons for the use of IT in South Africa and a comparison of these factors with social realities. The social realities of interest are the poor preparation of some South Africans for HE and the inequitable access structures to IT and telecommunications in particular.

The research argument is that the reasons for the use of IT in HE are significant indicators for potential effects of IT on HE. The motivations for the use of IT are closely related to the financial pressures that the expansion of HE exerts on the government and institutions for higher learning alike. IT is seen as the means of easing these financial pressures by increasing the economic efficiency and effectiveness of HE. This thesis argues that HE-institutions may thus place greater emphasis on their economic efficiency and financial effectiveness, and suggests that this may be to the detriment of objectives that are not directly economically significant. The integration of IT into South African HE-institutions thus has the potential to have significant adverse effects on some of the aims and goals of transformation of HE in SA.

This thesis is based on a thorough examination of the literature on IT in its application for learning in HE, supported by an in-depth interview and frequent participation in electronic discussion forums. Data collection involved library searches, e-mail links, an interview and Internet searches.

Acknowledgements

I would like to thank my supervisor, Mary Simons for all her time and effort. I also wish to thank the Political Studies Department at the University of Cape Town for allowing me to pursue this research and for providing me with assistance. Furthermore I wish to thank Dena Lomofsky and Mandy Barnett whose help were absolutely indispensable. Many thanks also to my parents for supporting me so unconditionally throughout my entire studies. This thesis would further not have been possible without the help of my friends in Cape Town who gave me support and lent me their ears.

Table of contents

INTRODUCTION **1**

RESEARCH OBJECTIVE 1
IDEAS GUIDING THE RESEARCH 2
METHODOLOGY 2
CHAPTER OUTLINE 4

CHAPTER 1: THEORIES ON TECHNOLOGY AND SOCIETY **6**

1.1 CLARIFICATION OF TERMS 6
1.1.1 Theories *6*
1.1.2 Defining technology *7*
1.2 THE NEUTRALITY DEBATE 9
1.2.1 Technology is neutral *9*
1.2.2 Technology is not entirely neutral *11*
1.2.3 Technology is not neutral *12*
1.2.4 The imperative of technology *15*
1.3 DETERMINISM 17
1.3.1 Technological determinism and substantivism *17*
1.3.2 Socio-cultural determinism *27*
1.3.3 Criticisms of instrumental approaches *29*
1.4 CONSTRUCTIVISM 30
1.5 DISCUSSION 34
1.5.1 The neutrality and the non-neutrality of technology *34*
1.5.2 The dialectic relationship between technology and society *35*
1.5.3 Criticisms of technology and of the social organisation *37*
1.5.4 Weak determinism *38*

CHAPTER 2: TECHNOLOGICAL DETERMINISM AND THE PROMISE OF INFORMATION TECHNOLOGY **40**

2.1 THE INFORMATION REVOLUTION 40
2.1.1 The political economy of IT *42*
2.1.2 The economics of information *45*
2.1.3 Services and the economic opportunities for the third world *46*
2.1.4 Urgency of change *48*
2.2 THE LEARNING SOCIETY AND LIFELONG LEARNING 49
2.2.1 New paradigm of learning *49*
2.2.2 New skills *50*
2.2.3 Expanding access to education *51*
2.2.4 IT and access to HE *52*
2.2.5 African Virtual University *55*
2.3 DISCUSSION 59

CHAPTER 3: SUBSTANTIVE IMPACTS OF INFORMATION TECHNOLOGY IN HIGHER EDUCATION **61**

3.1 THE CONTENT OF IT-FACILITATED HE 62
3.1.1 Information and knowledge *62*
3.1.2 Knowledge and the 'second-order character' of academic knowledge *64*
3.1.3 Learning, dialogue and critical thinking *65*
3.1.4 Information-rich learning and Information Literacy *69*
3.1.5 Fragmenting information *70*
3.1.6 IT-facilitated skills *72*
3.2 IT AND THE FORM OF HE 75
3.2.1 The relationship between the form and the content of IT-facilitated HE *75*
3.2.2 Communication, IT and DE *77*
3.2.3 The cost of education and DE *79*
3.3 THE COMMODIFICATION OF HE 83
3.3.1 Cost of IT *83*
3.3.2 Educational technology and the commodification of higher learning *86*
3.3.3. Skills for industry *87*
3.3.4 Higher Education and the performance principle *90*
3.3.5 IT, economic progress and global inequality *91*
3.4 DISCUSSION 94

CHAPTER 4: SOUTH AFRICAN HIGHER EDUCATION IN CRISIS **97**

4.1 SOUTH AFRICAN POLICY APPROACHES 97
4.1.1 Theoretical approaches to IT in SA *97*

4.1.2 Aims and goals of South African HE-policy *99*
4.1.3 The dilemma of HE *105*
4.2 INEQUITABLE ACCESS TO TECHNOLOGY 116
4.2.1 Cost of IT *116*
4.2.2 Public access facilities *122*
4.3 DISCUSSION 125

CHAPTER 5: CONCLUSIONS 129

5.1 THEORETICAL CONCLUSIONS 129
5.2 GENERAL CONCLUSIONS 130
5.3 CONCLUSIONS FOR SA 132
5.4 FURTHER RESEARCH 133

APPENDIX I

LIST OF APPENDICES: I
LIST OF ABBREVIATIONS: II
BIBLIOGRAPHY IV

Introduction

The study of the relationship between technology and society is a field that is gaining popularity as technologies of all kinds are increasingly being used in society. While this field is not new, in Political Science its status frequently does not coincide with its relevance to political questions. When concerned with technology, political scientists are most frequently occupied with the important political problem of the diffusion and accessibility of technology. However, other questions of political relevance can also be found in the structure of technology itself as well as in the purpose it serves. This thesis contributes to the discussion on the political relevance of Information Technology (IT) in its application in higher education (HE). It focuses on its increasing use in institutions for higher learning in South Africa (SA) in particular. Within this focus, it is necessary to carefully and thoroughly consider the reasons for the use of IT. This consideration should entail an understanding that there are grave contradictions between some educational, social and political aims and goals for HE, and some effects of the use of IT, particularly when employed to reduce the cost of HE.

Research objective

IT is presently frequently believed to represent an opportunity for countries to achieve more equity of access to HE; increase the internal and external efficiencies of HE institutions; and enhance the quality of learning alike. These factors are believed to advance countries socially and economically. The objective of this thesis is to examine the role of IT in relation to the aims and goals of the Government of SA for the transformation of HE. The **key issues** that have been identified are *equity of access*, *massification*, the *mismatch* between the output of HE institutions and the needs of the economy as well as financial constraints of HE-institutions and the government. The **central question** posed in this thesis is:

> *what are likely effects of the increasing use of IT in HE, and how do they relate to the aims for HE as set out by South African policy makers?*

In order to address this question, this thesis entails: (a) a theoretical review of the relationship between technology and society; (b) a review of the benefits and opportunities which proponents associate with a greater reliance of HE on IT; (c) a substantive critique of IT in its application in HE; and (d) a comparison of aims, goals and social realities of South African society with particular effects of IT in its application in HE. The aim of this thesis is, however, not to recommend particular technologies for the facilitation of higher learning or to devise a new

rationality for the development of IT. *The aim is to identify principles that can assist in assessing appropriate social responses to the challenges and pitfalls of an increasing reliance of HE on IT.*

Ideas guiding the research

This thesis argues that the effects of IT in HE extend beyond its potential and applications in higher learning. It further argues that the reasons for the use of IT in HE are significant indicators for potential effects of IT on the human experience of learning. This thesis asserts that, due to these reasons, the integration of IT into South African HE-institutions has the potential to have significant adverse effects on the aims and goals of transformation.

Methodology

The utilisation of IT for the facilitation of more access to HE is a relatively new development. In the context of SA there is a small body of empirical research relating to the role of IT in the transformation of HE. Therefore, it was necessary to access international literature and develop a variety of innovative ways of accessing information on this topic. The primary research method for this thesis was a literature survey, supported by an in-depth interview and participation in electronic discussion forums. Data collection involved library searches, e-mail links, a personal interview, Internet searches and "snowballing" techniques, i.e. the search for literature by use of references, to gather information.

Libraries were one of the main sources of information for this thesis. A number of libraries at the University of Cape Town, for example Jagger library, the Architecture library and the African Studies library were used. Other South African university libraries were also accessed by use of interlibrary loans. For the empirical section of this thesis, the holdings of these libraries were significant. Furthermore, being of German origin and having studied at the Freie Universität Berlin, it was possible to access the Staatsbibliothek Berlin and the University Library of the Freie Universität Berlin on a recent visit to Berlin. The material accessed here was an important addition to the theoretical discussion of the relationship between technology and society.

The Internet was an important source of material. It provided access to a number of publications which would either not have been easily accessible or which would not have been available at all using the libraries. These include some unpublished documents[1], electronic journals, web sites and electronic books. This was the case for publications of international organisations, such as the

United Nations and the World Bank. The Internet further provided access to national and international experts of technology and education via email. It provided valuable forums for the discussion and debate of various issues relating to this thesis, such as technology, education, and economic and social development.

One significant *limitation* of the Internet should be noted, namely the large percentage of uncritical publications pertaining to IT found here. Apart from few exceptions, web sites, electronic books and discussion forums were dominated by IT enthusiasts and few critical voices could be heard. Critical contributions were most frequently concerned about the diffusion of technologies and access to them, rather than about ideological aspects of technology in general and IT in particular.

Of practical assistance was the possibility to download some publications in electronic format in addition to having access to them in paper format, because electronic documents can be searched by keywords. This process simplifies the search for references and quotes in particular. Electronic publications, however, firstly had to be printed in order to be properly read. The printing of documents has been found to be expensive. Internet searches furthermore required a great deal of expertise in IT and network technologies. They were generally time consuming, particularly when accessed through UCT's electronic network. Private access, although faster, was also expensive.

Electronic sources are referenced according to the style used by the writing centre at the University of Cape Town (UCT). This style prescribes the provision of access dates for electronic sources in the bibliography, it does, however, not prescribe the provision of page numbers for the referencing of electronically accessed materials. In spite of this recommendation, this thesis has, however, referred to particular page numbers or section numbers for those electronic documents that provided them.[2]

The theoretical section of this thesis serves as a literature review of the theoretical approaches and debates relating to the relationship between technology and society. There is a marked silence from South African writings in this field. This thesis relies on a great deal of international literature on this topic in Political Science, Sociology and Philosophy. Most of this material was accessible through libraries, some of it was also accessible through the Internet.

---

[1]See: UCT, 1997; Shutte, 1996; Feenberg, forthcoming.
[2]Acrobat reader documents (.pdf), for example, is an electronic format which has a pre-set pagination.

South African libraries had few publications from international organisations, such as the World Bank, the United Nations and the International Telecommunications Union in this field. The second chapter of this thesis is, consequently, mostly based on electronically accessed materials, such as web sites, electronic books and Journals.

The critical examination of IT in HE is based on international publications by substantivist theorists and educational technology experts as well as international and South African educationalists. Most of their writings were available in South African libraries, some of them were also found on the Internet.

An extensive range of publications of the South African government, governmental departments and authoritative bodies were available via the Internet. All major policy documents, many papers of South African government departments and a number of publications by national commissions were available in electronic formats.[3] Furthermore, the National Commission for Higher Education (NCHE) provides a searchable database with all submissions, discussion documents, responses, press releases, report papers, interim report, final reports of task groups, minutes and the final report of the NCHE.[4] The examination of SA is based on the electronic as well as a number of paper-based publications by South African educationalists and educational technology experts.

Chapter outline

Chapter one reviews theoretical work pertaining to the relationship between technology and society. *Firstly*, the debate around the neutrality of technology is examined. Secondly, theories on the relationship between technology and society are assessed and discussed.

Chapter two examines the Information Revolution and Learning Society concepts in relation to HE and IT. Furthermore, this chapter assesses the project of the African Virtual University (AVU) as advanced by the World Bank. The various social and economic benefits which proponents associate with the increasing diffusion of IT in society are central issues in this chapter.

Chapter three consists of a substantive critique of technology in its increasing application in HE, supported by writings of educationalists and educational technology experts. This critique is

---

[3]See, for example, the SA Governmental Web Site (http://www.polity.org.za/lists/govsites.html), the Telecommunication-Enhanced Learning Investigation (TELI) (http://teli.mikom.csir.za) and the National Commission for Higher Education (NCHE) (http://www.hsrc.ac.za/nche.html).
[4]Available at: http://star.hsrc.ac.za/nchesearch

conducted on two levels, a micro-level and a macro-level. On the micro-level, the limitations of the artefacts themselves are addressed and related to higher learning. The marco-level consists of a discussion of systemic effects of IT, meaning effects on the social organisation of HE. The application of the performance principle to HE and a possible commodification of higher learning are central issues in this section.

Chapter four examines the aims and goals of the SA Government policies for the transformation of HE and the role of IT therein. The foci of this chapter are those of equity of access to HE; massification of HE; the purpose of HE in terms of educational objectives; the use of IT to facilitate access to higher learning; and, finally, the social realities which produce, in particular, inequitable access to IT.

Chapter five, the conclusions, summarise the key findings of this thesis, formulates principles for the socially-compatible integration of IT in HE and recommends criteria for the assessment of IT in HE.

Chapter 1: Theories on Technology and Society

In order to evaluate the implications of the increasing employment of Information Technology (IT) in higher education in particular, it appears necessary to examine the different theories and debates on the relationship between technology and society. The discussion of these theories allows the identification of the relevant factors concerning the use of IT, within the context of facilitating more equitable access to higher education in South Africa. The main theories this chapter places focus upon are technological determinism, socio-cultural determinism and constructivism. The main philosophical debate discussed in this section is the debate on the neutrality of technology, because it defines the most fundamental oppositional perspectives on the nature of technology and its alleged effects.

1.1 Clarification of terms

In order to be comprehensible, it is necessary to define the terms and concepts this thesis fundamentally relies upon. These terms and concepts are consequently defined below.

1.1.1 Theories

Analysts are unclear about the terms they use to describe the theories on the relationship between technology and society. They either ascribe different meanings to the same terms or employ different terms to explain similar concepts. The differences in terminology be confusing and a clear definition for the terms used in this thesis is thus necessary.

Theories on the relationship between technology and society can be divided into two major categories, namely those that emphasise the influence of technologies and those that place a greater emphasis on the influence of society. Theories that highlight the leading role of technologies in social change have been called *technological determinism* (Marx & Smith, 1994: ix; Chandler, 1996; Chandler, 1995; MacKenzie and Wajcman, 1993: 4-5). Technological determinism has been described as the most influential theory on the relation between technology and society (MacKenzie et al, 1993: 4). It has various facets and comes in differing extremes that will be explained in greater detail below.

Theories which place emphasis on the leading influence of society in determining social change mainly focus on two different aspects, namely the social system into which technology is integrated on the one hand and the social influence on the development and production of technologies on the other. Theories which are fundamentally concerned about the social system

into which technology is integrated have been called *socio-cultural determinism* (Chandler, 1996) and the "Marxist labour process approach" (MacKay, 1991: 9). This approach will in this thesis also be referred to as the social determination of technology, because it is based on the belief that society essentially determines itself in spite of its employment of technology.

Theories which place emphasis on the social influence in the development and production of technologies have been called the social shaping of technology (SST) (Williams and Edge, 1996), the social determination of technology (Winner, 1993: 27), social determinism (MacKay, 1991: 7) and constructivism (Feenberg; forthcoming). This thesis will employ the term *constructivism* to describe this approach in order to avoid its confusion with the socio-cultural determination approach described above.

Analysts and commentators draw different conclusions from their assessments of the relationship between technology and society and display varying extremes in their beliefs. The specifics of these differing perspectives will be addressed further below.

1.1.2 Defining technology

Herschbach cites Parayil (cited in: Herschbach, 1995) who claims that all technologies embody some form of human knowledge. Technology has also been defined as "... organised knowledge for practical application." (Mesthene, 1970: 24-25). It can thus be described as knowledge concerning the specific applicational requirements for a product or process, in short: know-how. Jacques Ellul (1964) has consequently included "technique"[5] in his definition for technology.

Technology has further been described as the structures and activities of useful material objects, of tools and instruments, of machines and technical systems, of design, engineering, fabrication, and use, of steel and concrete, wires and semiconductors, hardware and software, nuts and bolts (Winner, 1987: 1). We thus talk of disembodied and embodied technology (Hay and Morris, 1993: 466). While the former refers to knowledge, the latter refers to the artefacts. Disembodied technology further entails reference to organised knowledge that can lead to the construction of the devices and artefacts, or embodied technology, commonly referred to simply as 'technology'.

Herschbach (1995) asserts that since the 19th century technology has become synonymous with the application of scientific knowledge for the making and use of artefacts. He further claims that

---

[5]Defined as: "1.a practical method, skill or art applied to a particular task. 2. proficiency in a practical or mechanical skill." (McLeod, 1982: 1201)

the most active areas of technological progress are most frequently very science intensive (Herschbach, 1995). The production of such knowledge for technology has lead to a differentiation of 'scientific knowledge' into two categories, namely pure scientific knowledge and applicable scientific knowledge (Feibleman, cited in: Herschbach, 1995).

While science uses experimental methods in order to formulate theoretical constructs, explicate natural laws, and expand knowledge, applied science focuses on applications for purposeful activity and technology puts scientific knowledge to work (Feibleman, cited in: Herschbach, 1995). The two former definitions of scientific knowledge are what Gibbons calls Mode 1 and Mode 2 knowledge (Gibbons, Limoges, Nowotny, Schwartzman, Scott, Trow, 1994: 17-45).

> "In the former [Mode 1], the context is defined in relation to the cognitive and social norms that govern basic research or academic science. Latterly, this has tended to imply knowledge production carried out in the absence of some practical goal. In Mode 2, by contrast, knowledge production results from a broader range of considerations. Such knowledge is intended to be useful to someone whether in industry or government, or society more generally and this imperative is present from the beginning." (Gibbons et al, 1994: 4)

One's views on the nature of scientific knowledge thus coincides with how one perceives the nature of technology, since scientific knowledge shapes technologies. The different views on the nature of scientific knowledge and hence also on the essence of technology are discussed in the context of the particular theories below.

This thesis is particularly concerned with an embodied technology, namely *Information Technology* (IT) and its application in higher education (HE). IT has been defined as devices that integrate office systems for filing, typing, data and text processing, communications and copying; that integrate home entertainment / information systems; incorporate video, computing, television, tele-text and information systems; and integrate the remote control of a number of services, like education (Webster and Robins, 1991: 70). Hamelink (1997) has divided IT into five sub-categories, namely capturing technologies; storage technologies; processing technologies; communication technologies; and display technologies. A further addition to this list may be printing technology, which is frequently used in connection with these Information Technologies. 'Information Technology' is thus applied collectively to data processing and data communications devices. In the context of HE, the IT of interest consists of computing systems for learning, called computer-based learning (CBL) and for communication, called computer-mediated-communication (CMC).

According to Habermas (1968: 56), IT represents a logical step in the development of technology. In his description, technology first enhanced and replaced the human body, such as its arms and legs; then the physical generation of energy; later the senses; and lastly the functions of the brain. The field of microelectronics has also been described as "heartland technology" (Webster and Robins, 1991: 68) in so far as it has applications over an entire range of activities. Like the steam engine, the petrol engine and the electric motor can be used to power all kinds of machines, so IT can be used to handle all kinds of information. IT is a rather broad and vague concept that encompasses any technology that handles or processes information.

Technologies are organised knowledge for application, tools or methods that can add efficiency or allow us to perform tasks we were previously unable to achieve. Through this, technologies thus increase the extent to which we are able to exert control over our environment. The neutrality debate refers to the question whether technology merely allows us to exert control over our environment or whether technology at the same time also exerts control over us. This debate is explored below.

1.2 The neutrality debate

The theories on the relationship between technology and society are fundamentally divided in their perspective on the question of the neutrality of technology. The neutrality debate is a philosophical debate on the essence of technology (Feenberg, forthcoming). It refers to the question whether technology is a tool, a purely functional instrument that is either useful or not useful for the particular application and is ethically neutral; or whether technology carries an agenda of its own, determining how we see the world and how we interact with it (Chandler, 1995: section 8).

1.2.1 Technology is neutral

The belief that technology is neutral is reflected in the claim that the technical functioning of the system is the most central issue in the use of technology in society. Such approaches usually highlight the various *applications* of IT in higher education. This stance is frequently referred to as 'Instrumentalisation Theory' (Chandler, 1995: section 8; Feenberg, 1991; Feenberg, 1996; Feenberg, forthcoming).

The term derives from 'Instrumentalism', an educational theory conceptualised by John Dewey (1859-1952). Chafy (1997: 15) has described the link which Dewey's educational theory makes between scientific theory and application as technological practice. Butts (cited in: Chafy, 1997:

14) explains Dewey's position as emphasising moral goals based upon democratic civic and social experience, vocational and practical usefulness, and individual development in light of the rapid modernising changes that were taking place in Western civilisation. This emphasis on practical skills was soon reflected in a greater emphasis of education in industrialised nations on practical subjects such as science and engineering (Chafy, 1997: 15). The connection between the instrumental perspective on technology and the instrumental educational theory is relevant, because it indicates that a relationship between the two exists. This relationship is reflected in the emphasis which instrumentalists place on vocational skills in HE, more thoroughly discussed later in this thesis.

In the field of technology theory, the instrumentalist position is associated with the claim that technology is purely a means, that it doesn't have any implications for societal goals, as goals are set independently of technology, independently of the means used to achieve the goals (Feenberg, 1991). Instrumental analyses rely on the premise that technology is ethically neutral, as it is assumed that technology is not inherently good or bad, and that it can be used for whatever political or social ends are desired (Ebersole, 1995). Instrumental authors usually assert that technologies are value-free tools that stand to serve the purposes of their users (Chandler, 1995: section 8). Technology merely serves to expand the control which humans exert over their environment, it increases the efficiency, effectiveness and thus the performance of human action.

An example for the claim that technology is neutral is Kalashnikov's perspective on the use that is made of his invention, the AK-47:

> "If it is not used for the right cause, say in ethnic conflicts, the responsibility should be placed on the politicians, not the designers." (Sunday Independent, Nov. 16, 1997).

This view is characteristic of the claim that technology is neutral. The technology as such, and consequently also the designer, is not to blame, but the politicians who allow its use for 'wrong' causes.

This perspective provides no incentive to question technology per se as it asserts that the technology facilitates change, for the better or for worse, and as long as people are aware of the problematic potential of technology, effective choices can be made to ensure that IT development will be appropriate and socially beneficial (Lyon, 1991: 20-21). This approach is inherently optimistic about the role of technology in society, as it assumes that answers to the questions which technology raises can be found. In the light of possible gains, such assessments often

suggest that if technology's problems can be overcome, the only reasonable response can be unreserved commitment to it's employment. Such approaches frequently stress the advantages that a technology offers and often advocate its extensive use (Webster and Robins, 1991: 84-85).

Nartonis (1993) has clarified the arguments for the view that technology is in fact neutral. He asserts that people determine change through the choices they make and the values they employ (Nartonis, 1993: 68). In his view seeing people as the agents of change makes them responsible for the problem of technology in society. He argues that a perspective which denies people the ability to control their tools views people as powerless beings who are not responsible for the tools they have created or the use that is made of them (Nartonis, 1993: 69). Nartonis further asserts that shared values and a sense of human dignity will enable us to turn technology to human purposes and to make meaningful lives in an increasingly technological world. Chandler (1996) has called this perspective on technology the voluntarist perspective, which emphasises the individual control over the tools that are selected for use.

The voluntarist perspective can be opposed by two arguments. Firstly, the choices whether or not to use a technology, which technology to use, when or how to use it are, in the modern society, not always choices the user of a technology is able to make. If a person wishes to run a business, find employment, travel, communicate or study, there is frequently no alternative to the use of the technical systems and instruments modern society provides. Once the technical systems are installed and being used, it is not easily possible for the user, and thus for the majority of society, to reject and replace them again (Winner, 1993: 36). Secondly, the argument that critically opposes the neutrality view on technology goes beyond the claim that the problem about technology is merely the use that is made of it. Such criticisms allege that technology per se carries an agenda that is problematised (Ellul, 1980; Chandler, 1990; Postman, 1992). The instrumental perspective is unable to comprehensively address such criticisms.

1.2.2 Technology is not entirely neutral

Timms (1992), in his study on the use of technology for teaching Social and Policy Sciences touches upon this idea of a neutral technology:

> "[...] the computer is not an entirely neutral set of tools, which can simply be added in to what is already done. The incorporation of computer applications into teaching demands a clear understanding of course aims and an awareness of the epistemological demands the technology imposes." (Timms, 1992: 98).

Timms somewhat careful statement about the neutrality of technology suggests, however, that he does not appear to believe that the epistemological demands of computers may reduce the quality of the learning experience per se. He thus claims that computers do not interfere with the essence of what is being taught if they are used correctly. In so doing, he equally claims that the computer is a tool that can be used to the advantage of teaching when the demands made by the machine on the users have appropriately been attended to (Timms, 1992: 98). The question of the neutrality of the computer does not refer to the machine itself, but to its applications in particular contexts. For Timms, the neutrality of technology thus refers to the functionality of the computer for specific purposes, rather than the neutrality of technology per se.

The perspective which claims that technology is neutral in its application, not however outside of it, has also been advanced by Habermas (cited in: Feenberg, 1996: section 1). He implied that in its proper sphere technology is neutral, while outside that sphere it causes the various social pathologies that are the chief problems of modern society (Feenberg; forthcoming). Since technology is frequently a product of scientific knowledge, this belief is based on the idea that scientific-technical rationality is non-social and neutral, meaning that there are trans-cultural universal rules which guide scientific-technical rationality (Habermas, cited in: Feenberg, 1996: section 3). Scientific-technical rationality is neutral, because it discovers universal rules by observing natural phenomenon, it is formal as a result of the process of differentiation by which it abstracts itself from the various contents it mediates (Feenberg; forthcoming). Science and technology are thus not essentially responsive to social interests or ideology and merely advance the possibilities of human understanding and control.

1.2.3 Technology is not neutral

In opposition to this, the constructivist approach, more thoroughly discussed further below, argues that science and technology are socially constituted (Hughes, Pinch, Bijker, 1989: 47). The facts and the artefacts are thus fundamentally influenced by society. They are constructed with particular ideas, particular aims and objectives in mind. The argument thus asserts that technologies are themselves shaped by social and economic forces (Winner, 1993: 27). A wide range of factors influencing the process of technological innovation have been identified (Mackay, 1995: 13-32 & 41-53). They imply that technologies are not simply direct translations of economic imperatives into tangible machines and operations, but that a number of social objectives are interwoven into the innovation process. The objectives constitute a belief system that is ideologically not neutral. Technologies thus form part of a vision about a particular social organisation, which has to do with the ideas of people.

Feenberg (1996: section 3), in opposition to the claim that scientific-technical rationality is neutral, highlights the culturally-specific interpretations of technical rationality, by using the example of efficiency. Efficiency has been described as the fulfilment of tasks with the "least waste of effort" (McLeod, 1982: 355). It represents the primary reason for the development of technology and its employment in society. Efficiency is most frequently measured in terms of the input-output ratio (McLeod, 1982: 355).

Efficiency is a universal principle, as it is equally valid in traditional tribal life in the Kalahari Desert as it is in Tokyo. In this view, efficiency thus transcends the social. The interpretation of what comprises relevant inputs and outputs needs to be determined with regard to locally accessible materials or human resources. The example of water may clarify this point. While it may be efficient to use a great amount of water in Tokyo to achieve a particular effect, in the desert, the use of water may be severely limited. Efficiency is thus culturally, geographically and socially specific. What is efficient must be evaluated using the social context in which it is applied. Scientific-technical rationality must thus equally be evaluated with respect to locally specific conditions. These conditions are also central in an evaluation of the usefulness of technology.

The cultural-specificity of what efficiency entails suggests that the very basic scientific-technical rationality of efficiency is not a universal measure. The scientific knowledge that constitutes technology is thus also not necessarily neutral in every respect, as it may require a particular cultural context and natural preconditions in order to be efficient. Technology is thus, in this view, not neutral because it impacts on its environment in relation to the conditions of that particular environment. What this environment needs thus has to be evaluated independently of technology and consequently compared to the specific nature of the improvements in efficiency which technology provides.

When addressing the question of the neutrality of technology, commentators have argued that technology is never neutral, simply due to the fact that it assists people in gaining, for example, efficiency, and thus necessarily impacts on the social environment in some way (Woolgar, 1996: 88-89). In such an understanding of the neutrality of technology, the question is presented as: 'does technology induce social change of any kind?' The realisation that technology, when used by people, indeed has some effect is, however, banal. The meaning of the neutrality of technology is reduced to the technical functionality of technology. The question of the neutrality of technology

can thus not appropriately be addressed when it is based on an understanding of 'neutral' that is simply concerned with desired effects, but must refer to effects beyond the desired ones.

For some analysts the question of the neutrality of technology does not merely concern the application of technology, but its essence. In opposition to the instrumental approach, they ask: 'does technology carry an agenda outside of its intended purpose?' (Chandler, 1990), or: 'does technology necessarily also have a negative effect on society?' (Postman, 1992). The perspective which argues that technology can be neutral in one application, but not neutral outside of it is opposed by the argument which asserts that the computer carries an unavoidable agenda despite the intended use that is made of it (Chandler, 1990: 165). In this definition of the neutrality of technology, it is thus not possible for a technology to be neutral in one application and not neutral in another. Technology is thus, in this perspective, not neutral because it necessarily affects society in a particular way, namely according to its inherent ideology. This ideology is the characteristic that makes technology not neutral. The nature of this ideology is discussed in greater detail further below in this chapter.

Marshall McLuhan (1997) is amongst the well-known authors who reject the idea that technology is neutral. He asserts that the idea that the products of modern science are neither good nor bad and that their value is determined by their use does not withstand a serious examination (McLuhan, 1997: 114). His well known phrase "The medium is the message" (McLuhan, 1997: 114) establishes the notion of how the medium shapes social perceptions and, hence, social values. He asserts that the approach, which claims that technology is neutral, neglects the essence or nature of the medium and therefor neglects the message of the medium itself (McLuhan, 1997: 115).

This message is embodied in the characteristics of technologies. These are likely to have a particular effect on society in so far as they influence the way society organises itself (Winner, 1993: 27). The characteristics of instruments, machines and technical systems influence society to the extent that the specific limitations and opportunities they embody shape the way society organises itself (Winner, 1993: 27). According to Winner (1993: 31), the adoption of a given technical system unavoidably brings with it conditions for human relationships that have a distinctly political cast - for example, centralised or decentralised, egalitarian or inegalitarian, repressive or liberating. The idea in question is thus whether to choose a particular technology is to choose a particular form of political life.

Ebersole (1995) cites Ellul who has argued that all technical progress has three kinds of effects: the desired, the foreseen, and the unforeseen. Some commentators go as far as to claim that the outcome of the increasing use of technologies is "wildly unpredictable" (Postman, 1992: 12). This perspective has lead some commentators to believe that technology has become autonomous, meaning that, in its essence, technology is seeking to gain control over its environment, and this essence finds expression in the ideology of any technology, independent of the social or cultural context (Feenberg, 1996: section 2; Ellul, 1980: 12). Amongst others, Jacques Ellul (1964: 14) has advanced this claim. Ellul claims that technology has become an autonomous factor shaping society according to its own inner logic, meaning that it has its own momentum and influences the nature of society according to its own agenda. Technology is in such examinations frequently presented as amoral and as necessarily leading to unwanted and undesirable outcomes.

Chandler (1995: section 8) cites the philosopher Don Ihde who has argued that particular tools unavoidably select, amplify and reduce aspects of experience in various ways. Technologies are thus limited due to their structure and inevitably place emphasis on those particular aspects that they were designed to amplify. Abbe Mowshowitz, a computer scientist also cited by Chandler (1995: section 8), argues that tools insist on being used in particular ways. In this technical sense tools are thus not neutral and their limitations may contribute to shaping our purposes.

Feenberg (1996: section 1) has renounced the idea of the neutrality of technology as being: "[...] reminiscent of the naive instrumentalism so effectively laid to rest by constructivism." Constructivism, by stressing the idea that science and technology are socially determined, constructed with social and cultural values in mind and ingrained with an ideology, makes it impossible for technology to be neutral (Hughes et al, 1989: 11). These theorists assert that that technology is developed according to principles, which may essentially, and thus unavoidably, be in opposition to a human-friendly or environmentally friendly use of technology (Feenberg, 1996: section 1). They thus stand in opposition to desirable goals, for example, where those goals are fundamentally inefficient. In the context of IT, such theorists frequently highlight the military origin of IT to expose its non-social predispositions (Noble, 1998).

1.2.4 The imperative of technology

It has also been argued that assuming that technology is neutral means accepting the technological imperative (Shallis, cited in: Chandler, 1995: section 8). This imperative is the belief that the technical ability to perform an action means that this ability must and will be followed up on, either as a moral imperative, as an operational requirement, or in time inevitably (Chandler, 1995:

section 7). Nartonis' idea of the neutrality of technology, cited above, suggests that society has more choices available with the use of technologies. It further suggests that the choice for technology can be made voluntarily. The opposing argument claims that the conclusion that technology is neutral means that it must be used due to the advantages in efficiency it provides, with the result that society's choices actually fade. Kay highlights an account of the effects of this imperative:

> "Perhaps the saddest occasion for me is to be taken to a computerized classroom and be shown children joyfully using computers. They are happy, the teachers and administrators are happy, and their parents are happy. Yet, in most such classrooms, on closer examination I can see that the children are doing nothing interesting or growth-inducing at all! This is technology as a kind of junk food - people love it but there is no nutrition to speak of. At its worst, it is a kind of 'cargo cult' in which it is thought that the mere presence of computers will somehow bring learning back to the classroom. Here, any use of computers at all is a symbol of upward mobility in the 21st century." (Kay, 1996)

Here the imperative is reflected in the perceived necessity to improve education with the employment of IT. The imperative is frequently supported by arguments based on the improvement of competitiveness and productivity (Postman, 1992: 110). The move towards technology is in such approaches frequently an inevitable development that can not be resisted. There is no alternative to the use of technology because it offers a number of advantages. Due to the assumption of the neutrality of the technology, the expectations are that it will have a positive effect as long as it is used correctly. If technology fails it must be due to improper use and technology per se is not questioned.

The neutrality debate fundamentally divides the different perspectives on technology. Those who claim that technology is neutral either believe that technology can, due to its neutrality, be used to progress society in desirable ways; or they claim that society determines its own development path by the employment of aims goals and by the organisation of society according to socially determined principles. They ascribe no extraordinary qualities to technology at all and consequently defend the premise of its neutrality. In case technology is not neutral, the implicit or explicit assumption of the neutrality of technology is thus potentially highly problematic, as its message cannot be detected and therefor threatens to impose itself on social spheres. Positions defending the neutrality represent hard views on the relationship between technology and society

called hard or strong determinism (Marx et al, 1994: xii; Smith, 1994: 2; Chandler, 1996; Chandler, 1995). Determinism and its variants are discussed in greater detail below.

1.3 Determinism

In their extremes, deterministic theories are based on the notion of a single most influential factor conditioning social change (Chandler, 1995: section 1). Technology-lead theories have been called technological determinism. Technological determinism has been described as the single most influential theory on the relationship between technology and society (MacKenzie et al, 1993: 4; Chandler, 1995: section 1).

In opposition to this view stand the socially deterministic theories. They rest on the idea that social forces are most influential factor in determining social change. This approach has been called socio-cultural determinism (Chandler, 1996). Socio-cultural determinism emphasises the socio-cultural aspects of social change and presents technologies as entirely subordinate to the socio-political, historical and culturally-specific context of their use. This stance thus asserts that technologies are neutral, because the social organisation is the most important factor in social change. It is thus a theory in which the social and political organisation of a society composes the most important element in social change and technologies are consequently of little interest.

The third approach to technology is the constructivist approach. Authors who advance this approach highlight the social influence in the development of technologies. The principles, which are employed in the development of technologies, are the aspects of interest to this school. The theories will be discussed in greater detail below.

1.3.1 Technological determinism and substantivism

The term 'technological determinism' was coined by the American sociologist and economist Thorstein Veblen (Chandler, 1996). Smith (1994: 2) explains that the intellectual heritage of technological determinism can be traced to the enthusiasm and faith in technology by leaders of the eighteenth-century Enlightenment. Technologically deterministic theories attribute agency to technology as a historical force (Smith, 1994: 2).

Technological determinists perceive technology as causing social change, sometimes claimed to be revolutionary (Chandler, 1995). Hamelink (1997) explains that the technologically determinist perspective is characterised by a strong emphasis on the discontinuity of historical processes

caused directly by the advent of new technologies. Technological determinism has further been divided into a hard and a soft view (Marx et al, 1994: xi).

In the hard view, technologies are largely independent of social influence and are virtually autonomous agents of change (Marx et al, 1994: xi). The soft view is still focused on the technologies as change agents. In this view, the social constraints, such as inequitable access to technologies, are taken into account. Soft technological determinists locate technology in a more complex social, economic, political and cultural matrix (Marx et al, 1994: xiii).

Technological determinists are split between those who believe that technology transforms society to its advantage and those who perceive technological development as highly problematic and fundamentally negative (Feenberg, forthcoming). The former will plainly be referred to as 'technological determinism' and the latter as 'substantivism'.

Technological determinism

Technological determinism is a largely uncritical view which perceives technology as the motor of progress, as holding solutions for most of our social problems, as helping to liberate the individual from the clutches of a complex and highly organised society, and as a source of permanent prosperity (Mesthene, 1970: 16). Borgmann (1984: 89) asserts that in this reasoning of technology, powerful and effective means are provided to make an equitable society possible. It has its origins in the Baconian[6] conception of knowledge as power and is held by technologists, engineers, commentators, analysts and politicians who believe that society is in full command of its technologies and its destiny (Chandler, 1995: section 8; Mesthene, 1970: 16). Ebersole (1995) explains how Bacon saw science and technology as means to understand and master nature. This perspective displays great faith in scientific methods and tools, and by and large assumes a model of society in which the methods and tools which science brings about are the principal determining elements of social relations.

Such approaches are generally characterised by their belief in the neutrality of technology, as they assert that the application of technology progresses society both economically and socially (Chandler, 1995: section 8). This theory is thus an instrumental theory, because it entails the idea that technology is an instrument merely in the service of its user and without effects of its own. Of primary interest to authors of this stance are the applications of technology, or plainly put, what

---

[6]Francis Bacon (1561-1626) was a natural philosopher.

one can do with the technology, as it is these applications that allow people to increase their performance and so progress society.

In this theory, technology is narrowly defined as applied science and engineering (Borgmann, 1984: 8). Science delivers the facts, the disembodied knowledge, and technologists embody them to produce the artefacts. In turn, this conception is based on the belief that scientific knowledge is the observation and explanation of natural phenomenon, and relies on the belief in the objectivity of what has been scientifically verified (MacKenzie et al, 1993: 4). The activities of technologists are, in this view, in an important sense independent of their membership in society, as the knowledge used in their construction is objective and thus free of cultural, political or other inclinations (MacKenzie et al, 1993: 4).

Malhotra (1994) has examined different conceptions of science. The conception which technological determinists most frequently apply is defined as the development of laws and theories to explain, predict, understand, and control natural phenomena (Malhotra, 1994). It rests on the bedrock of empirical testability, the comparison of objective observations of different researchers studying the phenomenon. Technology is thus a product of objective facts, gathered using scientific methods and applied to increase the efficiency of human action. It is neutral, because it is composed of a body of knowledge that is objective, free of ideological elements.

Such evaluations largely operate in what Borgmann (1984: 40-48) has called the 'device paradigm'. The device paradigm is "... the formative principle of a technological society which aims above all at efficiency." (Feenberg, forthcoming). The 'device paradigm' describes the most basic condition of modern society, the constant quest for improvement of performance. Technological determinists generally believe that technology is a tool that can be used to increase the efficiency of human action, economically, socially, culturally and politically.

Technology promises to increase performance and efficiency, and, through that, provide for a better life for all. Positive technological determinists generally believe in the ability of technology to fulfil this promise. This belief has lead some authors to employ utopian images to advocate the power of technology to induce favourable social change. This genre has been called utopianism (Kling, 1996: 40-46; Kling, 1994; Kling & Lamb, 1996).

Utopianism

Technological determinists are sometimes overly enthusiastic about the ability of technology to lead to a new and very different society and advocate a technologically induced society with the employment of utopian images. Rob Kling (Kling, 1996: 40-46; Kling, 1994; Kling et al, 1996) has called extreme versions of positive instrumental accounts 'technological utopianism'. Utopian features inherent in the promotion and advocation of the effects of IT in society have been highlighted by analysts (Hamelink, 1997; Borgmann, 1984: 41 & 130). These commentators contend that the belief in the ability of technology alone to create a better society is a utopian claim.

Technological utopianism defines some of the literature published in recent years that concentrates on future events and scenarios.[7] Many of these futuristic anecdotes describe 'a day in the year of...' where the powerful information-processing capabilities of computer systems are central features in social change.

> "Faster, tinier computers can make it easier for people to find information from their homes and hotelrooms, as well as their offices and laboratories. Larger memories can make more data accessible. Richer display devices, which show lively video, colorful pictures, and text can make interacting with computers a reality for more people. Emerging higher speed networks can connect thousands of systems, providing communication links only dreamed about a decade ago." (Kling, 1996: 41).

The pace of development of IT is the basis on which many of the social forecasts of utopianists rest. The speed of progress in the field of IT is corroborated by Moore's law which states that computer chip capacity will double every two years. In practice this has been reduced to approximately eighteen months (Gates, 1995: 31). According to George Moore[8] the number of transistors which can be made of the same size piece of silicon doubles every 18 months. At the same time the cost of semiconductor storage has fallen by about 20% every year over the past two decades and it is expected that this pace of development will continue for the foreseeable future. The data storage capacity of CD-ROM's has now reached the capacity of a complete library of

---

[7]See: Negroponte, 1996; Weiland, 1996: 59-66; Cochrane & Smith, 1994: 11-12; Forge, 1995.
[8]George Moore is a co-founder of Intel, the company which produce and develop the microchips that run a large percentage of personal computers around the world.

books at low cost (Thomas, 1995: 93). The particularly rapid progress of IT leads many authors, not merely utopianists, to believe in the extensive impact of IT on society.

Utopian tales of technology are focused on the power of the instrument to improve life and highlight its primary qualities, namely its applications. These qualities are believed to enable people to easily achieve their objectives and greatly simplify human existence. Utopian tales are devised to stimulate the belief in a better future with technology (Kling, 1994). They often serve the role of giving people a positive sense of direction and a positive identification with the direction of social change. They can be misleading when their architects exaggerate the likelihood of easy and desirable social changes[9].

The pace of development in the field of IT leads some commentators to believe that information technology is the solution to a number of pressing social problems and that its applications are "only limited by the ingenuity of the human mind" (ISAD, 1996, chapter 1). In such publications advocates of technology attempt to create an undifferentiatedly favourable image of the future with technology. Utopian assessments of the computerisation of society often implicitly or explicitly present technology as the central feature in progress. They assume that technology creates possibilities that change the world and create a fantastic image of this new world.

The World Bank (Talero & Gaudette, 1996: section 1), for example, quotes the self-made telecommunications millionaire Sam Pitora who highlights a strong belief in the beneficial transformative powers of IT. He implies that IT leads to a transformation of society, which is necessarily advantageous, because it serves to provide for more equality in society:

> "As a great social leveler, information technology ranks second only to death. It can raze cultural barriers, overwhelm economic inequalities, and even compensate for intellectual disparities. High technology can put unequal human beings on an equal footing, and that makes it the most potent democratizing tool ever devised." (Pitroda as cited in: Talero et al, 1996: section 1)

The faith that is placed in the ability of technology to determine social structures is characteristic of technologically determinist reasoning. Kling (1994) stresses the influence of the genre of

---

[9]For accounts of utopian tales used in revolutions, see: Goldstone, 1993: 789; Malecki, 1996: 1196.

utopianism in scientific journals, conferences and monographs. A great deal of the literature studied in this thesis has been found to contain elements of such utopianism[10].

The hard technologically determinist view is complemented by a soft technologically determinist view. This view holds that technology changes society not, however, without restraints. Most publications on technology-induced social change, particularly those that focus on third world countries, tend to incorporate elements of this view into their analyses.

Soft technological determinism

Soft technological determinists don't treat technology per se as the locus of historical agency, as they see it in a particular social, cultural, economic and political context (Marx et al, 1994: xiii). Such approaches are characterised by the belief that the use of particular technologies steers its user in a particular direction by giving specific options, allowing the user to perform particular tasks (Chandler, 1990: 165). They claim that the presence of a particular technology or a particular social arrangement is an enabling or facilitating factor leading to opportunities that may or may not be taken up in particular societies or periods.

Lyon (1991: 20) asserts that amongst the most prominent critiques with respect to technology and social development is what he calls the 'liberal critique'. Liberal critics, while unwilling to submit to the "techno-hype" (Lyon, 1991: 20) of technological determinists, stress the importance of choice, and therefore of value, priorities and democratic participation, and thus highlights the importance of social issues in social change. Applying a liberal critique to a hard technologically determinist stance turns hard determinism into soft or weak technologically determinism, because the liberal critique re-integrates social issues into the notion of technology-determined social change (Lyon, 1991: 20). This critique will in this thesis be referred to as the 'instrumental critique'.

This approach may be considered to be similar to the category of 'pluralism' as defined by Borgmann (1984: 11). He has described pluralists as seeing it all, "... the entire complex web of numerous countervailing forces." (Borgmann, 1984: 11). Pluralists are not completely convinced about the ability of technology alone to assist in solving such pressing social problems as inequality of access to HE, while they, however, contend that appropriate social policies can be used to harness technology for such purposes (TELI, 1996: 16-17). Pluralists hover between their

---

[10]As found in: Du Plessis et al, 1995; Packer, 1997; Haupt et al, 1997; Christensen, 1997; Timms, 1994; Orville, 1996;

belief in the power of technology to facilitate social change and their concern about social constraints that are perceived to pose a great hindrance to a desirable impact of technology-induced change. Pluralists thus perceive social choices to be as important in social change as technological capacity.

In some publications, this view is more appropriately referred to as weak socio-cultural determinism, namely when technological change is perceived to be an important element in social change, not, however, the most influential one (Marx et al, 1994: xiv). Such publications may be pessimistic about the disparities in terms of access to technologies and perceive them as the main hindrance to comprehensive social change (Hamelink, 1997).

Weak determinists most frequently perceive the technology as not entirely neutral, meaning that it is neutral within a certain context, but not neutral outside of it. Such approaches largely don't question the essence of technologies, as they contend that technologies can be used to progress society, as long as problematic features are taken into account (See: ISAD, 1996; TELI, 1996). This approach has been criticised for failing to comprehensively address the limitations which technologies themselves present and most frequently place greater emphasis on social policies to avert the undesirable effects of technological progress (MacKenzie et al, 1993: 5). Borgmann contends that technology policy should do more than to centre around reactive crisis avoidance, "... i.e., a series of ad hoc measures which patch up ever new and unexpected cracks in the system." (Borgmann, 1984: 100).

These positive assessments of the power of technologies and associated social changes have leant credence to another kind of technological determinism, called substantivism (Feenberg, forthcoming). Substantive authors are fundamentally critical of the uninhibited faith which some authors have in the power of technology and its diffusion into increasing areas of society. Technology, in this theory, determines society to its detriment, not for its benefit.

Substantive Theory

Substantive theorists are authors who attribute a substantive content to technical mediation (Feenberg, forthcoming). Substantivists believe that the essence of technology is not technological, but is inherently social (Feenberg, 1996: section 5). This means that technology can

---

Talero et al, 1996; ISAD, 1996.

not be understood through its functionality, but only in the context of social life and its engagement with the world (Feenberg, forthcoming).

Smith (1994: 26) cites examples for substantive criticisms of technological progress dating back into the nineteenth-century. Most prominently, substantive criticisms have been advanced by Jaques Ellul (1964 and 1980), Martin Heidegger (1977), Borgmann (1984), McLuhan (1997) and Jean-François Lyotard (1984). More recently, authors such as Daniel Chandler (1990) and Neil Postman (1992) have advanced substantive positions.

Substantivists argue that the substantive content of technology affects society independent of the goals the technology serves (Chandler, 1990: 165; Ellul, 1980: 14; McLuhan, 1997: 114-115; Postman, 1992: 12). Smith (1994: 26) cites Thoreau who claimed that people have become the 'tools of their tools'. He thus attributes autonomy to the improved means of achieving a better life. Substantivists frequently present technology as an independent, self-controlling, self-determining, self-generating, self-propelling, self-perpetuating and self-expanding force (Chandler, 1995: section 6).

For substantivists the technology carries an agenda outside of the intended use that is made of it. Technology can thus not be neutral and the means and ends cannot be separated. For some authors the agenda of technology is revealed in technological features, such as its functional limitations, which shape how we perceive the world. This level will be referred to as the micro-level of substantive impacts of technology. In this view, it is the particular application of IT in education, for example, which changes the users' perspective on the main task of education. The particular limitations of the machines are, in this perspective, the main elements composing the agenda of technology. These limitations change our perception of the world by suggesting that the most important tasks are those, which the technology supports.

Substantivists further question the effects of the embodied ideological principles of technology, most notably the emphasis which technology places on efficiency. This agenda is feared to comprehensively restructure social life and change it on a macro-level. Authors which criticise this agenda of technology argue that it constitutes a type of cultural system that restructures the entire social world (Ebersole, 1995). Ellul (1964: 14) declared that: "Technique has become autonomous; it has fashioned an omnivorous world which obeys its own laws and which has renounced all tradition". Similarly, Heidegger (1977: 7) claimed that we are engaged in the transformation of the world and ourselves into standing reserves or raw materials waiting to be consumed in the progress of technology.

Thoreau (cited in: Smith, 1994: 26-27) claimed that technologies provide improved means to an unimproved end. In accordance with this view, Heidegger suggests that we lose sight of what is sacrificed in the mobilisation of human beings and resources for goals that remain ultimately obscure. For these authors the *ideology of technology* is characterised by the emphasis it places on the constant need for the improvement of performance (Lyotard, 1984). This agenda is perceived to be dominating society in achieving its objectives.

According to hard technological determinists of the substantive school, the increasing use of technology leads to a domination of social principles and is self-perpetuating. Society is thus unable to operate outside of a technological paradigm and problems that arise are solved primarily through the employment of technology. Postman (1992) calls the system that relies on the constant acquisition of new technology 'Technopoly' (Postman, 1992: 117). 'Technopoly' relies on the technologically deterministic idea that technological innovation is synonymous with human progress (Postman, 1992: 117).

Ellul (1980: 13) cites Lefebre who claims that technology is becoming an autonomous and determining social object. Elluls' argument, however, goes beyond the claim that technology is autonomous, as he clearly states, that no technology, however autonomous it may be, can develop outside a given economic, political and intellectual context (Ellul, 1980: 31). Further, he claims that technology exists as a system, as an organised whole, which has an expansive dynamic:

> "[...] the system presupposes a more and more thorough integration of each element, including man [sic!], as an object. Man can no longer be a subject. For the system implies that, for at least in regard to itself, man must always be treated as an object." (Ellul, 1980: 12).

Substantive critics question the progress of modernity, device-culture and the extension of the technological into the lifeworld (Feenberg, forthcoming). The essentialist criticism is entailed in the perspective that the impact of technology has lead to a society that is caught in a paradigm of economic growth and efficiency which, they argue, is highly inappropriately perceived as being positive (Chandler, 1990; Hornborg, 1992: 2-12; Winner, 1987: 2). Substantive critics frequently base their criticisms on effects attributed to instrumental reasoning. The social change, which they fear, is induced by societies appropriation of the paradigm of efficiency and performance. Substantivists often emphasise alternative values, an alternative focus to efficiency and the constant quest for economic growth (Winner, 1987: 2).

Criticisms of the substantive school

The substantive school has also unkindly been called 'technophobic' (Feenberg, 1996: section 1) because of their disbelief in the ability of technology to provide for improvements of social life. Kling (1996: 40-46; Kling, 1994; Kling et al, 1996) called the substantive approach anti-utopian, because it often paints a grim picture of a society that is heavily dependant on technologies of all kinds. Anti-utopian features of substantivist writings are, for example, revealed in the way in which the technology is sometimes claimed to be directly responsible for the advancement of capitalism at the expense of the third world (Hornborg, 1992: 12).

Substantivists have been described as neo-Luddites (Sale, 1995). The term derives from the counter-industrial movement of the Luddites who attacked factories and broke machinery in early-nineteenth century Britain, in protest against the kind of industrialism that threatened to destroy their way of life (Lyon, 1991: 150). In the effect of 'technisation' on their lives lies the substantive impact of technology. Their criticism has been interpreted as representing the "... refusal to submit to the dictates of laissez-faire political economy in which economic interests ride roughshod over customary lifestyles, jobs and skills." (Lyon, 1991: 150).

Sale (1995) called the neo-Luddites also members of "the radical and direct-action side of environmentalism, ... generally of the no-growth school" (Sale, 1995). This is the radical consequence that the rationale of substantivism suggests.

> "This system is characterized by an expansive dynamic which invades every pre-technological enclave and shapes the whole of social life. The instrumentalisation of man [sic!] and society is thus a destiny from which there is no escape other than retreat." (Feenberg; forthcoming)

Substantive theory has been criticised for not placing sufficient focus on solutions for alternative paths of development and for merely being concerned with outcomes of existing rationales (Feenberg; forthcoming). Feenberg criticises this approach for incorporating the hidden social dimensions of technologies into the concept of technology itself without, however, approaching the agenda of technology in a constructive manner. The autonomy which substantivists associate to technology provides no incentive to reform technology and leaves no choice, but retreat from technology altogether (Feenberg, 1996: section 1).

Lyotard (1984: 14) warned about perceiving the instrumental rationale and substantive criticism in purely oppositional terms. This kind of oppositional thinking does not lend itself to constructive criticism as it merely distinguishes between a positivist kind of knowledge which lends itself to

application and where technologies are an indispensable part of the productive paradigm on the one hand, and the reflexive and hermeneutic kind of knowledge which resists the value of performativity altogether (Lyotard, 1984: 13-14).

One logical consequence of the substantive approach is the rejection of technologies. Postman (1992: 181-199) and Chandler (1990), however, in spite of their belief in substantive impacts of technologies don't reject technology per se. They conclude that we need to be aware of the ideology in technology in order to be able to address it appropriately. Their solution is not retreat, but education and awareness. Since it appears that retreat from technology altogether is a purely theoretical solution and hardly implementable, a more practical solution is the renewed emphasis on social aims and social policies as guides for social transformation. This approach is also being advanced by the socio-cultural determination approach discussed below.

1.3.2 Socio-cultural determinism

Socio-cultural determinism is a theory on the relationship between technology and society that, in its extreme, places no particular emphasis on technologies at all. It entails the idea that society is the most dominant determining factor in any social change (Chandler, 1996). Technologies are, in this view, subordinate to the social configuration of a particular country. 'Socio-cultural determinism' was commonly associated with the Marxist critique of technology (Chandler, 1996).

Marxist critics assert that the present social order fails to serve people's best interests, and that these interests are best served by a fair assignment of rights, power, income and wealth (Borgmann, 1984: 82). The decisive shortcoming of society is perceived to be the extreme and unjust concentration of power and wealth in the hands of the ruling class (Winner, 1987: 3). Policy approaches that serve to equalise this shortcoming derive out of this understanding. Borgmann (1984: 82) highlights the Marxist view as seeing a small minority class as directing society, while technology still has to be recognised as a major social factor in its own right. In this theory it is thus not the technology itself, but the ownership of and control over it which is problematised. The socio-cultural determination stance represents an instrumental approach to technologies, as technology is, implicitly or explicitly, assumed to be neutral and its use is fundamentally defined by social policy choices, rather than technological predispositions.

This approach, which highlights the social aspects as the most critical factors in social change, has two variants. The first one assumes that technologies are principally compatible with any political ideology. Western technologies are thus, in this perspective, compatible with the ends of a

socialist state (Winner, 1987: 3). Another variant of this approach asserts that both, the political ideologies and the corresponding social organisation, will influence technological development, and result in technologies which are compatible with social aims (Winner, 1987: 3).

The second approach has been called the "Quintessential instrumental" approach (Moriarty, 1994: 264). Authors of this school have shown how changes in society result in changes in technologies (Moriarty, 1994: 264). The influence that society has on the implementation process and the use of technologies suggests, to proponents of this view, that social issues successfully affect the shape of technologies. This theory, however, falls short of addressing factors that may be inherent in technologies and technological systems themselves. It suggests that there is nothing inherent in technologies worth considering at all, because society is a sufficient force which shapes technologies according to its needs.

Feenberg (1996: section 1) cites Marcuses' idea about developing a reformed instrumental reason dissimilar to that produced by class society. For Marcuse the flaws in technologies are characteristic of class-society and a new type of instrumental reason can generate a new science and new technological designs freed of the negative features of our current science and technology (Feenberg, 1996). Marcuses' proposition is the notion of a metaphysically inspired transformation of science that leads to a change in the very nature of instrumentality. Instrumentality would be fundamentally modified by the abolition of class society and its associated performance principle (Feenberg, 1996: section 2).

A study completed by Bailes (1978) highlights the fact that the Soviet Union employed Western technology due to its inability to foster innovation itself (Bailes, 1978: 408). Even though Bailes stresses the fact that the social adoption was quite different in the Soviet Union, resulting in very different social relations connected to the use of technology, the social did not manage to determine its own technologies, but merely adopted it from the West (Bailes, 1978: 408). The reform of the device might thus require a comprehensive reform of the political and economic system.

It is claimed that a transformation of technical rationality, as opposed to its adoption from the west, could be the basis on which it is possible to create a new science and technology, based in different ideological principles and thus fundamentally different from the current interpretation. The new science and technology can, in this view, place us in harmony with nature rather than in conflict with it. Nature would be treated as another subject instead of as mere raw materials and human beings would learn to achieve their aims through realising nature's inherent potentialities

instead of wasting it in the interest of narrow short-term goals such as power and profit (Feenberg, 1996: section 2).

1.3.3 Criticisms of instrumental approaches

Critics of the instrumental approach have contended that the performance principle that is embodied in technology is reflected in any society, which employs technologies to enhance economic performance. They called the ideology of constant economic growth 'Machine Fetishism' (Hornborg, 1992). 'Machine Fetishism' is characterised by an emphasis on productivity, global terms of trade and a global division of labour (Hornborg, 1992: 12). 'Machine Fetishism' is the idea that technologies are revealed regularities of nature, to be approached as non-social phenomena (Hornborg, 1993: 39). The quest for economic development is in his view flawed, because it is a kind of development that is prone to abuse by a system that relies on the exploitation of peripheries.

> "We imagine that education and technology transfer might solve problems of underdevelopment, forgetting, as it were, that new centers of industrial growth require new peripheries to exploit, and that peripheries are already in so high demand that, looking east, we are seeing centers turn into peripheries, rather than vice versa." (Hornborg, 1993: 38)

In his discussion of the two major traditions of modern political thought, namely Liberalism and Marxism, Winner (1987) argues that both of these traditions are concerned with the human relationship to material things and locate the key questions of modern life in the production and distribution of wealth (Winner, 1987: 2-3). These theories thus assume that the human relationship to technologies, as the means of production or as consumer goods, is at the centre of social conflict.

> "Liberalism and Marxism are at one in celebrating industrialism's horn of plenty and assume that advancing technology and economic growth are ultimately beneficial to humankind. [...] Marxism offers a hopeful variant to this belief, looking forward to a revolution in the ownership and control of the means of production as the source of a new beginning to remedy ills of capitalist society. But while Marxist socialism promises the abolition of class power, redistribution of wealth and restructuring of society, it typically assumes either (1) that the same tools and instruments developed under capitalism will be compatible with the ends of a socialist state or (2) that the creation of a social system founded upon emancipated social principles will inevitably bring a reform of the system of material life. As a consequence, further theoretical

reflection about the politics of technology or practical research on the topic is taken to be unnecessary. " (Winner, 1987: 3)

Winner (1987: 2) thus criticises the belief which these theories advance, namely that technology and technological progress are positive developments which assist social development, while the essence of technologies and technological progress largely remain unquestioned. Both, the Marxist as well as the liberal theory, according to Winner, predominantly celebrate the contributions of technical systems to economic growth and efficiency and assume that these systems are basically neutral (Winner, 1987: 3). They are thus both instrumental, because they view technology as a mere instrument for the progression of society, particularly with respect to the generation of wealth, and they are both confident that either technology or society can rectify social problems.

For Borgmann (1984: 83-85) and Winner (1987) the fundamental flaw of these theories on technology lies in the uncritical acceptance of the ideology of the artefacts, as the failures of technology derive out of the flaws within its ideology (Borgmann, 1984: 220). A reform within the device paradigm thus ignores precisely those factors that are to be reformed. Borgmann consequently claims that the reform of technology equally requires the reform of the system in which it operates (Borgmann, 1984: 237-246).

The inability of socialist countries to create technologies that enhance the social aims these political systems attempted to progress has lead analysts to believe that technology must be actively shaped. Only the recognition of the social influence in the development and construction of technologies can, in this view, change the essence of technologies to comply with social aims (Feenberg, forthcoming). This approach has been called constructivism.

1.4 Constructivism

The approach to social research that has tended to focus on the implications and effects of technology on society, such as the instrumental theories and substantivism, is often criticised for reducing social progress to the limits of technological innovation (Mackay, 1995: 45-46). In opposition to this, arguments by some researchers highlight the social impact on technological innovation (Williams and Edge, 1996: 53), an approach which Feenberg (forthcoming) has called "constructivism" and "design critique" (Feenberg, 1996: section 1) and which begins with the recognition that technologies are socially shaped. This approach has also been called Social Shaping of Technology (SST) (Williams and Edge, 1996).

This approach holds that social interests and cultural values influence the realisation of technical principles (Williams et al, 1996). For some critics, it is Christian or masculine values that have given us the impression that we can conquer nature, a belief that shows up in ecologically unsound technical instruments; for others it is capitalist values that have turned technology into an instrument of domination of labour and exploitation of nature (White, 1972; Braverman, cited in: Feenberg, forthcoming). Noble traces the very development of computers themselves back to the demands of the military-industrial complex described as a "hardly an ideology-free birthplace" (Noble as cited in: Goodson et al, 1996: 68).

Society influences technology by shaping science and by influencing engineering. Feenberg (forthcoming) highlights the role society plays in shaping technologies through the social influence in engineering:

> "Its [the philosophy of technology] key mistake has been to assume that technical disciplines reveal the boundaries of their objects, not just in a certain respect for certain purposes, but generally, fundamentally. Thus limitations of those disciplines and particularly of their explicit self-understanding tend to be transferred to their objects and real technology comes to be seen as non-social, non-reflective, indifferent to values, power oriented, and so on. But as we have seen, an adequate definition of real technology, as opposed to the narrow, idealized cross-section studied by engineering, involves much besides the formal-rational properties of devices." (Feenberg; forthcoming)

The facts and the artefacts are, in this approach, socially determined. Malhotra (1994) described several different perspectives on scientific knowledge, which suggest that scientific knowledge is by no means objective. He cites Kuhn (as cited in: Malhotra, 1994) who claimed that what one sees depends upon what one chooses to look at and upon what previous visual-conceptual experiences have taught one to see. Prior knowledge thus influences one's observation. Truth thus takes shape in the mind of the observer (Malhotra, 1994). The scientific 'facts' that compose technologies are thus fundamentally contaminated with subjective perspectives on realities and intertwined with precomposed ideas. Technology can thus, in this view, not be neutral, because of the numerous subjective conceptions that contribute to the establishment of scientific 'facts'.

Furthermore, MacKenzie (et al, 1993: 13-15) claims that the social shaping of technology is much less characterised by the social influence in scientific knowledge and thus by a bias of the facts, as it is by the reasons and the origins of their development and employment, namely an increase in efficiency and performance. The social shaping of technology is thus, in this view, primarily an

economic shaping of technology as technology primarily serves to progress society economically (MacKenzie et al, 1993: 14). This school asserts that the problem is inherent in the technology due to the social, political and economic reasons for its development and employment (MacKenzie et al, 1993: 14).

Policy, in this view, thus requires the recognition of the ideology inherent in technology as the problem and attempt the reform of this ideology (Borgmann, 1984: 155-249). According to this assessment, what we have to be aware of when we use our technologies is its bias towards economic performance. Where such technologies are employed in social spheres, this bias might just be an important component shaping the effects of such technologies. The fact that most IT, educational software and electronic networks are commercially produced and maintained by private enterprises is, in this view, one of the threatening factors for the social compatibility of technology.

Winner's (1987) 'design critique' is a constructivist approach which places emphasis on the technological features influencing political objectives. This approach is concerned with the ergonomics of technical systems and addresses questions of the designs of technologies as a criterion for their evaluation, and as a starting point for constructive change of technology (Winner, 1987). The term 'ergonomics' is used by engineers and industrial designers to name the process in which the shape of a useful instrument is tailored to the human form (Winner, 1987: 19). It is thus a field that seeks to identify instrumental design criteria that are compatible with the progression of aims identified, for example, in political philosophy[11]. This approach suggests that there is nothing wrong with technology per se, but with the way it is constructed and derives out of the understanding that technology is not free of social influences. Technologies and technical systems may display particular political ideologies that have to be addressed.

Winner (1993: 28-31) cites the example of Robert Moses who built New York bridges in accordance to his racial and social-class ideology. Busses carrying the less affluent were discouraged from accessing certain parkways, reserving these parks for those affluent enough to afford a car. Winner's criticism of technological progress lies in the fear that at a time in which technological change is recognised everywhere as a potent element in changing the conditions of social and political life, the lack of recognition of the need to apply philosophical wisdom to

---

[11]The philosophical and political debate about the role of higher education for society is an example for the criteria that can determine the usefulness of technology for higher education, rather than the question of efficiency and productivity.

modern technology threatens to render political theory increasingly irrelevant (Winner, 1987: 19). Winner consequently recommends the progression of a field of study he calls 'political ergonomics'. This field identifies characteristics in technical design, which run contrary to political objectives and proposes alternatives. In this view, it is thus not the essence of technology, but the designs of the artefacts and the systems that are considered to be flawed.

Constructivists tend to claim that there is nothing inherent in technology that necessarily dictates an exploitative effect and that technology could be environmentally sound, humane and democratic (Feenberg, forthcoming). In the case of the use of technology for learning, constructivists consequently contend that technology can be developed which facilitates learning without posing further problems for education. The dispositions of technology are thus not extrinsic to the logic of technology, but closely connected to it. It is not the reasons for the employment of IT, which this approach perceives to be the most relevant criterion deciding on their effects, but the essence of the technologies. Consequently is it assumed necessary to "[...] construct synergistic totalities of natural, human, and technical elements." (Feenberg, forthcoming), or plainly put, to integrate social needs into the innovation and design process of new technologies.

In the context of learning technologies it is open to debate whether educational IT still require the application of the synergistic totalities of natural, human, and technical elements which Feenberg proposes, or whether such technologies are by definition inherently social due to their social application. Furthermore, the questions by whom educational technologies are constructed, how they are distributed and with what aim, are, in this theory, relevant in determining their effects on society. This problem will be addressed later in this thesis, as the reasons for the employment of IT are perceived to be highly relevant in connection with its effects on social spheres. The reasons for the implementation of technologies in social fields, such as the increasing use that is made of IT in education, might further be of great importance in determining the social compatibility of such technologies. A synergistic technology may thus further only be as socially compatible as its implementation. These issues are examined in greater detail in this thesis.

The different theories on the relationship between technology and society have yielded a number of insights into the complexity of this relationship and the various approaches to its study. The following section will engage in a thorough discussion of the theoretical basis on which this thesis rests.

1.5 Discussion

The question of the neutrality of technology has composed the starting point for the presentation of the theories on the relationship between technology and society. Consequently, this is an appropriate starting point for the discussion.

1.5.1 The neutrality and the non-neutrality of technology

The examination of the discussion on the neutrality of technology has in many ways cast serious doubts on the neutrality of technology. A number of theories on technology have questioned the neutrality of technology and in spite of their differing definitions for what the term actually entails, it has become clear that technology may, in many respects, not be neutral. To assume that technology is neutral means that any factor which may be inherent in technology and which might steers society in a particular direction will unavoidably remain unrevealed. The assumption of the neutrality of technology is thus unlikely to cast much light on problematic effects which technologies themselves may have. Consequently, it appears more useful to assume that technology may not be neutral and to examine technology in this light. In case technology is, in fact, neutral this neutrality will be revealed in such an examination. In case it is not neutral the nature of this non-neutrality can be revealed and strategies to avoid the pitfalls of technology can be devised.

It is thus necessary to examine the non-neutrality in greater detail. This non-neutrality has been claimed to display itself in a number of aspects of the development and use of technologies. One of them is the social influence in the construction of technologies, as the SST approach has shown. The disembodied knowledge, which comprises technological artefacts, may be contaminated with various subjective and thus also social influences. This assessment suggests that a thorough examination of the compatibility of the principles employed in the construction process of new technologies with social aims and needs. However, this appears to be an issue more relevant to the development of new technologies than it is to an evaluation of existing ones. In the context of existing technologies, their present form as well as the reasons for their employment may illuminate their impact on social aims and may reveal some of the limitations and pathologies which technology may have in its application in society.

The accounts of technology which ascribe no negative effects to technologies themselves, namely the instrumental theories, are, in this respect, doomed to repeat previously mistakes, because they fail to take the various ideologies of technology properly into account. Substantivism is the only

theory that seeks to identify negative effects of the artefacts themselves. In opposition to those critics who have concluded that the only logical conclusion of substantivist assessments of technology is the rejection of technology altogether, Postman (1992: 181-199) and Chandler (1990) have proposed that education about technology is the appropriate response to the agenda of technology. Only knowledge of the existence of this agenda and its thorough examination can empower people to avoid the pitfalls of technology. Substantivist technology-theory thus represents a valuable and a positive contribution to the study of technology, because it allows users and policy makers to identify negative influences of the technologies.

According to the substantive perspective, technology can not be neutral even if the synergistic totalities of natural, human, and technical elements, proposed by constructivists, can be embodied in the technologies. The substantive argument asserts that technologies insist on being used in particular ways and shape their use according to their structural limitations. Furthermore, technology has, in this view, an embodied agenda, which will always serve to increase human control over the environment, because technology exists to increase efficiency and to allow people to achieve more. The agenda as well as the structural limitations will be revealed in greater detail later in this thesis. They suggest that (1) either educational technology is not yet a synergistic totality of the elements named above or (2) that even synergistic technologies are only as socially compatible as their implementation. The question whether the ideology of technology can, however, amount to comprehensive changes in society, as some substantivists assert, is an open question and will be examined in greater detail in this thesis.

1.5.2 The dialectic relationship between technology and society

The radical deterministic approaches of either camp seek to explain social and historical phenomena in terms of one principal or determining factor, namely technology or society. This is reductionist as an attempt is made to find one single factor, which determines the complex and intricate process of cause and effect in the development, implementation and use of technologies in society. Hard or radical deterministic approaches are characterised by a lack of choice. In the technological determination view society is predestined, either to improve with the increasing use of technologies or it is doomed to fail.

Technological determinism has been criticised for its focus on the effects of technological change. This criticism is valid for the extremely positive assessments of technology-induced change, such as the utopian perspective, as well as for highly negative assessments, such as the anti-utopian perspective. Effects forecasting is, however, very difficult due to the fact that social action is

potentially complex and hard to predict, yet, never the less, plays a considerable part in social change (Hamelink, 1997). Forecasts, which rely predominantly on the potential of technology to induce change, are thus reductionist because they lack sufficient consideration of such social action.

Furthermore, it appears that the *reasons* for the development, implementation and use of technologies in society are factors that fundamentally define their effects. The implementation of technology and the reasons for its use are issues that require thorough examination. These issues are addressed by the socio-cultural determination approach. Socio-cultural determinism, however, tends to neglect those factors which influence social change and are inherent in the technologies themselves. As Winner has argued, attention must also be given to the momentum of large-scale socio-technical systems, to the response of modern societies to certain technological imperatives, and to the common signs of the adaptation of human ends to technical means (Winner, 1993: 27). In the theory of the social determination of change society is deprived of an opportunity to identify problematic limitations inherent in the technologies and of the possibility to alter the design and innovation process of new technologies. Both, the extreme technologically deterministic and the socially deterministic theories, thus appear to have some shortcomings.

Chandler cites Benthall (1995: section 11) who has argued that "a complete historical analysis of any technology must study the reciprocal action between technical and social factors - 'social' including economic, political, legal and cultural". The reciprocal action Benthall refers to has elsewhere been called a dialectic relationship between technology and society (Olson, cited in: Simpson, 1991: 172). At some stages, and under some circumstances, in the development, implementation and use of technology, it appears as if the social influence dominates, while at other stages technology dominates.

> "Technology and society thus relate dialectically: technology alters societal trends, favouring one form of social organisation over another, and it is itself empowered or retarded by the varying social organisational forms that society employs." (Olson, cited in: Simpson, 1991: 172)

One could equally argue that: Society and technology relate dialectically: society influences the innovation and selection process of technologies, and is itself influenced by the technologies it selects, implements and uses. The dialectic relationship between technology and society suggests that the reductionism of the hard determination theories render them of little use for policy formulation and planning.

If the relationship between technology and society is, indeed, dialectic, then a multiplicity of factors must be taken into account, namely the technological as well as the social ones. To reject radical determinism of any kind does thus not deny the impact of technological advance on social spheres or the social factors inherent in the creation and use of technologies. It further does not deny the importance of the political configuration of particular societies as determining elements in social change. It does, however, argue that the change must be evaluated from a perspective that takes note of a multiplicity of factors in the innovation process, the implementation process and the period of use of a technology. These factors may be social, technological, economic, political or cultural.

1.5.3 Criticisms of technology and of the social organisation

The technological factors are revealed in the substantive critique of technology. The substantive criticism of technology can be viewed on two levels. One is the micro level, the level of the artefact where structural limitations of particular technologies are examined. These limitations suggest a particular way of doing things. On the level of the instrument, the substantive criticism is reflected in the claim that particular technologies shape the users understanding of his or her task by suggesting a particular perspective on this task. In spite of the lack of viable alternatives to social progress with technologies, this approach has a valid and relevant contribution to make by highlighting the structural limitations of particular technologies. The substantive criticisms thus make a valuable contribution to the study of the relationship between technology and society, by highlighting the predispositions of the artefacts themselves. On the level of the artefact, some of the pathologies, which IT might produce in HE, are consequently explored later in this thesis.

The second level is the macro level, the level of the system where claims that technology restructures social systems, in fact, the entire world have been made. This view has earlier been called the hard view. This theory reveals systemic changes which technology induces, such as the emphasis in places on economic performance and the re-organisation of society it necessitates. Substantivists claim that a system which utilises technology to its fullest is likely to be a system which orientates itself along the needs of technology, rather than society. They have painted anti-utopian images of a technologically determined re-organisation of higher education. This image will be explored in greater detail later in this thesis.

The criticism of this approach is similar to that of the socio-cultural determination approach, because it essentially criticises the account of social change that emphasises increases in performance as the main factors that advance society. The main difference between the

substantive and the socio-cultural determination approach is that in substantivism, technology brings this system about, while in socio-cultural determinism, this system is determined by people. A logical consequence of the socio-cultural determination approach is thus to call for a reform of this system. A logical conclusion of the substantive perspective is the reform of the technologies, because they result in undesirable social effects. However, as explained above, substantivists rarely believe in the reformability of technology, because all technologies are constructed to exert control over the environment and this is precisely the flaw in them. This problem reveals the cul de sac into which the substantivist logic leads. It is also the main criticism of substantive assessments, namely their attack on technology and failure to convey viable alternatives to technology.

The system into which technology is integrated surely is one relevant level determining the effects of technologies. An examination of positive technologically determinist ideas about the system, which a technology-enhanced higher education requires, can reveal some of the ideological predispositions of these technological determinists. Socio-cultural determinists criticise these ideological predispositions and attempt to change the system. However, if technology is, in fact, a substantial factor determining this system, then the socio-cultural determination approach is doomed to give way to these technological predispositions. This is another argument for the necessity to thoroughly examine the technologies and any predispositions it may have. Only the identification of these predispositions can allow society to gain more control over itself, because then it has more control over its technologies.

1.5.4 Weak determinism

The weak determinism approaches do take a multiplicity of factors in the determination of social change into account. This makes their study more complicated, as the examination of cause and effect are less clear. The weak deterministic approaches place an emphasis on the technologies themselves as well as on the social organisation, the implementation and the use of technologies as important elements in social change.

In order to be able to gain a better understanding of weak deterministic approaches, it is thus necessary to study the extreme positions of the various camps and integrate them. Like this, the implementation and use of technology can be made with a clear idea about the prospects and pitfalls of technology. Furthermore, these prospects and pitfalls must be measured against socially determined aims in order to maintain a strong link between society and the tools it employs. The integration of the extremes of technologically deterministic theory, of substantivism and of

socially deterministic ideas can thus illuminate the specifics of the dialectic process between technology and society. The following section will begin with the views of the proponents.

Chapter 2: Technological determinism and the promise of Information Technology

At present, Information Technology (IT) is widely believed to be an "enabling technology" (IBM, date unknown) for countries seeking to participate in the global economy and promote the well-being of their citizens. Proponents of this view argue that the application of technology will lead to a general increase in economic performance and competitiveness (Talero et al, 1996; Orville, 1996; Baranshamaje et al, 1995), and to the enhancement of the efficiency and effectiveness of HE in particular (AVU, 1995; Herremans, 1995; IBM, date unknown)[12]. They assert that the employment of IT in HE allows for the development of human resources, and project resultant economic and social benefits.

According to proponents, IT results in more and more accessible information and knowledge. This increased accessibility is an important factor bringing about an Information Revolution (IR). This IR, it is claimed, will have profound effects on social, economic and political life around the world (ISAD, 1996: section 1). It is believed to result in a new society, called the Learning Society (LS). The LS is the notion of a society in which new forms of social organisation in the economy, the workplace, in education and in knowledge production emerge (Kraak, 1995: 1). Technologically determinist authors generally believe that the IR and the corresponding LS are a result of the application of IT in society in general and in HE in particular. It is often claimed that third world countries in particular stand to benefit from the IR (Talero et al, 1996: section 1 and 2; AVU, 1995).

This chapter examines the concepts of the IR and the LS. In order to locate these concepts in society it is first necessary to examine what is understood by the IR and how it is believed to produce a LS.

2.1 The Information Revolution

The IR is widely believed to represent the beginning of a new stage in social development which will result in the emergence of a new age called the '*Information Age*' and a new society, called the '*Information Society*' (IS) and, in the context of knowledge and learning, the '*Learning Society*'. The concepts of the Information Age, the Information Society and the Learning Society are related

---

[12]These publications were derived from Internet sources because of the paucity of holdings of South African libraries of publications of international organisations on this topic.

in so far as they all describe a future society, which is fundamentally changed through IT, information and knowledge.

The *'Information Age'* is a term which surfaced in Japan in the 1960's and which was theoretically underpinned by commentators such as Daniel Bell (1980; Bell, 1976) and Alain Touraine (Touraine, 1969; Lyon, 1991: 6). It emphasises the increasing role information plays in the productive process and in professions of all kinds, as well as the increasing importance of professional, scientific and technical groups in economic development (Lyon, 1995: 55; Orville, 1996: section 6).

Analysts, commentators and policy makers frequently assert that the Information Revolution is the most dominant determinant of social change around the globe today (See: Orville, 1996: section 1; Talero et al, 1996: section 1; IBM, date unknown; AVU, 1995). Commentators often stress the central role which technology plays in this revolution (See: Orville, 1996: section 1; Talero et al, 1996: section 1; IBM, date unknown; AVU, 1995). The South African Information Society and Development Conference (ISAD) (ISAD, 1996: section 1), for example, asserts that the world is in the midst of a potent revolution which will forever change the way we live, work, play, organise our societies, and ultimately how we define ourselves. The South African Science and Technology White Paper (STWP) (Dep. of Arts, Culture, Science and Technology (Dep. of ACST), 1996: section 1.3) states that science and technology are considered to both, create wealth by increasing economic efficiency and effectiveness, as well as to improve the quality of life in contemporary society.

The IR is not a political revolution in the sense that it is an illegal, violent seizure of power that produces an abrupt and fundamental change in institutions (Goldstone, 1993: 789). It is, however, frequently compared to the Industrial Revolution which was a social revolution in the sense that it brought fundamental change to social, economic and political life around the world (ITU, 1995: section 1.1; Kranzberg, 1985: 37-39). Unlike some political revolutions, a social revolution involves the thorough transformation of the ways in which people work, think and live (Kranzberg, 1985: 38).

Analysts of past revolutions stress the utopianism inherent in most revolutionary ideologies (Goldstone, 1993: 789; Malecki, 1996: 1196). Advocates of revolutions often stimulate hope among the masses by promises of utopia after the revolution. The notion of a utopian society encourages people to believe that change is desirable and constitutes a goal for the revolution. By drawing a sharp contrast between the ideal society of utopia and the existing social organisation,

utopian beliefs simultaneously stimulate hope and enthusiasm (Malecki, 1996: 1196). As in previous revolutions, the concept of the Information Revolution thus requires the vision of a better world. In the context of the IR, this vision is based upon the unlimited possibilities of IT.

A closer examination of the political economy of IT can illuminate who the proponents of IT are, what their promotion entails, why they believe IT will benefit society and what they perceive to be the greatest hindrance to the widespread and beneficial use of IT in society. This is subject of the following section.

2.1.1 The political economy of IT

IT holds a particular position in the economic progress of the Information Society, as it is believed to have an extensive impact. According to Gibbons, the information technology industries are "... the key to a new techno-economic paradigm - the information technology paradigm." (Gibbons et al, 1994: 118). While between the 1880s and 1930s cheap steel was the key factor in production, between the 1930s and the 1980s it was oil and currently it is Information Technology (Gibbons et al, 1994: 125). He further states that:

> "A new paradigm begins to emerge when the new technologies become pervasive enough to seriously threaten the existing ways of doing things. Currently the information technology paradigm is based on a constellation of new industries that are amongst the fastest growing in all the leading industrial countries. In this case industries, such as computers, electronic components and telecommunications, have already demonstrated a dramatic fall in costs and a counter-inflationary trend in prices as well as vastly improved technical performance. This technological revolution is now affecting all other sectors, not only particular products, processes or services, but also the organisation and structure of their firms and industries." (Gibbons et al, 1994: 125-126)

Gibbons highlights the revolution as a technological revolution that affects society through its rapid and constant progress. Baranshamaje's (et al, 1995) explains that the IR is being driven by the convergence of telecommunications, computers, satellites, and fibre optic technologies. It is further "... fuelled by rapid and sustained falls in the cost of processing, storing, and transmitting information." (Baranshamaje et al, 1995). The progress of technology affects organisations and necessitates them to restructure due to pervasive advantages which technology offers.

Advocates consequently use data on technology-consumption to confirm that the IR is indeed taking place. The idea that large amounts of information provided by IT are a crucial factors in the

IR is, for example, highlighted by the analysis of the International Telecommunications Union (ITU), which suggests that the expansion of the information commodity sector in the global economy is an indication of a revolution in information (ITU, 1995: section 1.2.1). It is questionable whether increasing consumption is sufficient indication for a revolution. However, the growth of the IT industry shows that this industry is increasing in importance for the economy. This industry generates approximately US$ 1.5 trillion annually (Hamelink, 1997).

Large corporations are involved in driving technological development and in developing the telecommunications infrastructures. They attempt to lay underwater cables and create satellite linkages to increase the available bandwidth. Amongst their initiatives are the FLAG project (Fibre Optic Link Around the Globe), AT&T's "Africa One" initiative to lay a fibre optic cable around Africa, Alcatel's West Coast Africa cable and Afrilink from Siemens (ITU, 1996: section 3.2). Furthermore, Africa's satellite connections are being enhanced by companies such as Globalstar Telecommunications Ltd. (owned by Lockkheed Martin and Loral Corp.) who seek to provide telephone services by bouncing signals off 48 low-orbiting satellites (scheduled completion date is 1998 with a projected investment level of US$ 2 billion); Teledisc Corp., backed by Bill Gates and Craig McCaw, envisages a US$ 9 billion network of 840 low-orbit satellites to bring telecommunications to remote areas around the world; Iridium is a Motorola-led consortium planning to launch 66 low-orbiting satellites at a cost of US$ 3.4 billion, mainly for cellular telephone services by businesses; ICO Global Space Communications Ltd., a private company started by Inmarsat, also pursues a low-orbiting satellite project; Odyssey, owned by TRW and Teleglobe Inc. of Canada, envisages a 12 satellite system; AT&T proposed a network of twelve satellites relying on spacecraft in geostationary orbit, it would be for users operating from a fixed location, sending and receiving information through small antennas (Orville, 1996: section 20).

Many policy makers in a great number of countries around the world are also involved in the creation of information infrastructures to facilitate the information flow (ITU, 1995: section 5). A recent and important development in this respect is the Next Generation Internet (NGI) which is being developed in the United States. The initiative of President Clinton and Vice President Gore is a three-year, $300 million investment that is supposed to create the foundation for the networks of the 21st century (NGI Website). It could work 100 to 1,000 times faster than today's Internet and will, for the development phase, connect 100 or more universities, laboratories, and research

institutions in the US[13]. This digital highway lays the foundation for the increasing use of Information Technologies all over the world and is therefor an important element fuelling the growth of the IT industry.

Furthermore, powerful international organisations have embarked on a range of very different initiatives which all aim at increasing the use of electronic means to deliver information, most notably the Internet. Amongst them is the United Nations Development Programme (UNDP) with its Sustainable Development Networking Programme (SDNP) (SDN Website). As well as the World Bank with its 'infoDev' programme (infoDev Website) to "... ensure that developing economies have access to information that is relevant, just in time, and above all objective and free from conflicts of interest." (infoDev Website). The Bellanet Initiative, hosted by the International Development Research Centre (IDRC) and funded by a consortium consisting, amongst others, of The Rockefeller Foundation, United Nations Development Programme (UNDP) (Bellanet Web Site).

Advocates of technology claim that some third world countries in particular will be able to take advantage of the technological revolution. They are claimed to be able to leapfrog stages of economic development by employing the latest technologies (Talero et al, 1996: sections 1 and 2; Orville, 1996: sections 8, 23, 68, 69 and 96; Braga, 1995; AVU, 1995; Baranshamaje, 1995; Hamelink, 1997; infoDev, date unknown; IBM, date unknown; Knight, 1996). By leapfrogging, third world countries are believed to be faced with a "dramatic opportunity" (Baranshamaje, 1995) to break out of decades of decline and stagnation. Leapfrogging stages in telecommunications development means that wireless communication replaces the need to build expensive local loops (Talero et al, 1996: section 2). Technology thus supposedly provides for effective means to overcome backlogs in the telecommunications infrastructures of developing countries.

The examination of the political economy of IT has shown that powerful international organisations and large multinational corporations are notably occupied with the promotion and development of IT. Many of the companies have invested large sums into the development of the telecommunications networks and thus have a vested interest in the wide diffusion and use of IT and the Internet in order to get returns on their investments. Many of them are occupied with the sale of telecommunications lines, hard- and software and can be expected to continue to propagate

---

[13]See: Large Scale Networking Next Generation Internet Implementation Team (1998) for more details on the NGI.

the use of IT, not merely for the claimed benefit of the users, but fundamentally also for their own benefit in terms of higher sales of their products.

These technologies consequently provide information, said to be the resource of future generations. Information is widely believed to be increasingly important for economic development. A number of different criteria have been used to assess the value of information in the economy. They are most frequently occupied with the measurement of information-sectors in the economy.

2.1.2 The economics of information

Foremost, information and knowledge are perceived to be engines of economic growth and the resources upon which generations after the IR will rely (ISAD, 1996, chapter 1; Talero et al, 1996: section 2). In contrast to raw materials, such as steel and oil, information cannot deplete as a resource. This is succinctly described by Culpeper (1997: 23): "My consumption of knowledge and information does not reduce your consumption of knowledge and information." He concludes that information promises to be a sustainable resource. It is further fundamentally social in its nature, rather than private, as it has the attributes of a pure public good (Culpeper, 1997: 23). Orville (1996: section 2) argues that information leads to wealth in a seemingly simple and logical equation:

> "The information revolution is complemented by an explosive growth in knowledge. Indeed, information is itself an expression of knowledge. It can be argued that science and research is about conversion of money into knowledge, while technology is about conversion of knowledge into money and wealth." (Orville, date unknown: section 2)

Wealth, in this assessment, derives from the creation of technology; technology depends on knowledge; knowledge is expressed in information; and, hence, access to information is central to the creation of wealth. It is this logic which makes proponents of IT believe that central to the creation of wealth is the ability to access and handle information. The concept of the IR is inspired by a set of ideas, which aim at increasing economic performance and constitute the ideology of these proponents of IT.

The increasing status of information is expressed in the attempts by a number of analysts to measure the role of information in the economy. Several attempts have been made to determine the contribution of the information industries to the industrial output of the economies (See: Drucker, 1969; Porat, 1977; Monk, 1989; Bell, 1976). Fritz Machlup (1962), an American

economist, was the first commentator to analyse what he called "The Knowledge Industry" in the United States. He asserted that "Knowledge Production" mounted to 29% of the US Gross National Product (GNP) (Cawkell, 1991: 710). He identified five broad information industry groups and traced their contribution to the GNP. The groups basically covered all those who created new information and those who distributed it. Another measure used in this respect is the service-sector of economies because services are not primarily occupied with production, but with the delivery of information. The ITU (1995: section 1.1) suggests that a growing service sector is evidence for the emergence of the post-industrial society[14]. The measurement of the role of information in the economic system is unclear as many different criteria are applied to measure it.

It has also been suggested that, rather than being characterised by the emergence of a dominant information sector, the Information Society is characterised by an increasing 'information intensity' in occupations and private households throughout society (Lyon, 1991: 50). The ITU (1995: section 1.1) cites United States statistics on household consumption which indicate growing spending on information relative to food. Hamelink (1997) claims that in order to handle information, computers are used by some 50% of the work force in the industrial nations. However, it has become evident that increasingly private households and occupations use IT to transmit and handle information. Information is thus increasingly being viewed as contributing to economic growth.

2.1.3 Services and the economic opportunities for the third world

A growing percentage of global trade is constituted by service industries. The ITU (1995: section 1.1) claims that countries such as Singapore or Senegal, Hongkong and Hungary have service sectors that contribute over 60 per cent of the nation's economic activity. Braga (1995) asserts that the internationalisation of services is at the core of economic globalisation. It is thus claimed that the service-sector is particularly important in the process of globalisation as well with respect to the IR, as the service industries are believed to be greatly enhanced by IT (Knight, 1996).

Technological advances are believed to lead to the "death of geography" (Orville, 1996: section 6). IT makes distance irrelevant and helps us to overcome the barriers of physical distance (OECD, 1996). Through this, IT invokes a social transformation process by allowing people to access a number of services from anywhere. Orville (1996) has described these service industries:

---

[14]The post-industrial society is the notion of a society proceeding the industrial society.

> "Knowledge and information ... drive and intensify an increasingly comprehensive globalisation process relying on knowledge-intensive services (engineering, research, consulting, software development, financial services and private services, leisure and entertainment) for the creation and preservation of jobs and giving rise to the emergence of a tele-economy with new global and societal organisation models (telework, telecommuting, teleservices, telemedicine, distance education, teletraining, teleshopping, telebanking) as in many instances physical location is becoming irrelevant for the ability to receive or deliver services." (Orville, 1996: section 6)

A range of new industries which have been described as a tele-economy are developing. These industries are said to have a profound effect on the accessibility of services, as it allows for them to be delivered to anywhere around the world and received by anyone with access to electronic infrastructures. Education is notably amongst these services, distance education in particular (Potashnik and Capper, 1998). The IR thus has a direct influence on education by making education an exportable service. The development of an exportable distance education industry is seen as one of the ways in which the creation of greater wealth and social progress through the facilitation of education go hand in hand, as such an industry provides an income-generating exportable service and provides a means to develop human resources alike.

It is claimed that citizens of third world countries are to be the main beneficiaries of the ability to access services via telecommunications. An IBM (date unknown) publication formulates this opportunity as follows:

> "When we think about the powerful potential of information technology and the Global Information Society -- to provide education and training where teachers are unavailable, to deliver high quality medical information and care to the sick, to enable artists, musicians and craftspeople to share their efforts and sell their work to others across a nation or around the globe -- no one stands to benefit more than the citizens of developing countries." (IBM, date unknown)

Education and training are believed to be particularly valuable for economic development, because they will allow countries to build human resources with the skills needed in the Information Age and increase economic capacity (Knight, 1996). The opportunities are most frequently connected to the capacity of particular technologies to facilitate communication and deliver information (Knight, 1996; Knight, 1995). In the context of IT and its effect on developing countries technological determinists identify insufficient diffusion of technology as a central problem. They assert that the provision of widespread access to IT is the key to the effective exploitation of

information (AVU, 1995; Baranshamaje, 1995; Talero et al, 1996: section 5; IBM, date unknown; Orville, 1996: section 5).

2.1.4 Urgency of change

Advocates of the Information Revolution frequently assert that there is an imperative to use IT because it increases the internal and external efficiency of institutions (AVU, 1995). Chandler has described this imperative as "... the lure of always pushing toward the greatest feat of technical performance ..." (Chandler, 1995: section 7). This is the promise of IT in HE, namely the notion that IT allows the development of a critical mass of trained professionals in the fields of science, engineering and business, claimed to be absolutely essential to economic growth (AVU, 1995). It is thus an economic, rather than a social, need to adjust to the information economy which is advanced.

Proponents consequently present the increasing utilisation of IT and information as an unstoppable movement that has to be adopted. This is best illustrated by use of a statement made in the World Bank publication of Talero and Gaudette (1996) which urge countries to adjust to the new paradigm:

> "These changes dictate, for all countries, a major adjustment - the information adjustment - to achieve macroeconomic and political balance in an environment of uncontrolled information flows and global competition, trade, and investment. ... Developing countries must also adjust or suffer exclusion from the global economy and severe disadvantage in the competitiveness of their goods and services." (Talero et al, 1996: section 1)

The AVU-concept paper (1995) highlights that the digital revolution will enable countries to participate in economic development if they are able to build up capacities in relevant economic sectors. Countries that fail to do so will, however, be left behind and the gap between them and the rich will then be accentuated, rather than reduced, further necessitating the information-adjustment of the economies. This gap derives out of the greater efficiency and effectiveness of economies that have adapted to the information economy, have produced highly skilled human resources and have developed extensive industries that exploit IT. Countries that miss the opportunity to secure a share of this market now will be at a disadvantage as the major players secure their share.

It is further argued that globalisation and technology alter the principles of competitiveness. In a globalised economy, it is believed, the reliance on the exploitation of cheap industrial labour no

longer gives one economy the edge over another, but the utilisation of highly skilled human resources does (Drucker; cited in Talero et al, 1996: section 1; NCHE b), 1996: 11-12). Advocates claim that the increasing use of IT in the economy at large, as well as in higher education institutions, leads to the development of a Learning Society (LS). The LS is a response to the pressures of the new economic paradigm and entails a re-organisation of higher learning to suit the needs of technology and exploit the possibilities of IT.

2.2 The Learning Society and lifelong learning

The Learning Society is the notion of a society where new forms of social organisation in the economy, the workplace, education and in knowledge production emerge (Kraak, 1995: 1). Education and learning are central features in this society and access to higher education is believed to be greatly expanded (IBM, date unknown). Other terms, such as the 'Information Society', the 'Information Community' and the 'Knowledge Society', describe the same development, however, with different emphases. They all rest on the premise of increasing role of information and knowledge in society and the economy.

2.2.1 New paradigm of learning

The focus on 'knowledge' and skill which is inherent in the new economic paradigm has lead commentators to believe that a fundamental change must thus also occur in the general approach towards learning and teaching, to cater for changed needs in the working environments of many occupations (Herremans, 1995). Concepts such as 'lifelong-learning, continuing education, open learning, just-in-time training, self-study' (Herremans, 1995: 2) are amongst the perceived fundamental necessities employed for education in the future. A "new paradigm" of learning has been invoked which entails the following characteristics:

a. Just-in-time-learning - flexible and open learning and training methods
b. Lifelong Learning - continuous learning through communication with learning tutors / facilitators
c. Electronic performance support systems - integrated information, tools and methodology, electronically on demand (Herremans, 1995: 2; Moonen, 1995: 22).

Lifelong learning is believed to foster an increasing market for continuing education to cater for large fractions of the population (Gibbons et al, 1996: 74). In the future, the lifelong learner shall purchase education á la carte from open electronic universities (Forge, 1995: 21).

"All universities will move toward the open university model and toward electronic universities rather than the traditional physical form. Higher education will become a commodity sold to students, trainees, and anyone interested. Universities will sell courses world-wide to generate income, often over television and computer networks." (Forge, 1995: 24)

Forge here explicitly highlights the commodification of education in a setting of lifelong learning. This commodification is further echoed in the AVU concept discussed further below. At this point, it is relevant to note that technological determinists associate a growing market for education and skills with the new paradigm of education.

2.2.2 New skills

The new paradigm is a response to and a consequence of the IR, and IT is a central tool therein. In this phase of development, flexibility is a major factor adding to competitiveness. Webster (1995: 150-151) mentions six aspects of this flexibility, these are: flexibility of employees; wage flexibility; labour flexibility; time flexibility; flexibility of production; and flexibility of consumption. The constant progress of IT is believed to require a highly skilled and continuously re-educated professional workforce who is able to exploit the latest IT products (Armin, 1994: 15).

While in the past, educational systems were designed to prepare people for a lifelong activity in a particular profession, expectations are that in the future, people will have to constantly upgrade their skills throughout their lives in order to keep pace with the changing needs of the economies (UNESCO a), 1995: 8). Higher education is central in creating the foundations for the development of a LS, because it assists in the development of the skilled human resources which the new economic paradigm requires (Talero et al, 1996: section 2).

In the new economic paradigm, IT is used in a great number of occupations and where education prepares students for such occupations, the ability to work with IT, consequently, needs to become an integral part of the curriculum (Hamelink, 1997). It is argued that imparting IT-skills must be a primary objective of higher education. IBM (date unknown) highlights that business operations will be supported by the move towards a greater reliance on IT:

"Enabling as many people as possible to use information technology is obviously crucial to the task of educating people and building better physical and administrative infrastructures. But it is also a critical asset in attracting international investment. In addition to seeking political and economic stability, companies look for an educated workforce and an infrastructure that will support business operations." (IBM; date unknown)

The development of a LS thus also suggests a particular approach to higher education. This approach is based on the idea that an education for occupations is a necessary and appropriate rationale for higher education.

In the case of higher education and IT, an instrumental position to technology thus concurs with an instrumental view of education (Torres, 1996; Lauglo, 1996; Barnett, 1996). This view has been described as resulting in higher income and better chances of finding employment for the individual, and economic efficiency and productivity for the nation as a whole (Talero et al, 1996: section 5; AVU, 1995; IBM, date unknown). In this view, the machine is perceived to be of good value. An aim of education is to save money for employers by providing a workforce that has received the specific training which business requires.

A commentator stresses the need to get rid of the: "... over-educated, underskilled and obsolete - the not economically viable product of outdated times and outdated circumstances." (Lickindorf, 1993: 71). The most important aim stressed here is thus the creation of a higher education system that creates an economically viable product. Similarly, Nel (1993: 205-206) emphasises the importance of the economy for the state. He asserts that the state is, in the final instance, as strong or as weak as its economy, the economy is dependent on the number and quality of the state's workforce, the quality and quantity of the workforce is dependent on its education, and finally, the economy is therefore only as strong as education can make it.

2.2.3 Expanding access to education

The World Bank has, in accordance with Gibbons, established a correlation between economic performance and higher education development (Choksi, 1994: 2). Enrolment ratios in countries that belong to the Organisation for Economic Co-operation and Development (OECD) averages 51%, compared with 21% in middle-income countries such as South Africa and 6% in low-income countries (Choksi, 1994: 2). It is further suggested that investments in higher education contribute to increases in labour productivity and to higher long-term economic growth. An expansion of higher education enrolments is thus expected to work in favour of economic performance. The massification of HE is thus an aspect of the economic paradigm of growth and accumulation. It represents the accumulation of knowledge and skills embodied in human resources and is perceived to play a substantial role in furthering the developmental needs of economies and of society.

The Worldbank highlights that rewards to an individual for an educational investment include more employment options, higher income, and better future prospects (Talero et al, 1996: section 2). The provision of an education represents a direct empowerment of the individual and suggests the possibility of greater opportunities for wealth. Numerous authors have equally highlighted the value of HE in the quest for greater wealth creation. Gibbons claims that evidence is mounting that societies that were successful in building up scientific and technological competencies, did so within a broader context of raising educational standards and changes in values, including a positive attitude towards science and technology (Gibbons et al, 1994: 114). The World Bank stresses the importance of education as "... the key to human and economic development." (Talero et al, 1996: section 3) and cites Wooldridge (in Talero et al, 1996: section 2) who claims that education correlates with employment, income, and opportunity. The role of skills in the coming society thus appears to be increasingly important and access to higher education is seen as enhancing economic potential.

2.2.4 IT and access to HE

A UNESCO publication (Herremans, 1995) on new training technologies refers to the opportunities to expand access to education through the utilisation of IT. In this publication, training technologies are said to contribute "to a large extent" (Herremans, 1995: 1) to the opening up of educational opportunities for lifelong learning. This belief is further highlighted by the World Bank in its African Virtual University[15] concept paper:

> "Finally, the project [the AVU] would lead to the instalment of the principles of lifelong learning and to greater social equity as the greater majority, traditionally marginalized, would now have access to higher education and the professional opportunities that such training provides." (AVU, 1995)

It is claimed that the LS is a more equitable one with a more just distribution of wealth through the increased opportunities for learning (AVU, 1995; IBM, date unknown; ISAD, 1996: section 2.2). A particular social effect is thus associated with the LS, namely more equity of access to higher education in particular. It is thus advocated that more social equity is a direct result of the utilisation of IT in higher education.

---

[15] The African Virtual University project is based on a concept developed by the World Bank. This project will be discussed in greater detail further below in this chapter.

Logistical advantages

The belief that traditionally underrepresented students, such as the economically disadvantaged and the geographically isolated, can gain access to institutions for higher learning through electronic networks has resulted in the claim that electronic education is socially beneficial. This notion advocates the idea that new means will bring about new social relations. Baranshamaje (et al, 1995) has outlined how society can enhance access to higher education through the employment of IT, primarily through an expansion of distance education:

> "Entirely new ways to support, encourage, and document learning, spawned by the information revolution, will bring the needed sharp increase in educational productivity. Distance education -- using such interactive multimedia tools as the World Wide Web, CD-ROMs and videoconferencing, as well as telephones, e-mail, radio and broadcast television -- is making it possible to network learners and learning resources from Timbuktu to Paris, from Maputo to São Paulo, from Capetown to London, from New York to Nairobi, not to mention among African locations." (Baranshamaje et al, 1995: 6ff)

It is often claimed that with the rapid advance of technology, new opportunities are opening up to broaden the access of learners and educators to distance education across the continent (AVU, 1995). The logistical advantages, which IT offers, are thus seen as an important factor in expanding access to HE. The promise of communication technologies is thus connected to greater accessibility of education, through a shift towards distance education in particular. Noble (1998) cites Jonathan Newcomb, who claims that the use of interactive technology is causing a fundamental shift away from the physical classroom toward anytime, anywhere learning - the model for post secondary education in the twenty- first century.

Cost advantages

The advantages of IT in terms of the cost of HE relate to two problems, namely the additional expenditures which more students bring about and the need to facilitate access to a wider constituency, most notably more economically disadvantaged students. Technological determinist publications reviewed for this thesis frequently highlight the opportunity which IT provides to cut the costs of HE and, through this, to allow the poor to access HE (AVU, 1995; IBM, date unknown: 13; Baranshamaje et al, 1995; Orville, 1996: section 57).

An increase in student numbers is a necessary measure to create the LS outlined above. This also means that higher education must learn to cope with greater expenditures. The problem of the

rising cost of education, sometimes referred to as the "cost disease" (Kernan et al, 1994) of education, is prevalent in many industrialised nations as well as in SA (Science and Technology Green Paper (STGP), 1997; section 3.4). Twigg (1996) asserts that, in the US, the cost of higher education to the consumer is rising at two to three times the rate of the consumer price index, indicating the possibility of similar developments elsewhere. An important aspect of the expansion of higher education is thus the necessity to reduce the cost of education. Twigg (1996) has calculated that IT makes education more cost-effective by reducing expenditures on teachers and staff:

> "Real labor costs tend to rise with economy-wide productivity gains (say 2 percent per year, on average), whereas technology-based costs tend to decline due to learning-curve effects, scale economies in production, and continued innovation. Increasing technology's share of cost will reduce overall cost growth until the rate differential reduces technology's share to the point where labor again dominates. By this time, however, total cost will be lower than it would have been without the injection of technology." (Twigg, 1996)

The assumption that technology can have a positive effect on education by making it cheaper is frequently central in publications promoting the use of technology therein. The perception of efficiency in education as primarily a financial consideration is an important part of what makes information technology relevant to education. IT is thus the tool which brings the need for continuous learning about and which, simultaneously, provides access to the learning opportunities (Talero et al, 1996: section 5). IT is thus both, the cause of a problem, namely the problem of having to expand access to higher education due to the LS, and its remedy, namely the tool that allows its expansion.

In the LS, the incentive for expanding access to HE is the connection between the availability of more skilled human resources and wealth creation. The *raison d'être* for the LS is distinctly economic. Economic developments determine the kinds of skills HE imparts and the number of HE graduates. With respect to education, the vision being promoted primarily relates to the availability of cheap, lifelong distance education. The use of technology in education is believed to cut costs and, through this, assist the HE sector in its expansion and, simultaneously, help the economically disadvantaged (IBM, date unknown: 13). The expansion of opportunities for access to higher education for economic reasons are equated with beneficial social change through enhanced economic power.

The World Bank (AVU, 1995) has devised a concept for the most effective exploitation of the advantages which IT is believed to offer. This concept is based upon all-encompassing applications of IT in higher learning, an example is the African Virtual University (AVU, 1995). The institution they envisage is an example for a HE system that caters for the needs of the LS outlined above. It provides remote access to science and technology courses and facilitates the transferral of applicable skills for occupations in these fields. The following section explores the characteristics of this institution and relies heavily on the AVU concept paper published by the World Bank (AVU, 1995).

2.2.5 African Virtual University

The Virtual University is the notion of an institution which delivers educational materials to students via telecommunications networks, establishes electronic links between learners and tutors and enables access to information via digital libraries and electronic networks (See: AVU, 1995; West, 1997; TELI, 1996: 18). It is currently in its pilot phase of development. It has a number of participating HE-institutions in Africa that can access lectures, materials and experts through IT and telecommunications. It represents the complete integration of higher education and IT, because it is entirely based on IT-facilitated access to education. Remote access to information, experts, other students, educational materials and tutors are all provided through IT (AVU, 1995).

The World Bank (AVU, 1995) highlights its unreserved position with respect to IT, as it advocates the establishment of a "culture of technology". The creation of such a culture entails the increasing use of technology in HE:

> "The scheme would develop acquaintance with the use of various media technology, creating through learning by using, the base for a culture of technology." (AVU, 1995)

Through exposing AVU students to media technology, the World Bank believes it can get students acquainted with IT and confer necessary skills. These skills are to serve the demands of the market place (AVU, 1995). An explicit aim of the AVU is thus to cater for the needs of industry. Science, engineering and business instruction are the subjects which the AVU focuses upon (AVU, 1995).

In the context of the increasing diffusion of IT into various occupations, the AVU cites Hills who describes the main task for HE as training people how "... to gain access to the universal data base of knowledge, whenever and wherever they need to do so." (AVU, 1995), meaning the increasing amount of information available over electronic data networks. They give access to information

and knowledge through "... curriculum products; reference materials and databases; multimedia conference proceedings; multimedia learning packages; software application tutorials; and computer simulations" (AVU, date unknown).

Individual gains are primarily situated in the attainment of greater opportunities for wealth creation. Beyond individual advantages lie national gains, most notably increased economic stability, productivity, competitiveness, and entrepreneurship (AVU, 1995). This view is characteristic of the instrumental approach to education (Lauglo, 1996). This approach stresses the role of HE as an instrument for the development of the economy by producing human resources, knowledge and technology required by industry and in the marketplace.

HE is to be enhanced via the AVU and due to the employment of IT therein. The advantages of the use of IT in the AVU refer to three issues in particular:

> "AVU will tap the potential offered by the new technologies to overcome the financial, physical and informational barriers that prevent increased access to high quality higher education in SSA." (AVU, 1995, emphasis added)

Three benefits of the AVU are highlighted in this quote. They are the financial benefits, physical benefits and informational benefits. The *financial benefits* refers to the decreased unit cost which the AVU is supposed to offer, the *physical benefits* refers to the ability to access electronic education independent of place and the *informational benefits* refers to the ability of technology to deliver unprecedented amounts of information.

This virtual institution is said to require minimal investments and minimal operating costs (AVU, 1995). Essentially, the aim is to make education cheaper by making it more efficient. This way, it is hoped, the problem of funding can be eased because more students are likely to be able to afford HE (AVU, 1995). This advantage is to be achieved through the organisation's corporate structure and operating philosophy, its mix of products and services, and its marketing and distribution strategy (AVU, 1995). This strategy relies on franchising of institutions and the incorporation of existing institutions in the AVU-structures. The participating institutions compete for students while offering similar courses, providing similar educational materials and using similar educational methods.

In this institution, it is claimed, drop-out rates will be reduced and pass rates increased through the provision of unlimited access to materials and through better communication between students and tutors. IT is thus seen as solving one of the gravest problems of DE, namely the isolation of the

learner (AVU, 1995). Baranshamaje[16] (1995: section 37) further claims that an advantage of the employment of IT is that "software is generally user-friendly and easy to learn", IT eliminates the need for expensive and sophisticated equipment, multimedia systems are durable and instruction is "usually of high quality, effective and efficient". In the AVU concept paper (date unknown), it is further claimed that pedagogical advantages lie in the expansion of hands-on learning opportunities, more independent research and less rote memorisation.

Competition amongst different institutions of higher learning is believed to be beneficial for increasing the quality of higher education as well as access to opportunities for higher learning. Competition, it is claimed, forces institutions to become more responsive to the needs of their customers because institutions will have to compete for students (AVU, 1995). The globalisation of the service industries means that cross-border trade in HE is a viable business opportunity (Braga, 1996). The creation of a competitive industry in education is thus important, because the IR means that new competitors will access the educational market and institutions will have to compete with them for their market-share (AVU, 1995).

The World Bank (AVU, 1995) further progresses a particular perspective on the social status of higher education, as it explicitly highlights that students should view higher education as a privilege which they should pay for, rather than as a right. This perspective leads the World Bank to appeal to Universities to diversify their financial bases particularly through cost-recovery for non-academic services, the introduction of targeted fees, and a calculated expansion of income-generating activities (Findings, 1994). These changes are political in so far as they imply that higher education should increasingly become a commercial venture. Higher education is, in this assessment, not primarily a tool through which the upward mobility of disadvantaged people can be achieved, as Cloete (et al; date unknown: 125) implies, but a commercial venture which provides a service to those who are privileged to enough to access it.

A philosophy of HE which concentrates on efficiency as its primary deciding factor, a characteristic which has earlier been connected to technological determinism, stands in opposition to the facilitation of equitable access through public funding of education. The World Bank perceives public funding as inefficient:

> "In addition, efforts must be made to help students become accustomed to their role as customers: particularly in helping them to understand their rights and choices. There should be

---

[16]Baranshamaje is the author of the AVU concept.

a marketing campaign to show that education is a worthwhile investment for the individual and that, on that account, the individual should be willing to pay for it. The organization may need to work with local institutions to help explore and develop mechanisms e.g., loan schemes, which will allow students who do not have individual savings to pay for their education." (AVU, 1995)

The proposal of the World Bank is coherent in so far as it recognises the need to cater for disadvantaged students. This assessment, however, also means that even with IT the problem of student funding remains an important issue discriminating between those who gain access to HE and those who don't. The World Bank proposal for the funding of AVU students is thus an important aspect of the AVU project.

The concept paper emphasises its commitment to employ cost-sharing and cost-recovery as methods by which students should finance their studies. The costs involved in studying at a higher education institution is central in determining the class-structure therein (Hall, 1997). Where payments for education are high, we can expect that the poor will have difficulty in affording it. For this reason, the AVU aims at cutting unit costs in order to make an electronic education affordable to more people.

Social and political aims, such as a commitment to providing a higher education for the disadvantaged in particular (Higher Education White Paper (HEWP), 1997), require governments to seek ways of expanding access to higher education at reduced cost. Where this commitment leads to a financing of students and where a virtual education is, in fact, cheaper than a traditional education[17], it is possible that a considerable expansion of DE, facilitated by IT, may be amongst the methods by which governments and educational institutions will seek to exploit IT in order to reduce cost. Students are believed to attain access to the AVU through improved means, namely logistical advantages and reduced costs. Furthermore, the external efficiency is raised by placing a particular focus on applicable skills to meet the needs of commerce and industry. These needs are characterised by skills in science and technology. Funding of students, however, remains a central issue in the facilitation of more equity of access to higher education.

---

[17]In this thesis the term "traditional education" applies to contact institutions which use frequent face-to-face meetings to educate their students.

2.3 Discussion

The aim of this chapter is to espouse the views of technological determinists. The examination of their views on IT and HE yield a number of insights into the effects popularly associated with the role of technology in facilitating social change. The IR is amongst the images employed by technological determinists to elucidate the thorough transformation of society and the economy with the application of IT therein. Technological determinists generally believe that IT necessarily results in social change, often believed to be revolutionary, and assert that technology is a major factor, if not the most important factor, in social change. They promote the vision of a better world through the use of IT.

A revolutionary effect of IT is said to lie particularly in its ability to provide access to information, enhance human communication and deliver services. Amongst the services which IT enhances is notably also HE. The utilisation of IT to deliver HE is supposed to enhance the efficiency and effectiveness of educational delivery, because it increases the internal efficiency of HE by decreasing its cost; it increases the external efficiency of HE by imparting skills needed by commerce and industry; and, finally, increases the accessibility of HE by making geographical location irrelevant for the delivery and reception of HE.

The increasing reliance of many economies around the globe on IT compels countries to adjust to the information economy or face exclusion from the global economy and severe disadvantages in the competitiveness of their goods and services. It, however, also provides an opportunity for third world countries to enhance the delivery of services and build industries in these sectors. In their view, HE is an important social service, because it assists in the creation of a human resource base. This suggests that in order to take full advantage of IT a distance education industry needs to be built that uses IT to deliver HE and teaches IT-skills.

Technology, IT in particular, is further believed to provide an opportunity for underdeveloped countries to leapfrog stages of development. Leapfrogging is claimed to come about through the employment of the latest information technologies and allows countries to skip previous stages of development. These technologies are said to provide for effective means for developing countries to overcome their infrastructural backlogs.

Large multinational companies, international organisations and governments around the world make significant investments in international communications infrastructures. Powerful international organisations are advocating IT and advance its use through various initiatives and

projects in many developing countries. They aim at increasing the diffusion and accessibility of more powerful communication channels, particularly in the third world.

In order to be able to utilise IT most effectively for higher learning, technological determinists believe that society requires a new social organisation of higher learning. This organisation is characterised by greatly expanded opportunities for access to higher learning for a greater variety of constituencies, notably from workplaces, and a greater orientation of higher education towards provision of skills for occupations in industry and commerce. This orientation fosters a growing market for higher education and increases demand for skills needed in workplaces.

The AVU is an institution that is characterised not merely by its utilisation of IT and improved means to facilitate access to higher learning, but also by its delivery of particular skills. These skills are primarily situated in the fields of commerce, science and technology. The AVU-concept also reveals that technological determinists tend to primarily place emphasis on technological opportunities in their assessment of the benefits and effects of IT. The problem of financial constraints of students is, for example, not a central issue in the facilitation of access to HE, as responsibility for this problem is transferred to national governments (AVU, 1995).

The technologically determined HE sector outlined in this chapter as well as the particular institution, namely the AVU, studied here are fundamentally guided by their focus on efficiency and effectiveness in terms of economic gains. HE is, in this scenario, a market-driven and market-respondent service. The technological determination of HE thus extends beyond a utilisation of IT for learning, as it entails the notion of a particular aim for higher education. This aim lies in increasing the connection between HE and the needs of the economy. The use of IT in higher education is informed by an ideology that places particular emphasis on economic needs.

Having examined the views of proponents, the following chapter is a critical examination of the information presented in this chapter. Substantivists as well as educational experts and educational technology experts have questioned some of the assumptions about IT made by proponents. They have examined IT according to its actual abilities and have come to very different conclusions about the potential of IT to provide opportunities to access HE.

Chapter 3: Substantive impacts of Information Technology in higher education

This chapter examines the arguments brought forward for the existence of substantive impacts of the use of Information Technology (IT) in higher education (HE). For substantivists the essence of technology cannot be understood through its functionality, but only in the context of social life and its engagement with the world. Technology is, in this theory, evaluated not according to the potential of particular applications, but to its effects on the way we perceive the world. In its evaluation of IT in HE, this chapter does not only rely on publications by substantivists, but also a range of experts from different fields, such as educationalists and educational technology experts[18].

Substantive effects of IT have, in chapter one of this thesis, been separated into a micro- and a macro-level. On the micro-level substantivists question the effects of technology on the human experience of learning and are occupied with the impact of particular technologies in particular applications. This stance is concerned with the consequences of technology on "... the form and quality of the human associations" (Winner, 1993: 32). This concern is, in this chapter, applied to the way in which IT influences the content of higher learning as well as to the form of conducting HE.

Micro-level effects are frequently believed to lead to the comprehensive restructuring of HE and a change on the systemic, the macro-level. On this level, technology is believed to impact on the *raison d'être* of HE, its aims and goals or its general orientation. The ideology of technology on the macro-level is revealed in the employment of HE for the purpose of economic growth, efficiency, productivity, competitiveness, the compulsion to participate in the technological race with the use of IT therein (Winner, 1987: 44). In this theory, the emergence of a new paradigm for HE, namely that of the constant improvement of performance, is directly attributed to the use of technology therein. The use of computers in HE is, in this theory, believed to integrate HE into the "economic machinery" (Noble, 1998) like never before. In the substantive view, the new purpose of HE is the progression of global capitalism. This purpose displays itself in the re-organisation of HE according to the needs of technology and the economy. The result is feared to be the commodification of HE.

---

[18]Such as Sherry, 1996; Harasim, 1995; Lemmer et al, 1995; TELI, 1996.

3.1 The content of IT-facilitated HE

The change in the content of IT-facilitated HE is inspired by the functions which IT supports. One of the relevant functions in this respect is the ability of IT to make large amounts of information accessible.

3.1.1 Information and knowledge

Advocates of IT claim that the integration of electronic networks into the educational context brings an information-rich environment about, which will fundamentally alter the learning context by putting students in touch with more information (Duchastel and Turcotte, 1996; Sherry, 1996). The use of IT in learning leads to the creation of an information-rich learning environment which comes about through the utilisation of the electronic networks and the installation of virtual libraries (NCHE d), 1996: 32; NCHE c), 1996: 306). The advantage of IT is claimed to be the accessibility of information by anyone, anywhere, and almost without financial restrictions, and the availability of the rarest texts and serials as they are published (Hall, 1995).

Some commentators go as far as to claim that IT also brings students in touch with knowledge. The transferral of knowledge can, like this, be connected to IT and the various media it handles:

> "We must remember that knowledge is not merely textual; but also visual and oral: particularly in developing countries. Not only the Internet, but all information technologies, allow developing countries to bypass written knowledge." (Paquet-Sévigny, 1997: 20)

This perspective promotes the idea that knowledge is external to people and, in turn, that IT is valuable for its transmission. Knowledge becomes a transmittable object that can be owned, as Culpeper (1997: 27) describes. It is in this light that promoters of IT are more often occupied with the power of IT to transmit large amounts of information than with the problem of building knowledge.

Iseke-Barnes (1996: 16) observes that information and knowledge are often used interchangeably, as if acquiring information and constructing knowledge were the same thing. Paquet-Sévigny's quote above suggests that IT does indeed change our perception of what constitutes knowledge, rather than merely providing access to information. In order to be clear about the difference between information and knowledge, it is necessary to define them.

Coming to know something is more complicated than accessing information. The Education Centre Handout (1997) of the Lincoln University reinforces the view that receiving and even reading information is by no means equal to knowing what has been read:

> "Reading is not knowing. As most people can attest, they can lift their eyes after reading a page and wonder what it is they have read. Believing that they must not have read it at all, they return to the top of the page and read it again only to find that it seems familiar. ... On the second reading their brains say 'We have read this all before'. The intrapersonal response is 'Yes. But we don't know it do we? It is familiar. It is information. It is not known.' If access to information was knowledge then libraries would grant degrees to every student who borrowed 65 books (or some other number)." (Education centre; Lincoln University, 1997)

Laurillard (1993: 121-123) describes the relationship between information and knowledge as being characterised by contrast. While the former is de-contextualised and elementary/atomistic, the latter is unitary/holistic and contextualised. Laurillard's definition takes note of the need for knowledge to have a context in which it can be understood and which gives it meaning. Thorngate has explained that information "... is what exists 'out there' beyond our senses; it lives in nature, in print, on hard disks, in the air." (Thorngate, date unknown). Knowledge, he further contends, exists "in here" (Thorngate, date unknown) in our minds and is quite literally a figment of our imagination.

Those who divorce knowledge from meaning by claiming that it is equal to information, Chandler explains, "... detach the knowers from the known .. divorce knowledge from community, from history, from wisdom." (Chandler, 1990: 166). Winner (as cited in: Iseke-Barnes, 1996: 17) highlights the difference between knowledge and information and claims that knowledge is understanding, enlightenment, critical thought, timeless wisdom, or the content of a well-educated mind. Baurillard (as cited in: Iseke-Barnes, 1996: 17) also defines knowledge as 'meaning' and claims that it is a widely believed myth that more information produces an accelerated circulation of meaning. Over all, he asserts, only a residue of meaning remains in the load of information. Concerns about the emphasis placed on information have been raised by Tuman (1992):

> "For the literate mind prior to the advent of computers, the central problem of human knowledge had to do, not with finding one's way through a forest of information, but with achieving genuine insight, usually expressed in terms of vertical movement. The original thinker gains a deeper (or higher) understanding mainly through undertaking a more intense analysis of a single given situation or creative work in literary study, for example, a reader

undertakes successively more intense readings of a poem or short story, just as a writer in turn works more intensely at producing poems and short stories that reward such readings." (Tuman, 1992: 53)

Tuman claims that it is directly the computer that changes our understanding of the problem of human knowledge, by implying that the collection and manipulation of large amounts of information are the central tasks in education. Tuman argues that we have to define knowledge in terms of its qualitative worth, rather than in terms of the quantity of information we have available.

However, information is an important factor in building knowledge. This fact is reflected in the central function of libraries in institutions for higher learning. Orville (1996: section 2) claims that information is an expression of knowledge. It can, however, not simply be expected to lead to more knowledge. Knowledge is more than simply the collection of information, as it requires a context to be understood, and thus also human negotiation and a meaning. Information is what exists 'out there', on paper or in electronic data banks, while knowledge is 'in there' in the minds of people and is thus not connected to IT.

3.1.2 Knowledge and the 'second-order character' of academic knowledge

The emphasis on increasing amounts of information has been criticised for distracting from the actual task of higher education, namely the achievement of genuine insight or a second-order character of knowledge (Laurillard, 1993: 25). Postman argues that the computer suggests: "... that the most serious problems confronting us at both personal and public levels require technical solutions through fast access to information otherwise unavailable." (Postman, 1992: 119). Postman also claims that the computer is unable to assist education where it is impotent, because the problem in impotent education does not lie in inadequate information, but in attaining a deeper understanding (Postman, 1993: 119).

Such understanding cannot be expected to derive simply through the availability of information, but through learning. Laurillard asserts that knowledge is information already transformed; selected, analysed, interpreted, integrated, articulated, tested in application, evaluated (1993: 122-123). The process that transforms information into knowledge thus involves an activity or a series of activities. These activities are central to learning. Optimally, the outcome of learning can be said to be knowledge gained by the student. The kind of knowledge higher education tries to mediate is believed to entail a "second-order experience of the world" (Laurillard, 1993: 25).

> "I have .. defined academic knowledge as having a second-order character, being known through descriptions of experiences of the world. Within this account, clearly knowledge is not the same as information. .... 'information' is an important and powerful concept, which we cannot do without. It should not be adulterated by confusing it with something else we need as well. Academic knowledge as I have defined it is not reductive; it is unitary, invisible." (Laurillard, 1993: 122-123)

The nature of academic knowledge goes beyond the acquisition of knowledge to involve a contemplative reflection on a particular way or several ways of experiencing the world (Laurillard, 1993: 53). To acquire this second order character of academic knowledge, students are required to go beyond their experience of the world, and come to understand different perspectives on the world by a comparison of their views with those of others. These different perspectives allow students to abstract from their knowledge. The knowledge that derives out of this abstraction is what Laurillard calls the 'second-order character' of academic knowledge (Laurillard, 1993: 25).

The 'second-order character' referred to by Laurillard goes well beyond the repetition of facts and allows students to achieve a higher level of understanding. It appears that such a level of understanding is superior to knowledge that consists of well-learned facts. Rather, it consists of complex sets of ideas, knowledge of underlying structures and concepts and is more universally applicable than facts and dates. We can thus differentiate between knowledge in terms of *well-learned facts* and *deeper insight* or a *higher order of thinking*.

The definition of learning as selecting, analysing, interpreting, integrating, articulating and evaluating information, however, does not comprehensively address what 'learning' actually entails, because it does not address how these activities are conducted. The process of learning, as conducted in HE institutions all over the globe, is examined below.

3.1.3 Learning, dialogue and critical thinking

Bates (1995) defines 'learning' as an "... individual quest for meaning and relevance" (Bates, 1995: 233) and Young (date unknown: section 2.5) describes learning as an inevitably lonely task. There is undoubtedly a great deal of individual effort involved in learning. However, the way higher education revolves around meetings, seminars and lectures suggests that studying in a university is not a purely individualistic activity, but equally a social one.

In the present system of higher education we can distinguish between different educational meetings. While some are meant to involve a great deal of interaction between students and tutors,

such as seminars and courses, others are primarily based on imparting information, such as lectures. Bates (1995) criticises the pedagogical value of lectures as being inappropriate for learning:

> "In particular, the predominance of the lecture-based classroom model in post-secondary education needs to be challenged. The ancient Greeks did not learn this way. Plato argued for dialogue rather than instruction." (Bates, 1995: 17)

The idea, that learning entails dialogue rather than simply passing on information, has furthermore been raised by Laurillard (1993: 97). To assert that learning is essentially dialogue suggests that any form of education, other than one involving dialogue, is not optimal for HE. This conclusion does not discredit the value of lectures for HE altogether. It does, however, suggest that lectures alone are inappropriate for the transferral of particular skills in HE. The role of dialogue in learning requires further examination.

Learning as a focal thing, as defined by Borgmann (1984: 81), further engages students in many subtle ways which are difficult to quantify. Amongst these factors is also dialogue. Forrester (1991: 70) has called the dynamic role of learning in conversation a "social-cognitive phenomenon". 'Incidental' and 'accidental' learning undoubtedly takes place in dialogue (Forrester, 1991). It is, however, claimed to be difficult to study due to frequent periods of 'digestion' following a conversation as well as a lack of recognition of the phenomenon (Forrester, 1991; Draper et al, 1991). Substantivists raise the fear that the inability to quantify some aspects of learning, such as the human experience of meetings and personal interactions which accompany them, may lead to their negligence as a factor in learning (Borgmann, 1984: 81). They have contended that this negligence will lead to the de-humanisation of education (Feenberg, forthcoming; Lyon, 1991: 136).

Interpersonal dialogue plays an important role in Beyers (1996: 196) approach to education. This approach aims at the development of the individual, and has been called an education towards full-humanness. Beyers has defined the requirements for such an education as follows:

> "1. Since most of knowing is discovered in intersubjective experience, effective education will strive towards the creation of mutual concern, that is, between a lecturer and a student a dialogue should be constructed reflecting mutuality, warmth and concern.
> 2. Central to mutuality is conversation, which renders imperative the development of a discursive repertoire for the student.

3. Central to humanness is the development of a sense of self, which occurs when a person is treated as a person and shares in the act of the construction of social rules.
4. For a sense of self to proceed towards full humanness, a person should develop agency; which implies the development of autonomy and reflexivity within a context of inerhuman concern.
5. None of these principles can be effected without advancing the articulatory powers of the student." (Beyers, 1996: 196, emphasis in the original)

The close connection Beyers makes between the interpersonal experience of education and the personal development of students implies that in contexts where such contact is limited, the development towards being "fully human" may also be restricted. This approach stands in opposition to the "... modern Western idea of personhood ..." (Beyers, 1996: 196) which:

"... emphasises information processing and everything that has to do with computational significance; it stresses self-actualisation as a deed of disengagement from the social context; it denies the significance of history in processes of knowing; it promotes bureaucratic activity (skill-as-recipe training; rationality training); it views the student as either an object (physicalist) or a subject (cognitivist) but never as a person of local identity striving towards the attainment of character." (Beyers, 1996: 196).

She (Beyers, 1996: 197) perceives the development of interpersonal dialogue as central to the construction of moral roots and sees the Western educational practice, which neglects this issue, as autocratic or colonising or both. Western educational practice, she claims, relegates the student to a position of being the recipient of input (training).

The TELI (1996: 278) suggests that educational methods without interpersonal exchange, such as lectures, are educationally questionable, because they lack the ability to transfer critical thinking skills and independence of mind. Critics of the emphasis placed on information-processing have outlined the importance of the emancipation and liberation of individuals by way of the development of independent and critical social thinkers (Besser et al, 1996: 883). Barnett (as cited in: White, 1997: 8), has highlighted the need to develop students minds to foster levels of reasoning on which critical reflections of experiences can occur. The levels of reasoning and reflection are 'higher' because they enable students to reach higher-order states of mind. This higher order of thinking is to allow students to emancipate themselves from dominant viewpoints and become more independent and critical participants in society (White, 1997: 9).

From the perspective of students, the value of the social component in learning has further been described in a web site of the Education Centre at Lincoln University (1997):

> "Students don't come to a university because it provides access to information. They come to socialise, to find partners, to have fun, to talk long into the night about deep things, to play league, to be with others among whom they will make friendships for life at a time in their life when that is most easily done... The fabric on which all of this activity is appliquéed [sic!] is the desire to know, to learn ... in a social setting of their choice and in a pleasant physical environment." (Education Centre, Lincoln University, 1997)

Learning, in this account, further involves a great deal of social activities which characterise much of the learning experience in HE institutions at present, most notably in the contact institutions. The social community that universities provide is said to be one of the motivations for students to attend institutions of higher learning, and provides them with opportunities to gain a better understanding of other ways to see the world (Stahlman, 1996; Education Centre, Lincoln University, 1997).

The definition for learning is thus not irrelevant in the evaluation of IT for education. A definition that includes the unquantifyable factors named above requires a particular learning environment, namely one that provides access to a social community. This assessment is important with respect to the form of HE that IT supports, and will be addressed later in this chapter. A thorough discussion of what learning is, however, rarely plays a part in advocative publications on the use of IT in HE and none whatsoever in the technological determinist publications reviewed in chapter two of this thesis.

We thus come to realise that knowledge is not derivative of data banks, but of learning, a process that is very different from the installation of a fibre optic cable. The numbers of computers in higher education will thus neither easily increase knowledge nor directly lead to learning. Learning requires a particular kind of interaction between the learner and the subject that allows students to build knowledge. The achievement of critical and independent thinkers further requires communication with other people. This communication enables students to understand different perspectives on the way the world works and to acquire a second-order character of knowledge.

3.1.4 Information-rich learning and Information Literacy

Electronic publishing provides information in large amounts. This feature has been highlighted as one of the important improvements for education, in particular with respect to institutions which previously had little access to information (Hamelink, 1997). The information-rich learning environment to which electronic networks provide access is believed to fundamentally alter the learning environment by replacing the teacher as the primary depository of information and the sole communicator of topics (Sherry, 1996). In the future, the teacher's role is expected to change to a guide, facilitator or councillor who assists the learner in the independent discovery and understanding of a matter (Sherry, 1996).

Information Literacy (IL) has been progressed as a necessary skill in this respect. An information literate person is one who:

- recognises the need for information,
- recognises that accurate and complete information is the basis for intelligent decision making,
- identifies potential sources of information,
- develops successful search strategies,
- accesses sources of information, including computer-based and other technologies,
- evaluates information,
- organises information for practical application,
- integrates new information into an existing body of knowledge, and
- uses information in critical thinking and problem solving (Doyle, as cited in: Bruce, 1994: section 1.A)

If large amounts of information are a central component in learning in the future, students clearly need to learn how to handle the information load productively. IL has been defined as the skill to seek, gather, retrieve, discern, analyse, evaluate and apply information to solve the problem (Mendrios, 1994: 4). These attributes of IL are markedly similar to those earlier attributed to learning by Laurillard (1993: 122-123). IL is thus another definition for learning, one, however, which places emphasis on information. To claim that IL is what learning in the future is all about shifts the focus of HE from the understanding of different perspectives on the way the world works to the management of large amounts of information, and reduces the aim of HE.

It is highly questionable whether the concentration on access to information, and in turn equally access to IT, is in fact the key to the transferral of some skills. IL further does not appear to be a

new skill in so far as many of its properties have been a part of education even before the advent of IT. New is merely the amount of information students have to deal with.

Doubts have further been raised in terms of the value of the information in online environments:

> "The Internet is an ocean of unedited data, without any pretence of completeness. Lacking editors, reviewers or critics, the Internet has become a wasteland of unfiltered data." (Stoll, as cited in: Darch, 1995: 6).

One of the problems of the information-rich learning environment, such as the one which the use of the Internet brings about, is the large amount of pedagogically and factually questionable information. The value of information is thus not primarily a quantitative, but a complex qualitative phenomenon. It is thus further possible to distinguish between different kinds of information and assess their usefulness for learning. Rather than a concentration on amounts of information, a focus on its quality might be more appropriate. However, furthermore, not merely the type of information, but also its form is a relevant feature. The form in which information is most frequently found on electronic networks is examined below.

3.1.5 Fragmenting information

Analysts wishing to confirm that technology has an inherent ideology have analysed the particular characteristics of certain technologies. Chandler, for example, claims that the computer is the cause of the fragmentation of information through the way in which it "distorts information" (Chandler, 1990: 166). Using the computer, he explains, can transform one's intentions according to an inexplicit but unavoidable ideology. This ideology manifests itself in the way the computer handles, displays and stores data, and "fragments the known" (Chandler, 1990: 168). Phenomena are dis-integrated, split into irreducible categories, defined, labelled and put into boxes (Chandler, 1990: 168).

The problem of a fragmentation of information has been raised in connection with the most popular information storage technology at present, namely hypertext or hypermedia in particular (Laurillard, 1993: 122-126)[19]. Laurillard (1993: 122-126) argues that hypertext fragments information by disengaging it from the context in which it is presented. It consequently

---

[19]Hypertext is an electronic information storage and retrieval system which allows readers to navigate texts by choosing particular words. The reader consequently receives a new document with further details on the chosen expression. Hypertext thus provides libraries of interconnected texts. Hypermedia is an information storage environment which does not merely incorporate text, but equally entails other media, such as graphics or sounds.

undermines the structure of texts and effectively fragments interconnected storage facilities, such as books or articles, by allowing readers to navigate a wide range of very different texts through links[20]. By doing this, it destroys complex ideas and reduces them to segments of information by encouraging the reader to interrupt at different points and continue with another text and another idea (Laurillard, 1993: 125). Hypertext suggests that information sought by the reader is more relevant than a comprehensive set of ideas presented by an author (Shenk, 1997; Laurillard, 1993: 122).

Using hypertext, the learner, as Laurillard (1993: 126) asserts, is less likely to be working on discerning the structure and through it the meaning of a particular text. Rather, students are occupied with finding information to satisfy their needs. Hypertext in this respect fails to support the learner in building a comprehensive knowledge of a field because it enables readers to seek out information that supports their beliefs. Academic knowledge, as defined above, is particularly dependent on a unitary apprehension of information, as it is not reductive. Tuman (1992) agrees with Laurillard and highlights the tendency of online environments to fragment ideas by highlighting how they favour a kind of hit-and-run mentality:

> "Our ability or willingness to attend closely and for prolonged periods of time to the narrative experiences of others ... is intimately connected to our broader experience of print culture and the inner consciousness that it both demanded and rewarded. A new cultural landscape, one grounded in computer technology, will affect all of us, professors and students alike. All of us, and not just hyperactive adolescents, will zap" (Tuman, 1992: 69)

To 'zap' means to excessively use hyperlinks and constantly access new hypertext pages. It is an expression of the speed at which information can be accessed on the Internet. This way of accessing information means that new sources of information can continuously be sought and entails the fear that no source will ever comprehensively be read and understood.

Hypertext, in this view, has a direct influence by changing written culture and our perception of texts. There are thus serious doubts about the ability of the technology that the World Wide Web most predominantly provides, namely hypertext, to be of great assistance in some aspects of learning. It may carry an agenda that distracts learners from the comprehension of complex sets of ideas and perspectives on the world. This recognition highlights the fact that particular

---

[20]Links are connection points between different hypertexts.

technologies need to be better understood before their value for education can accurately be assessed. Uncritical assessments of online information tend to ignore such factors.

The conversational character of learning is simulated in a popular application of the computer in HE, namely computer-based learning (CBL). CBL is software that leads students through learning materials by presenting information, embedding questions and simulating dialogue with the learner. Its effectiveness in this respect is examined below.

3.1.6 IT-facilitated skills

Laurillard asserts that the dialogue that constitutes learning may never take place between the student and teacher, but that it may equally be a purely internal dialogue, with the student playing both roles (Laurillard, 1993: 104-105). Alternatively, the dialogue may take place between the student and distance education materials or a computer, using pre-programmed CBL materials. Teachers are believed to become less central in learning due to the possibility to use a designed multimedia course in which syllabus content is made available to the student via computer networks (Swift, 1992: 1). It is thus claimed that IT can replace functions which teachers used to fulfil. Due to the definition of learning as a dialogue, these learning materials are created to be interactive, to simulate a dialogue with the student (Lemmer, Bergh, van der Linde, van Niekerk, van Wyk, 1995: 9). An interesting question in this respect is thus the ability of such materials to simulate dialogue.

One of the key beliefs in the field of CBL is that the dynamic adoption of course materials will maintain student interest, improve retention, and enhance the learning process (Iacono and Kling, 1996: 94). However, while some claim that retention rates improve with the adoption of technology into the learning process (Herremans, 1995: 5; Sherry, 1996), others reply that for every piece of research which claims that computers are effective in facilitating the learning process, another says they are ineffective (Bagus, as cited in: Glover; 1995: 19). Trotter (as cited in: TechnoTimes, 1998: 8) has highlighted that research into the effectiveness of lessons with computers is still scant. Oppenheimer (1997) claims that there is no evidence that most uses of computers in education improve teaching and learning. Laurillard (1993: 99) discusses a number of technical educational media, amongst which also CBL, and emphasises that CBL was not developed as a response to a pedagogical imperative. She thus claims that computers are being adapted to suit the needs of the educational process. The reasons for their employment are thus, in her assessment, not pedagogic. She thus fundamentally questions the functional usefulness of

CBL for learning. Educationalists are thus divided on the question of the effectiveness of IT in learning.

Educational experts believe that the essential function of computers in education is moving away from the notion of the computer as substitute teacher. Instead, it is increasingly being viewed as a 'true' technology, as a set of tools to be used by teachers and learners, to facilitate the task of learning and understanding (Walton et al, 1997; Bates, 1995: 227). Educationalists thus advance the idea that computers are best applied as an addition to traditional learning environments, rather than as a replacement thereof.

The subject of the Mellon Foundation (date unknown)[21] is consequently not related to all-encompassing applications of technology, such as the Virtual University, but to discover ways to use technology in traditional university settings which reduce the cost and improve the quality of education. The Mellon Foundation (date unknown) approaches the use of technology in teaching "... with an understanding of the high value so many dedicated faculty put on human interaction with students as they learn, as well as recognition that there is a limit to how much students, parents, and the rest of society are willing to pay for even a first-rate education." (Mellon Foundation, date unknown). The approach of the Mellon Foundation thus incorporates a social concern, namely the fear that computer-facilitated education is less effective than face-to-face teaching.

Bates (1995: 192) has found that CBL is unable to teach particular skills, because it is characterised by a *lack of flexibility*. In the simulation of the dialogue with students, the computer only understands certain responses and can thus only verify certain answers. Such programmes are consequently only of use where few and very particular responses are correct. This limits the scope of such programmes considerably with respect to complexity of responses and, in turn, also subject matter. It has been noted that higher thinking skills are difficult, if not impossible, to teach using CBL (Bates, 1995: 192). It thus appears that at least for some skills, CBL is not an appropriate application.

The problem inherent in the notion that CBL can teach higher levels of thinking is that this idea is based on the assumption that artificial intelligence can represent human behaviour. This ability is, however, still severely restricted. In this context it appears that the value of CBL to assist in the

---

[21] An organisation which funds research into electronic software for learning, amongst others, also at the University of Cape Town.

negotiation of meaning is in question. An important question in this respect is thus whether an extensive reliance of HE on computers has an effect on one of the skills HE attempts to transfer, namely the development of one's own perspective on the way the world works through the comprehensive study and understanding of those perspectives of others.

Elsewhere (Hartley, 1995: 152; Besser and Bonn, 1996: 883; Massy et al, 1995), it has been maintained that some fields of study are not suited to extensive computer mediation. Amongst them are those subjects that are concerned with meaning and value, culture and philosophy (Massy et al, 1995). Here, knowledge cannot easily be rendered objective and empirically verifiable as it often has to be negotiated, discussed and debated (Hartley, 1995: 152). Where truth is more concretely defined, such as in the transmission of facts, CBL and other de-humanised learning environments, might thus be of greater value. Fields where truth is not clearly defined, such as subjects that engage in debate and discussion to negotiate meaning, can expect to benefit less from an increase in computerised teaching and more from an increase in communication.

Most of what the humanities do has, for example, been described as the "construction of meaning" (Gibbons et al, 1994: 92). Humanities, as well as to some extent the social sciences[22], may find it difficult to produce something that could be presented as absolute truth. In these subjects:

> "All given must be mistrusted because they represent the treacherous reassurances of tradition which inhibit reflexivity. All utopian prescriptions must be denied - because they foreclose future reflexivity, which, by definition, must be endlessly open-ended. Even science, even reason, are suspect. Proof, after all, is terminal." (Gibbons et al, 1994: 103)

The speculative ground of the humanities and some areas of the social sciences is what sets them apart from subjects that manage to present verifiable outcomes and ultimate truths. With the use of IT, the status of the latter is increasing and the perceived importance of the former is decreasing.

With respect to the content of HE, there appear to be reason to believe that IT particularly supports those subjects that are occupied with the transmission of established knowledge. IT further appears to have limitations in terms of its ability to assist in the development of critical thinking skills and the negotiation of meaning. This assessment is supported by the increasing emphasis

---

[22]Gibbons (1994: 105) expands on the differences between the humanities and the social sciences. While both are concerned with the inner workings of society and the generation of culture and meanings, the social sciences have been called more 'analytic' and their explicit function more oriented towards the construction of practical tools to better understand and manage the increasingly descanted world that their descriptions unravel.

placed on independent learning with the increasing use of IT in HE, as discussed below. It is, however, complicated by the ability of IT to facilitate communication. These issues are discussed in relation to the quality of the learning experience below.

3.2 IT and the form of HE

Substantivists claim that IT suggests a particular perspective on the appropriate form of conducting higher learning. This form is characterised by an increasing emphasis placed on independent methods of learning.

3.2.1 The relationship between the form and the content of IT-facilitated HE

In the previous section, it has been argued that the content of HE stands in a particular relationship with its form. Here it has been claimed that in order to teach the negotiation of meaning, access to a physical community is a necessary feature, while the transmission of established truth, or the teaching of facts, does not necessarily require access to such a community. The increasing employment of IT, and the effect that it has on the form of conducting HE, is thus related to its content where the increasing use of IT equally leads to an expansion of independent learning.

Critics question the urge to employ IT for learning as a development which is set to fundamentally change our perception of the way higher learning is conducted. Neil Postman (1992: 19) asserts that what we need to ask is not how efficient the computer is as a teaching tool, but how IT changes our conception of learning:

> "New technologies alter the structure of our interests: the things we think about. They alter the character of our symbols: the things we think with. And they alter the nature of community: the arena in which thought develops." (Postman, 1992: 20).

For Postman the computer has a distinct ideological agenda which alters the nature of community from an oral one that entailed a sense of social responsibility to an individual one that is much less oriented towards social spheres and distinctly characterised by its focus on individuality (Postman, 1992: 17). While orality was retained in schools in spite of the use of written texts, the computer is, in his rationale, set to change this by placing a greater focus on private learning and individual problem-solving (Postman, 1992: 17).

The most striking feature about the potential of IT is that it allows us to access services through remote access. IT and telecommunications will allow us to engage in remote shopping, remote democracy, remote health and remote or distance education (DE). Full exploitation of IT in

learning thus results in the employment of more independent learning methods in residential education (TELI, 1996: 48); in the greater employment of remote or distance education methods in residential education (TELI, 1996: 278); and in an expansion of DE (TELI, 1996: 277). This is to be achieved primarily by replacing face-to-face contact between learners and tutors with the different media IT encompasses (TELI, 1996: 278).

Independent learning has been practised for many years in DE-institutions all over the world. The problems which DE-students experience can, consequently, indicate what difficulties a HE-sector that relies on IT may experience with respect to the content of what is being taught. How the educational method employed relates to the outcomes of education has been debated by educationalists. Russell (1997) cites 248 authors who claim that there is no significant difference between the outcomes of distance and face-to-face education. The TELI (1996) investigation further asserts:

> "... that no method of educational provision is intrinsically better than another; rather, the appropriateness of selecting a particular method or combination of methods is determined entirely by the context in which they are to be used and the educational needs they are intended to fulfil." (TELI, 1996: 277).

This assessment suggests that IT has to be understood in relation to the particular skills that a course tries to impart. When skills are to be taught for which independent learning is not suitable, such as in the negotiation of meaning, the use of IT in HE can be said to be negative. Where independent learning is as effective in transmitting intended skills, such as in the transmission of established knowledge, the effect of the use of IT can be said to be beneficial.

Besser (et al, 1996: 882) supports this argument by contending that distance learners experience difficulty in building and participating in an intellectual community and often have less practice and motivation in finding such a community. Besser (et al, 1996: 882) asserts that distance, both, psychological and physical, makes it difficult to build a strong mentoring relationship between students and faculty. It makes the instructor merely a limited tool amongst a set of others and leads to the elimination of the experience of socialisation and peer interaction as well as the experience of challenging traditional values and ideas (Besser et al, 1996: 882). As has been argued earlier in this thesis, Besser thus claims that some skills, such as critical thinking, require socialisation and peer interaction.

The emphasis that IT places on independent learning in particular thus appears to reinforce the imbalances that the first section of this chapter has identified with respect to subject matter. IT, however, furthermore has the ability to enhance communication. This function of IT has been called Computer-Mediated Communication (CMC). The support of independent learning and DE by way of CMC is discussed in the light of the reasons brought forward for the increasing employment of independent learning and DE as preferred educational methods, namely the cost of education.

3.2.2 Communication, IT and DE

In this section, it is argued that it is questionable whether the outcomes of DE and residential education can, indeed, be equal, because there are some marked differences between them. In order to illustrate this point, we firstly examine the different models of DE and thereafter relate them to the reasons for the emphasis placed on an expansion of DE rather than for an expansion of residential education.

Lemmer (et al, 1995: 12-14) distinguishes between two models of DE, the industrial model and the guided didactic conversation model. Courses based upon the industrial model instruct students by the use of pre-packaged course materials. What is perceived to be efficiency is amongst the main determinants of the form of interaction between students and teachers. This model does not facilitate frequent personal interaction with students and neglects a thorough analysis of students needs (Lemmer et al, 1995: 12-14). The guided didactic interaction theory is based upon the idea that a main characteristic of education is the interaction between learner, teacher and peer-group (Lemmer et al, 1995: 12-14). The experiences made in distance education suggest that, although the activity of learning, in DE, is most frequently an individualistic one, there is also a distinct need to provide extensive student support in the form of communication between tutor and student or amongst students (SAIDE, 1994: 64; Leibbrandt, 1992: 5; Garbers, 1992: 7).

Distance poses one of the main problems of DE because it isolates learners (Garbers, 1992: 7; Ewing, 1996). Educationalists have connected the high drop out rate of DE-institutions to the isolation of students and have argued that it poses a major problem with respect to efficiency and effectiveness of DE:

> "A problem which is peculiar to distance education, which sometimes even questions the cost effectiveness and its ability to provide crisis education, is the so-called isolation of the learner. Drop-out rates from distance education institutions are a great deal higher than those found at

residential institutions. Therefore it is all the more necessary that a good support system is developed which is able to provide and receive regular feedback in order to maintain a high level of motivation on the part of the learners." (Garbers, 1992: 7)[23].

Garbers claims that distance education is distinctly different from education conducted at a contact university due to the lack of personal contact in distance education (Garbers, 1992: 7). The high drop out rate at distance institutions suggests that it may be more difficult for students to complete a course at a distance (Garbers, 1992: 7).

In support of this claim, Garrison (as cited in: Sherry, 1996) has argued that the quality and integrity of the educational process depends upon sustained, two-way communication. Ehrmann (1995) also supports this assessment by suggesting that, in order to be successful, independent learning requires a particular emphasis on student support. When done poorly, he further argues, independent learning can separate the learners completely from faculty and from each other. The centrality of a good student support system for student success in DE supports the claim made earlier, that personal interaction is highly important in learning.

Proponents of IT argue that CMC promises to enhance DE, because it provides powerful communication channels. Most studies on CMC highlight the advantages of discussion fora and debate in the use of computers in educational settings (Bates, 1995: 202-227; Feenberg, 1989: 22-39; Paulsen, 1995; Harasim, 1995; Herring, 1993; Berge and Collins, 1995). Such studies frequently refer to the advantages to be gained from the functional structure of the specific CMC-applications of computer conferencing (mailing lists) and bulletin boards. Such functions facilitate group discussions with place independence, asynchronicity of communication (Harasim; 1995: 138) and learner control in terms of amount of participation and interactivity of communication (Bates; 1995: 213-214).

It is important to note that CMC represents a significant improvement where it enables communication that would otherwise not occur. It is, however, equally important to realise that the use of IT might have a negative impact when it replaces face-to-face communication altogether. The value of face-to-face meetings and personal discussions thus require particular attention if a more obligatory use of IT for learning is advanced.

---

[23]See also: Sherry, 1996 and Ewing, 1996.

CMC, can provide almost instant contact with teachers and other students (Sherry, 1996). It thus promises to substantially enhance DE by providing the communication channels that are believed to be able to substitute the physical studying community with a virtual one. The AVU (1995) claims that the interactive nature of educational technologies can help to solve the problem of the high drop-out rate encountered by distance education programs. An interesting question with respect to the communication channels that IT provides is thus whether the use of IT is, in fact, likely to result in more communication between and amongst students and teachers.

3.2.3 The cost of education and DE

The question, whether the use of IT will, in fact, lead to increased communication between students and tutors in HE stands in a particular relationship to the reasons for the employment of IT, independent learning and DE. The shift towards more DE is, amongst others, motivated by the promise of a better quality of IT-facilitated DE over traditional DE, as explained above, in connection with a reduced cost of DE over residential education.

An account of the cost of DE in comparison to contact education made by the SAIDE (b); 1995: 3) suggests that DE is only cost-effective when the drop-out rate can be kept to a minimum. Cost-effectiveness further depends on the number of students that can be recruited to this system (SAIDE b), 1995: 12).

> "University education at large is expensive but distance education on a reasonably large scale is relatively inexpensive for both the state and the student. Expanding the existing system of university education by means of distance education is most probably the only affordable alternative for South Africa." (Garbers; 1992: 6 and 12)

The Open University in the UK[24] is able to produce 9% of all undergraduates in Britain each year at 5% of the national university operating budget. It can thus be argued that DE can be cheaper if the drop-out rate can be kept to a minimum and economies of scale can be achieved. This assessment suggests that, firstly, DE needs to provide a good student support system in order to keep the drop-out rate low and, secondly, the more students DE-institutions recruit the more cost-effective they become.

> "Perhaps the basic decision that a distance education system has to make is the balance that it offers to the student between independent study and interactive tutoring. Independent study is

the backbone of distance education. It is reasonably straight forward to organise and can benefit from economies of scale and achieve low unit costs." (Garbers; 1992)

Student support is not straight forward to organise and threatens to increase the cost of DE (Garbers, 1992). The problem of individual student support in DE is that the more time tutors spend on teaching, the more expensive DE becomes. Student support is thus an issue that contradicts the urge to decrease the cost of tuition, as personalised attention is the expensive part of DE.

The use of IT thus promises to enhance DE by providing more opportunities for communication between and amongst learners tutors, and more individual student support. An increase in such communication is, however, potentially also a threat to the cost-effectiveness of DE, as teachers and tutors may spend more time supporting individual students. Noble (1998) supports this assessment, as he claims that the use of technology expands the working time of academic staff. In his account, electronic communication brings an inevitable extension of working time and an intensification of work, because academics have become more accessible to both students and administrators (Noble, 1998). Sherry (1996) agrees with this assessment, as she claims that electronic communication is very time consuming and that one-on-one communication is, in fact, not likely to occur in electronically-enhanced remote education. Individual attention from the tutors is thus unlikely to directly increase with the increased use of IT in DE if the reason for the use of IT is a reduction of the cost of HE. IT makes DE more labour intensive by enhancing the opportunity for students to gain access to tutors and simultaneously makes it more expensive by occupying more teachers with communicating with students.

The push for the use of educational technology for learning is, however, foremost a result of the rising cost of education, as IT is often seen as the solution to this problem (FRD b), 1995: 6; Twigg, 1996). The increasing cost of DE with the use of IT therein obscures the reasons for the expansion of DE named above, as these reasons are most frequently based on the belief that IT reduces the cost of instruction (Kernan et al, 1994). In order to do so, Sherry (1996) claims, virtual classrooms[25] are likely to characterise IT-facilitated instruction, because they promise to increase teacher productivity. The South African Technology-Enhanced Learning Investigation (TELI, 1996: 18) asserts that virtual classrooms are merely traditional classrooms where students

---

[24]A UK DE institution which has a policy of open access.
[25]Virtual classrooms are groups of students connected via communication links.

at distant sites are added on to conventionally taught classes. Rather than individual attention, IT may thus be used to extend the traditional classroom to distant sites.

If an extension of traditional classrooms is the most likely application of CMC in an educational system that needs to reduce the cost of tuition, an interesting question refers to the personal interaction that IT facilitates in this application. TELI (1996: 236) stresses that remote sites should ideally not have more than about twenty students, and a facilitator is needed at each site. The AVU project as well as the University of Stellenbosch have recently begun to use virtual classrooms for tuition[26]. Rose Dios is a US mathematics teacher who instructs 250 AVU students once a week by way of a video-linkup from the New Jersey Institute of Technology (Reconstruct, July 7, 1998: 7). Students can ask questions using e-mail, fax or phone. Furthermore, the University of Stellenbosch is attempting to use virtual classrooms that can cater for up to twenty students in ten different sites (Business Day, May 21, 1998: 26). Altogether, this particular distance education network may thus have up to two hundred students in one class. An effect of the use of IT is thus, in these examples, a considerable expansion of the numbers of student attending classes.

Kling and Covi (1995) have formulated the problem inherent in the urge to become more financially efficient and the employment of CMC in education as follows:

> "As the audience scales up in size, or moves out in space and time with real- time video or othertime video-tape, the informal give and take between speakers and listeners becomes more difficult (in contrast with the smaller face-to-face seminar)." (Kling et al, 1995)

Stahlman (1996), further, cites a survey of students participating in an intercontinental and experimental class hosted by the Massachusetts Institute of Technology. The size of this particular classroom is unknown. In this class, however, off-campus students were substantially less likely than in-class counterparts to ask questions or positively identify with their peers or teachers. Interviews with students revealed their frustration with the lack of give-and-take in the electronic classroom and regrets at missing the rest of campus life. This assessment indicates that remote participation may not compare to face-to-face contact.

The application of IT for the facilitation of communication is thus more complicated than proponents frequently make believe. The more the cost of instruction is a factor in the choice of

IT, the more likely is the form of instruction characterised by an emphasis on individual learning, a lack of personal interaction and more distance between and amongst students and tutors. The high drop-out rate of DE suggests that individual learning is more difficult than traditional education. If IT thus leads to the provision of access to an education that is more difficult to complete, an examination as to how this change affects the chances of success for particular groups of students, namely those who are poorly-prepared for HE. This assessment will be important in the next chapter of this thesis.

Measurable outcomes of those who manage to complete a course may be equal to those contact institutions impart, as claimed by Russell (1997). The physical studying community in traditional institutions, however, further composes part of the cultural experience of higher learning. This experience is not related to measurable outcomes of instruction. It is, however, closely related to the human experience of learning therein. It is thus not possible to claim that the outcomes of DE are equal to those of residential education, because of unquantifyable factors in face-to-face learning.

In sum, a micro-level impact of IT appears to be a change in the nature of learning from a, at least partly, communal experience to an almost entirely private experience. Proponents frequently imply a superficial and incomplete definition for knowledge and learning. Substantivists, in opposition to this, argue that a definition for learning must be applied which addresses the human aspects in it, the educational and cultural value of personal interaction in particular. Independent learning is an important theme in the advocative educational technology literature reviewed for this thesis and the process of learning, as a fundamentally human experience, rarely of concern.

Above, the assessment was made that there is a relationship between the reasons for choosing IT to facilitate instruction and the form of tuition. Similarly, where IT adds to the expenditures of HE-institutions, IT itself is likely to have an effect on the way in which HE is organised. We can thus expect that if, in opposition to the claims made by proponents, IT does not reduce the cost of HE, but adds to it, IT will itself have an effect on the form of instruction. Some substantivists claim that the cost of IT significantly adds to the expenditures of HE-institutions and suggest that this cost leads to the commodification of HE.

---

[26] At the time this thesis was written the IT-initiatives at the University of Stellenbosch were still at an early stage and could not comprehensively be evaluated.

3.3 The commodification of HE

A number of interrelated developments, all a reflection of a heightened phase of capitalism, are believed to be central in the commodification of HE (Slack, 1984: 249; Lyotard, 1984: 45-51 and 148-149; Noble, 1998). This phase is said to find its main resource in the exploitation of information and knowledge for economic growth and is characterised by an emphasis on wealth creation through science and technology. This focus is believed to integrate HE into the economic system like never before and lead to its commodification. David Noble (1998) has formulated this fear as follows:

> "What is driving this headlong rush to implement new technology with so little regard for deliberation of the pedagogical and economic costs and at the risk of student and faculty alienation and opposition? A short answer might be the fear of getting left behind, the incessant pressures of 'progress'. But there is more to it. For the universities are not simply undergoing a technological transformation. Beneath that change, and camouflaged by it, lies another: the commercialization of higher education. For here as elsewhere technology is but a vehicle and a disarming disguise." (Noble, 1998)

In the substantive perspective, IT induces a thorough re-organisation of HE. It does this by requiring HE-institutions to find ways to recover investments made in IT; by allowing HE to be embodied in commercially produced educational technology which is consequently marketed and sold; and, finally, by reinforcing the emphasis placed on applicable skills needed by industry and commerce. This commodification is consequently believed to lead to a significant disadvantage of the third world and to its exploitation by industrialised countries.

3.3.1 Cost of IT

Proponents of IT frequently assert that IT can make education more cost-efficient (Orville, 1996; AVU, 1995). The belief that multimedia technology can in fact assist in making education more cost-efficient is, even though widely assumed, not clear. In order to assess this question, it is necessary to understand that the costs of IT are not confined to the acquisition of the hardware, as explained in an Educom-publication (Alvarez, Barone, McClure, Ringle, Stuckey, West, 1996):

> "Technology costs money, lots of money. The up-front cost of purchase is just the tip of the iceberg. Either we have not been totally forthright in the way we have presented the full cost of ownership to our campus financial planners, or those who have made the investment decisions thought that they were, instead, making one-time purchases. ... This problem is equally severe

> whether we are dealing with equipment on the desktop or the costs of operating, maintaining and enhancing campus infrastructure. ... To pay for it planners and managers, at all levels, must engage in the unpalatable exercise of budget reallocation. " (Barone, as cited in: Alvarez et al., 1996)

Societies have gone through major changes to be able to use technologies, as the road system, for example, impressively demonstrates. Similarly, IT requires a range of organisational, infrastructural, social and technical changes (Mackay, 1995: 45-46; Sherry, 1996; Plomp and Van Akker, 1994: 27). It is claimed, that it is necessary for educators to use new approaches, to invest in the training of personnel and in the installation of technical systems (TELI, 1996: 17). Preconditions further entail support structures, like the physical infrastructures, such as telecommunication lines, electronic networks and IT; the development of appropriate materials (TELI, 1996: 95-96); their transmission for residential and distance education (TELI, 1996: 1); skills needed to use technology in the learning situation, such as Information Literacy[27], Computer Literacy[28]; as well as the development of human resources to service technologies (ISAD, 1996: section 6), such as technicians (TELI, 1996: 14) and the training of teachers[29]; the establishment of a structure for public access to IT[30]; and, lastly, the development and transmission of electronic library materials (TELI, 1996: 49). This list is by no means a comprehensive account of the items which qualify for a calculation of costs on such a broad basis. A detailed account of all present and future costs of the use of IT is difficult to make, because numerous variables have to be considered in such a calculation. It may only become clear what costs actually accompany IT, once electronic learning materials have been developed and implemented, human resources have been trained, hard- and software has been developed and paid for, the recurring costs have been assessed and an appropriate social organisation of electronic learning has been developed and implemented.

Professor Whitaker (as cited in: Mellon, date unknown), asserts that the strongest advocates of the application of technology in teaching claim that the cost of teaching will be reduced. In opposition to this view, he claims that the literature shows little compelling evidence that costs have been decreased with the employment of IT (Whitaker as cited in: Mellon, date unknown). Gultig (1992) calls the idea to digitise, electronically transmit materials and save financial resources at the same

---

[27]See: TELI, 1996: 108-110; Darch, et al, 1996: 9; Doyle, as cited in Bruce, 1994: section 1.A; Mendrinos, 1994: 4-9.
[28]See: West; 1997: section 'background'; UCT, 1997; Haupt et al, 1997.
[29]See: ISAD, 1996: section 6.3.2; TELI, 1996: 56-57; West, 1997; Plomp & Van den Akker, 1995: 28; Plomp & Van Akker:, 1994: 27; Sherry, 1996.

time the "... search for a bargain, or blind faith in technology" (Gultig, 1992: 6). Williamson (1996) has argued that the need to invest heavily in IT may indeed increase costs, at least in the short run. Rushkoff (date unknown) and Becker (1996: 190-196) highlight that recurring investments are required to keep ahead of the rapid development of IT. Becker (1996: 192) claims that perhaps the greatest additional expenditure is smaller class sizes for technology-enhanced learning classes. Noble (1998) cites Kenneth Green, who claims that there are no indications that the total costs (including all realistically amortised capital investments and development expenses, plus reasonable estimates for faculty and support staff time) associated with teaching some unit to some group of students actually decline while maintaining the quality of learning.

Substantivists argue that IT considerably adds to HE-expenditures and forces them to raise funds elsewhere. Noble (1998) cites the example of the University of California in Los Angeles (UCLA) to reinforce this view. Here the high costs for IT prompted the administration to raise the fees for tuition and to privatise parts of the IT-facilities on campus (Noble, 1998). In this example, IT-facilities in educational institutions thus become a commercial venture. Such a privatisation is significant when IT becomes a central tool for the attainment of a higher education.

Institutions who have invested heavily in their IT infrastructure are desperate to secure some returns on their investments (Noble, 1998). In some instances where this market materialises too slowly, institutions have created it by forcing students and faculties to use, and hence consume, the hardware, software and content as a condition for getting an education, no matter what their ability to pay might be (Noble, 1998).

One significant aspect of the commodification of HE derives out of the practical need to pay for IT. This assessment suggests that in countries where the cost of IT is particularly high, such as most developing countries, HE-institutions may be particularly prone to such a development. The commercialisation of HE is further feared to derive out of the saleability of instruction which is embodied in educational technology.

Substantivists, as well as some educational experts, are thus fundamentally in doubt about the ability of technology to decrease the cost of HE. Instead, substantivists argue, IT places institutions under great financial pressures and incites them to increasingly produce saleable products, which materialises, amongst others, in the form of educational technology.

---

[30]See: TELI, 1996: 114-116; ISAD, 1996: section 5.4.1; Orville, 1996: section 68; AVU, date unknown.

3.3.2 Educational technology and the commodification of higher learning

A major change which universities have experienced over the last two decades relates to the identification of the campus as a significant site of capital accumulation. This change has resulted in the systematic conversion of intellectual activity into intellectual capital and, hence, intellectual property (Noble, 1998).

When technology is being utilised for the purpose of instruction, software packages are developed. Such educational software is expensive to produce and therefore these products are extensively used and widely marketed (Solomon, 1994; TELI, 1996: 105-106; Bates, 1995: 190; Noble, 1998). The perceived need to increasingly utilise electronic materials generates an industry for the production of such materials in which the universities as well as a great number of private institutions are central players (Noble, 1998).

More generally, it has been observed that an increasing emphasis is being placed on research for application, called Mode 2 knowledge production (Gibbons et al, 1994: 4). While disciplinary knowledge is public knowledge and a public good, Mode 2 or transdisciplinary knowledge "... is usually for a client and is therefore private." (Muller, 1996: section 6). Mode 2 knowledge production is the outcome of a process in which supply and demand factors are said to operate (Gibbons et al, 1994: 4). Knowledge in Mode 2 is thus a marketable product. A tendency to produce such knowledge has been noted, particularly in relation to technical subjects:

> "Research carried out in the context of application might be said to characterise a number of disciplines in the applied sciences and engineering - for example, chemical engineering, aeronautical engineering or, more recently, computer science." (Gibbons et al, 1994: 4)

The research into and production of educational software is an attempt by institutions of higher learning to produce a saleable educational product. According to the definition for Mode 2 knowledge production given above, educational software appears to have similar properties.

Noble (1998) cites the example of UCLA, where the content of electronic materials produced by staff is being appropriated by the administration and consequently sold to other institutions. UCLA recently forced staff to place their coursework, ranging from syllabi and assignments to the entire body of course lectures and notes, at the disposal of the administration where it is to be converted for online access (Noble, 1998). It is to be used in UCLA's Home Education Network, a university-sponsored for-profit corporation established in partnership with the Times Mirror Corporation, publisher of The Times (The Los Angeles Times, January 19, 1998). This example

suggests that the commercial sale of such software is one of the main incentives for their production.

In turn, educational technology provides the possibility for students who wish to further their education, and who, in the past, would have taken courses subsidised by the state or provided by skilled private tutors, to buy their education in the form of commercially produced and sold programmes. Where learning comes in the form of data delivery, such as electronic learning software, it may be a commodity sold as a packaged product, and its acquisition may confer privileged social status (Ranson, 1994: 94). Like this, substantivists argue, education will become a commodity which consequently conforms to the rules of the market (Simpson, 1991).

The rule of the market is heavily criticised by Ranson (1994: 93-97). He contends that the market is a crude mechanism of social selection that provides social engineering in favour of the privileged few (1994: 96). It is based on the wealth available to families, a factor which implies that equality of access may, in this setting, become increasingly unlikely, because to lack resources is to be disenfranchised from the polity of the market (Ranson, 1994: 95). This issue is particularly relevant in relation to the increasing need for high-level skills in the economy.

3.3.3. Skills for industry

Higher education has become a major source for highly skilled human resources required by the present phase of economic development (See: AVU, 1995; West, 1997; TELI, 1996: 10-11; ISAD, 1996: section 6.3.3; HEWP, 1997: section 1.14.). Substantivists argue that the increasing use of IT in society intensifies this development by necessitating lifelong learning and the constant reconfiguration of IT-skills (Noble, 1998).

They further assert that the emphasis placed on IT-skills is an expression of the calls to make education 'more relevant', by imparting 'competencies' and 'transferable skills' which will make students more effective and efficient employees (Packer, 1997; Christensen, 1997; Haupt et al, 1997). In a world where IT is increasingly being used in workplaces, a central skill necessary for industry is Computer Literacy (CL). Goodson and Mangan (1996: 68) question the push for a computerisation of education as a value-neutral, technological necessity of modern life. They are concerned about the ideology of computer literacy as a need motivated more by the needs of business and industry rather than by its inherent educational worth. To examine computer literacy as an ideology suggests that it is not merely a neutral descriptor, but the manifestation of a belief system. This belief system constitutes the ideology of CL.

It is based on the notion that IT is going to be everywhere in the future and that, therefore, the educational system needs to prepare the future workforce for the use of IT. Analysts, however, also criticise this notion as taking part in a rationale about education that derives out of a primarily vocational tradition, as opposed to the developmental tradition (Goodson et al, 1996: 69). Goodson and Mangan (1996: 69) describe the difference between the vocational and the developmental traditions of higher education as lying in the skills they attempt to teach. While the developmental tradition selects forms of knowledge for their importance to the learner's cognitive and affective development, the vocational tradition stresses the occupational destination and the skills needed by industry.

Not all analysts believe that the needs of industry should define the curriculum. The value of education may also be defined very differently. It may place emphasis on education for polity, the transmission of culture and morality or on the needs of the social, cultural and cognitive development of individuals (Goodson et al, 1996: 72; Ranson, 1994: 4-5; Postman, 1992: 181-199; Lyotard, 1984: 25-27). Substantivists usually criticise the instrumental perspective on HE, as explained in chapter one of this thesis, as neglecting such skills (Postman, 1992; Lyotard, 1984; Torres, 1996).

The state, however, has a marked interest in the development of a skilled workforce. Nel (as cited in: de Villiers, 1993: 205-206) asserts that the state is in the final instance as strong or as weak as its economy; the economy is dependent on the number and quality of the state's workforce; the quality and quantity of the workforce is dependent on its education; and finally, the economy is therefore only as strong as education can make it. This is an assessment of the dependence of the power of the state on its economy in which people are reduced to instruments for economic growth and the expansion of state power.

The advance of practical disciplines such as Management, Business and Computer Science, and the retreat of disciplines which find it hard to produce economic performance indicators has been noted in this context (Lyotard as cited in: Webster, 1994: 184). This shift is closely connected to the notion that the connection of subjects concerned with questions of culture and morality, such as the humanities, to the economy is much weaker than with the technical subjects (Gibbons et al, 1994: 95). In the substantive perspective, the increasing use of IT in HE reflects this emphasis placed on vocation and skills needed by industry.

Ranson (1994: 10) stresses that the different functions of education, the vocational and the developmental, do not always sit together easily. The rigorous pursuit of one function, such as, for

example, technology and business education, may divert schools, or institutions of higher learning for that matter, from other functions, such as music and art teaching (Ranson, 1994: 10). Torres (1996: 203) claims that a focus on the economic role of higher learning unavoidably lead to a negligence of other aims. This theory implies that the economic function of which HE clearly has must be rejected altogether. Due to the fact that the economy is an important element in society, this approach is unrealistic and cannot guide policy formulation with respect to the functions of HE.

White believes that the aims of HE should vary, reflecting the many different goals that students have in mind (White, 1997: 13). Feenberg (1996: section 6) cites Habermas who concludes that every legal system is not merely a reflection of universal content of human rights, but is equally an expression of a particular form of life. Education is also not merely a reflection of the economic human resource needs of a country, but a reflection of the values a country wishes to impart to the next generation (Ranson, 1994: 3). In question is thus, whether the concept of the Learning Society, discussed in chapter two of this thesis, accurately captures the values which coming generations ought to obtain in their higher education.

In sum, substantivists paint a grim picture of the effects of IT on HE. They assert that IT-facilitated education is delivered in the form of commercially produced software and has to be accessed in privately managed IT-facilities in the HE institution, indicating that IT induces a development where private funds determine the extend as to which students gain access to HE. Participation in the economy requires a HE, access to HE is determined by private funds and "... institutions survive according to their capacity to discover and adapt to their distinctive social environments: that is, social class settings." (Ranson, 1994: 94). Such a development must essentially reinforce existing inequalities.

Substantivists thus claim that IT is ideological, as it changes the philosophical basis of HE. IT, they claim, makes HE particularly respondent to one principle, namely the performance principle (Lyotard, 1984; Noble, 1998; Borgmann, 1984). IT re-orientates HE according to its own agenda or ideology, which is characterised by an emphasis on economic, financial and material gains, rather than moral, social and political demands. The performance principle is examined in greater detail below.

3.3.4 Higher Education and the performance principle

For substantivists IT substantially changes HE. It brings the appropriation of the performance principle and the rejection of an all-encompassing metanarrative therein about (Lyotard, 1984). Substantivists have argued that the increasing reliance of HE on IT necessarily leads HE to submit to this agenda of technology.

Lyotard (1984: 32-34) has explained that the pursuit of knowledge, as practised in universities all over the world, used to be reliant on and legitimised by a metanarrative; an ideology or philosophy. The idea that the spread of new domains of knowledge to the population was achieving more freedom for the people in France in the beginning of the 19th century, or the pursuit of knowledge in the former eastern block, carried out under the banner of socialism and for the achievement of a classless state, were such metanarratives (Lyotard, 1984: 32 and 37). Universities used to be founded on such speculative ground, that is to say they were fundamentally philosophical (Lyotard, 1984: 33).

With the upsurge of technology, capitalist renewal and prosperity, however, this principle has been eroded and metanarratives are being replaced by a new ideology that emphasises efficiency and economic performance (Lyotard, 1984: 38-39; Gibbons et al, 1994: 109). They are being replaced by the idea that humanity progresses itself through the advancement of science and technology. Universities are, in the new paradigm for HE, set to limit themselves to the transmission of what is judged to be established knowledge and the speculative or humanistic philosophy is forced to relinquish its legitimisation duties for HE (Lyotard, 1984: 39 and 41).

Substantivists criticise the new paradigm of HE for merely providing more material wealth and wealth is narrowly defined as allowing more people to spend more money on more products (Borgmann, 1984: 81). Borgmann (1984: 106) suggests that the very idea that technology actually serves to enrich society is utopian because of its employment for the creation of material wealth. He thus contests the benefit of a progression towards more material wealth altogether and questions the basis of economic progress, namely the production and consumption of industrial goods and commodities. This is the motivation behind the urge to enhance the economy. In Borgmann's scenario, technology merely provides for more consumption and for commodities. It thus firmly operates within the capitalist perception of progress through material gain.

Substantivists argue that this motivation coerces societies to the application of IT as an imperative. For them, this imperative to use IT means that inevitably, individuals and society must serve the

requirements of the technical system and suspend ethical judgement or social control (Chandler, 1995: section 7). Efficiency and performance, Lyotard (1984: 46) asserts, have no moral obligation; a technical move is good when it does better and expends less energy than another. Such an approach places people as particular kinds of subjects to technology. It places people in a particular relationship with technology, as particular kinds of entities. That place is the place of a user. People become users, the creator or actor is relegated to the irrational. People are creative reactors in a system where the priorities of economic and technical progress are loosing their connection with the human dimension (Slack, 1984: 252). One substantive impact of the increasing use of IT in HE lies in the loss of moral obligation and the dismissal of social aims.

Substantivists assert that the technical and economic reasons for the advancement of IT mean that IT is advanced for its own sake. The means become the ends and ethical and social reasoning is suspended in the pursuit of the aim of increasing efficiency. They fear that growing inequality is likely to characterise the Learning Society, not merely in relation to access to HE, but equally amongst higher education institutions and economies around the globe, precisely due to the loss of a moral obligation.

The advancement of IT for its own sake means that an increasing diffusion, the sale and use of more IT, must be one of the main issues of interest for technological determinists. The problem in the advancement of IT and the associated industries is that they are primarily situated in industrialised countries. As highlighted by Gibbons (et al, 1994: 118), these industries are the engines of economic growth at present and they, therefore, constantly seek new markets for their products. The result of the increasing use of IT is feared to be the continued exploitation of the third world (Hornborg, 1993: 38).

3.3.5 IT, economic progress and global inequality

Substantivists assert that IT induces a process in which developing countries are fated to remain at a disadvantage. They reject the notion of leapfrogging and argue that:

> "Previous capital is needed to produce more capital, previous knowledge is needed to produce more knowledge, skills must be available to acquire new skills, and a certain level of development is required to create the infrastructure and the agglomeration economies that make development possible. In summary, it is within the logic of the dynamics of the system that the rich get richer and the gap remains and widens for those left behind." (Perez and Soete, 1988: 458-459)

The existing inequality between the first and the third world is feared to be reinforced by technology and its constant development. This problem, they argue, comes about through the dynamics of a system which relies on technology to achieve economic growth because the backlog of the third world, in terms of their human resources, infrastructures and technological assets, necessitate them to stay behind.

Hornborg (1993: 38) has emphasised that this economic system, which underlies the increasing use of IT in higher education, is geared towards the exploitation of industrial peripheries. In his scenario, wealth creation primarily refers to increasing the wealth of industrial centres. Rather than for wealth creation, he asserts, third world countries are being geared up for a new phase of economic exploitation. Due to the fact that third world countries have to purchase these products in industrialised countries, they foster further economic development there and remain dependent on the latest technologies, developed and produced in the industrialised countries (Hamelink, 1997). The advocation of IT, in his view, merely reflects the need for industrialised countries to find new markets for their products (Hornborg, 1992: 2-3). The AVU thus, in this view, does not reflect social progress through education, but the creation of a new cadre of consumers for IT and related products.

Concrete examples for the way in which the increasing use of IT in third world countries stands to primarily benefit the industrialised countries can clarify the dynamics of this system. By way of looking at the countries that are mainly involved in producing IT and related products, such as software and telecommunications, the beneficiaries of the increasing use of IT in HE can be pinpointed. The twenty leading IT-companies been listed by Hamelink (1997) and are located in industrialised countries, such as Japan, the USA and Western Europe[31]. SA merely produces 5% of the IT used here while 95% of IT hardware and components are imported (Hodge and Miller, 1996: section 2.1.2). These figures suggest an obvious benefit of the increasing use of IT all over the globe for few countries and their IT-industries.

Another example relating to the increasing importance of centres of excellence, located in industrialised countries, is the increasing intellectual leadership brought about by the increases in communication channels. Gibbons (et al, 1994: 130-131) claims that an international assimilation process amongst the institutions of higher learning world wide is the result of the increases in communication between HE-institutions. Rather than a reduction of the importance of physical

location, Gibbons assessment below suggests that physical location is becoming more important in determining the status of higher education institutions world wide:

> "The ability to transmit information cheaply, and almost instantaneously throughout the world, does not seem to be leading to a more equitable distribution of scientific competence; rather, it is increasing its concentration. ... Scientists and technologists from peripheral areas of institutions will experience pressure against working in native languages, or on questions different from those attracting attention in the main centres. They will be measured against their peers in these centres, not against those in their own institution or region (Goonatilake, 1984). There will be less reason to spread human and technical resources geographically." (Gibbons et al, 1994: 130-131)

A focus on few centres of excellence suggests that approaches, publications and techniques emanating from these centres may receive increased attention in the scientific communities. The professional expertise collected by these institutions may thus attract increased attention while other institutions may find themselves more on the periphery than ever before. This assessment applies to international professional expertise which can be brought into higher education institutions around the world with the increasing utilisation of the communication channels provided by IT (Forge, 1995: 21). Geographical position may thus, in fact, become more important, as a standardisation process amongst higher education institutions world wide is invoked by the increasing communication between them.

Paul West (1997) and Simon Forge (1995: 24) have noted a trend towards an increased and global competition of electronic education. In an international marketplace for electronic higher education, institutions must thus compete with the centres of excellence in the world. This competition means that there is a greater chance that this system segregates according to wealth and reinforces inequalities between the rich and the poor. People who can finance a first world education will be able to access prestigious international institutions, while those without funds remain confined to local institutions.

In sum, substantivists thus assert that IT induces substantive change in HE. It is an important element in the re-orientation of HE towards the creation of knowledge, skills and technology with economic value. Philosophical and humanist principles, they fear, will be left behind with the loss

---

[31] With the exception of South Korea and its IT-company Dewoo which ranks number nine of the leading companies of the IT-industry (Hamelink, 1997).

of moral obligation being an important result. Substantivists further emphasise that IT-based industries are the engines of economic growth in industrialised countries at present. They conclude that the creation of markets for IT and associated products is an important incentive for the advocation of the increasing use of IT in HE.

3.4 Discussion

In the substantive perspective, IT is fundamentally ideological. It has an agenda that is revealed in its impact of HE on a micro-level and a macro-level. On the micro-level, substantivists examine IT in the particular functions it supports. In these functions, IT changes the content and form of HE. IT, it is claimed, supports the transmission of established knowledge and inhibits the negotiation of meaning. This is believed to lead to an emphasis on subjects which are occupied with imparting well-established facts, rather than those which teach values, morality, culture, philosophy, social and cognitive skills.

There are indications that in order for students to emancipate themselves from dominant viewpoints and become more independent and critical participants in society, it is necessary for them to have access to a physical studying community. IT further tends to remove the social component in HE. This thesis has argued that this social component is an important element in the human experience of learning because it allows students to understand the different perspectives on the way the world works.

IT further changes the form of conducting HE by placing an emphasis on independent forms of learning. IT thereby reinforces the subject imbalance outlined above. In its support of independent learning, IT further makes higher learning more difficult by its tendency to remove face-to-face contact and individual student support. The fact that individual learning is more difficult than traditional education is reflected in the high drop-out rate of DE-institutions in particular. This realisation will be important in the evaluation of IT for the teaching of poorly-prepared students below.

IT is feared to reinforce the process of transformation that HE has been undergoing since its discovery as a significant site for capital accumulation in the 1970's. This transformation is feared to result in the commodification of HE, with access according to wealth as a result. IT reinforces this development by placing great financial pressures on HE-institutions, necessitates them to recover expenditures from elsewhere and makes HE more expensive. The recovery is feared to result in higher tuition fees for students, the privatisation of parts of HE-institutions, such as IT-

facilities, in an emphasis on the production and sale of education embodied in technology and a renewed focus on economically valuable skills and thus also saleable skills. It can be expected that the likelihood of such a development increases with an increasing proportion of the budget being spent on IT.

These developments are what Lyotard (1984) has called the application of the performance principle in HE. It entails the rejection of an all-encompassing philosophical metanarrative guiding HE and its emphasis on outputs that add to economic performance and wealth creation. The lack of moral obligation is feared to be a characteristic of HE when guided by the performance principle.

Knowledge is, in the substantive view, thus profoundly being changed, as it is being produced almost exclusively where it can be justified on grounds of efficiency and effectiveness. Where scientific information is justified on the grounds of performance and produced for the market, it has become a moment in the circulation of capital (Lyotard, 1984: 45). The State and the civil society are, in this view, abandoning the idealist and humanist narratives of legitimisation in order to justify the new goal under this principle (Lyotard, 1984: 46).

The new paradigm is one pertaining not to the true, the beautiful or the just, but to efficiency (Lyotard, 1984: 44). The old narratives are, in the substantive view, no longer part of the driving force behind the interest of acquiring knowledge (Lyotard, 1984: 51). The motivation is technology, wealth and power. The overt question asked in the new paradigm is no longer: "Is it true?", but "What use is it?" or "Is it saleable?" or "Is it efficient?" (Lyotard, 1984: 51). Where the saleability of outcomes is the main determinant for the direction of development of higher education, it may not be surprising that the services higher education provides, the skills it imparts and the research it produces, are equally judged using this criterion. Scientists and technology are thus not employed to find truth, but to boost performance. Technology enhances performance, provides wealth, and wealth in the capitalist system is power.

The lack of moral obligation in the new paradigm of HE is reflected in the accessibility of IT-facilitated HE according to individual wealth. When IT is a central tool in higher learning and access to IT is determined by individual wealth higher learning is segregated according to financial potency. This problem is particularly fierce in an economic paradigm where high level skills are a significant factor for finding employment. Such a system thus provides no opportunity for social upward mobility and reinforces class divisions.

Substantivists claim that the main beneficiaries of the increasing reliance of HE on IT will be located in the industrialised countries, as they are the main producers of IT and related products. This assessment is based on the belief that developing countries will continue to lag behind in the economic development process. The lack of a widespread availability of infrastructures, technologies and human resources in the third world destines them to remain in a relationship of dependency with industrialised countries. The third world is, in this view, merely a market for IT products and the AVU merely a sales centre for first world educational technology, IT and professional expertise.

The belief that the employment of IT necessarily leads to the commodification of HE is, however, questionable. Social action, such as funding policies or student strikes may play a significant role in determining such issues in HE. In order to gain a better understanding of the social influence in change, such social action needs to be taken into account. Technologically determinist authors, such as some substantivists presented in this chapter, tend to neglect such factors.

In chapter one of this thesis, the assessment was made that a dialectic process between technology and society determines change. In terms of this assessment, a causal connection between the use of IT in higher learning and its commodification cannot be easily justified. While the substantive criticism argues for the existence of this threat, the implementation of social policies may be able to avert some of the negative effects which substantivists ascribe to the use of technology in HE. The approach of South African policy makers with respect to aims and goals for the transformation of HE is examined in the following chapter and consequently related to technology.

Chapter 4: South African higher education in crisis

In the theoretical discussion of technology, found in chapter one of this thesis, the relationship between technology and society has been described as dialectic. According to this assessment, socio-culturally determined aims and goals, technological opportunities and technological limitations are interrelated and interdependent. Socially-determined aims and goals thus need to be examined and, consequently, related to the opportunities and limitations of technology, discussed in chapters two and three of this thesis. The aim of this chapter is to relate these impacts of IT to the socio-culturally determined aims and goals for the transformation of HE in SA.

4.1 South African policy approaches

In SA publications on technology, the belief has been voiced that society can use technology to meet the aims and goals of society (FRD b), 1995: 6; Technology-enhanced Learning Investigation (TELI), 1996: 16-19; Science and Technology Green Paper (STGP), 1997; section 3.4; Information Society and Development Conference (ISAD), 1996: section 6.2.2; Higher Education White Paper (HEWP), 1997: sections 2.60 and 2.62). This belief is based on the idea that society can influence effects of the use of IT in HE by the values; policies and frameworks that govern its implementation.

4.1.1 Theoretical approaches to IT in SA

The Information Society and Development Conference-paper (1996: section 1.2.3) claims that technology is not neutral. It must consequently have effects over and above those intended. On the micro-level, the ISAD (1996: section 1.2.3) and the Technology-Enhanced Learning Investigation (TELI, 1996: 16-17), initiated by the South Africa Education Department, associate negative effects of IT to the designs of particular applications. They consequently claim that, on a micro-level, there are unintended impacts of the use of IT in HE. The TELI (1996: 107) has equally voiced its disbelief in the neutrality of technology and has expressed the idea that the use of IT in HE:

> "... can and often does impact on a number of socio-political factors like access to and ownership of information, power relationships, economic benefit and dependency, and cultural dynamics." (TELI, 1996: 107)

This assessment implies that the TELI-investigation suggests that there is furthermore a macro-impact of the use of IT in HE, as IT is believed to have negative effects on socio-political factors.

TELI (1996: 16) also asserts that the implementation of IT must be made on the grounds of appropriate decision-making and implies that some negative effects can be avoided by use of this approach. The TELI (1996: 9) advances the idea that the political aims and goals for the transformation of the South African HE-sector represent the appropriate political framework to guide the use of IT in HE. This belief is formulated as follows:

> "Any discussion about the use of technology in education and training in South Africa must locate itself within the ambit of goals of transformation, reconstruction, and development set out by the democratic government, and by the Ministry of Education in particular." (TELI, 1996: 9)

The ISAD (1996: section 1.2.3) advances the notion that rather than emphasising efficiency and effectiveness, the key criteria of those implementing IT in HE should be on social acceptability, appropriateness and sustainability. Here lies the central conflict of the use of IT in HE, in the question whether an increasing emphasis on the efficiency of HE can be avoided with the increasing use of IT therein or whether IT, in fact, amplifies the need to become more efficient.

The SA policy documents which are explicit about their theoretical approach to IT thus advance the notion that that (a) IT has effects over and above those intended and that (b) the reasons for the use of IT and the consequent implementation thereof are important factors determining effects of the use of IT in HE. It is thus claimed that, while IT affects higher learning according to its own agenda, society can employ human- and socially-oriented principles to guide the implementation of IT and can, like this, avoid many negative effects of its use in HE.

This assessment suggests the need to, firstly, examine and debate the aims and goals for the transformation of HE, as formulated by South African policy makers in relation to IT. This chapter consequently questions to what extend a greater reliance on IT can, in fact, be socially determined and to what extend the dynamic of IT affects society. In this chapter, it is argued that the use of technology in South African HE-institutions is likely to result in significant changes, such as an increasing emphasis on economically valuable skills, more independent learning and greater inequalities between HE-institutions in SA and of access to HE. This assessment is based primarily on an examination of the costs of IT and the lack of funds for their appropriation and maintenance by HE-institutions.

4.1.2 Aims and goals of South African HE-policy

In order to be able to examine the question in how far technology determines society in spite of socially determined organisation of HE, it is necessary to be clear about the aims and goals of HE in SA. The South African HE system is fundamentally characterised by its recent history, the legacy of apartheid and the inequalities which this system fostered (Theunissen, 1997, HEWP, 1997: section 1.1, NCHE e), 1996: 1). The first part of this chapter is an examination of this problem.

Equity of access in South Africa

The demand for equity of access derives out of a historically-determined process, namely the struggle against apartheid and for democracy in South Africa (Theunissen, 1997). Policy formulation in SA is unambiguous with respect to the achievement of more equity of access as the need to expand access to disadvantaged students in particular is clearly stated (HEWP, 1997: section 1.4). A number of commentators who have published on the question of inequitable access and opportunity appear to agree that the expansion of access to HE is particularly important for those previously excluded from the Historically-White Institutions (HWI) for higher learning, because these institutions provide a HE of a higher quality (See: NCHE b), 1996: 5; Hofmeyr, 1995: section 6; UNISA, date unknown: section 4.3; Garbers, 1992: section 2; Choksi, 1994: 2-8; Thomas, 1996; Mwabu and Schultz, 1996).

In order to assess equity of access, this concept needs to be clearly defined. A classical liberal idea of equity in the context of a scarce resource is equality of opportunity (Bunting, 1994: 243). Equality of opportunity can be perceived to be reached when the same access restrictions for all applicants exist. Such an approach falls short of considering other factors that restrain people from a participation in HE, like financial and geographical restraints as well as prior education.

In SA the levels of primary and secondary education vary considerably (HEWP, 1997: section 2.32). There is a marked racial gap between levels of preparation for HE. This disparity derives out of the chronic underfunding of black education in the apartheid era, and the effects of repression and resistance on the culture of learning and teaching. These factors have "... seriously undermined the preparedness of talented black students for higher education." (HEWP, 1997: section 2.30). Theunissen (1997) clarifies the relevance of equitable access policies by explaining how denial of access to education has been used in the past by highlighting that:

> "Knowledge -- the product of education -- has .. been regarded as a form of power and consequently has been (and is being) used to structure political and social relationships within a state. .. examples include `Bantu' education which existed in South Africa and was specifically designed to place black Africans on an unequal footing with their white counterparts as regards power through knowledge. This approach was also followed by the Nazi government in the territories it occupied in Eastern Europe during the Second World War -- official policy in this case was to provide sufficient education only to maintain a functionally literate population that would be suitable as a source of cheap labour." (Theunissen, 1997).

The inequitable levels of primary and secondary schooling are important, because they advantage whites in particular over other population groups. The SA Government consequently perceives that equity of access will be reached when the composition of the student body and of its graduates reflect the composition of the population as a whole (HEWP, 1997: sections 2.24). This aim entails the recognition that equity of access must be complemented by a concern for equity of outcomes. Redress and equity should consequently be advanced with an understanding that measurable progress toward improving quality and reducing the high drop-out and repetition rates of disadvantaged students in particular must be achieved (HEWP, 1997: section 2.29).

High entry restrictions, the method by which higher education institutions have this far ensured the admittance of well-prepared students (Young and Maaga, 1995: section 3), is said to retain the preferential treatment of scholars advantaged in primary and secondary schooling, who are most predominantly whites (Wolpe and Barends, 1993: 4-6). It has been argued that simply deracialising, while maintaining high admission criteria, in fact, continues to disadvantage those ill prepared for HE due to apartheid policies, and represents a hidden barrier to achieving equity in HE (Wolpe and Barends, 1993: 4-6). High admission criteria will thus most likely continue to exclude people along the lines of race. A mere focus on the quality that is guarded by fierce entry restrictions is thus not perceived to be satisfactory in terms the political objectives in South Africa.

Commentators, such as Brooks (1996), however, also appear to believe that equity is a concept that is misplaced in HE. Brooks (1996: 190) believes that the value of universities lies in the pursuit of truth and the creation of an educated elite. The composition of the student body and equality amongst applicants lies, in his view, in contradiction to the retainment of standards. Equality of access should thus be secondary to the preservation of a high quality (Brooks, 1996). The discussion around the question whether this fear is unfounded or reasonable is, however, not in question in this thesis, because it is assumed that the massification process is a given due to

economic, demographic, political and moral reasons which all suggest an expansion of HE and an increase in the admittance of previously disadvantaged students to HE institutions. Brooks (1996) approach insufficiently addresses the historical, moral and political reasons for the expansion of access to higher education for black and coloured people in particular and must be rejected.

The commitment to increase the number of poorly-prepared students in institutions of higher learning requires a consideration of the disparities with respect to prior levels of study. This is required to enable disadvantaged students to successfully complete a HE. The problem of poorly-prepared students is most notably addressed in SA by way of bridging programmes (Zuma, 1995; Kotecha, 1995). Bridging programmes are additional educational programmes that aim at assisting students from disadvantaged backgrounds in reaching levels similar to other students.

The disadvantage which Bantu education has imposed on the majority of South African students is reflected in the student profile of higher education. One of the requirements for equity is revealed in the statistics on student access to higher education by race. In SA overall student enrolment lay at 15% in 1993 (FRD c), 1996: 32). These 15% were composed of:

Table 1: Student enrolment in HE by race (1993)

Race	**% enrolment in HE**
White	49%
Indian	7%
Coloured	5%
African	38%

(Source: FRD c), 1996: 37)

These figures must be seen in relation to the demographic composition of the South African population. The population figures were estimated at 12.8% White, 2.6% Indian, 8.6% coloured and 76% black (NCHE b), 1996: 26, FRD c), 1996: 29). Compared to the composition of the population, there is thus a clear over representation of Whites and Indians, while Coloureds and Africans are under represented. The racially skewed composition of the student body is thus one of the characteristics of the HE system in SA and equity of access thus needs to place a particular focus on the achievement of greater participation rates of these groups.

Inequalities of education with respect to race can furthermore be found between the different institutions. While the Historically Black Institutions (HBI) were comprised of 97% of Africans and 1% each of Whites, Coloureds and Indians in 1995, the HWI consisted of 66% Whites, 23% Africans, 7% Indians and 5% Coloureds (FRD c), 1996: 46). Great differences in terms of the composition of the student bodies thus furthermore exist amongst the different institutions of higher learning. Due to this fact, a central component of SA HE-policy is further to "... ensure that inherited inequalities between the historically black and historically white institutions are not intensified, but diminished." (HEWP, 1997: section 2.19).

SA policy formulation thus advances a social objective, namely equity of access to and more equality amongst HE-institutions, as an important goal for the transformation of HE. This objective means that a moral, political and essentially also philosophical metanarrative is to guide the transformation of HE. With respect to the technological imperative, as described in chapters two and three of this thesis, it is thus of interest to examine how IT affects this social objective in the context of SA.

Purposes of HE in post-Apartheid SA

The South African government has defined four primary purposes of HE. These purposes are to:

- meet the learning needs and aspirations of individuals through the development of their intellectual abilities and aptitudes
- provide the labour market, in a knowledge-driven and knowledge-dependent society, with the high-level competencies and expertise necessary for the growth and prosperity of a modern economy
- be responsible for the socialisation of enlightened, responsible and constructively critical citizens
- engage in the creation, transmission and evaluation of knowledge (HEWP, 1997: section 1.2)

The purposes of higher education can be summarised as consisting of a number of personal, societal and economic functions. On a *personal* level, HE is to be the "key allocator of life chances" (HEWP, 1997: section 1.2), thus opening opportunities up for the individual, empowering and progressing them personally. On a *societal* level, it is to be responsible for the socialisation of enlightened, responsible and constructively critical citizens that support a democratic ethos, a culture of human rights, cultural tolerance and a humane, non-racist and non-sexist social order. On an *economic* level, it is to provide a knowledge-driven and knowledge-

dependent society with the high-level competencies and expertise necessary for growth and prosperity of a modern economy aspiring to global competitiveness.

A discrepancy between the human resource needs of the economy and the output of the HE sector has been named as one of the problems in HE. The HEWP (1997) explains in greater detail how this mismatch is to be understood. Here, it is argued that a focus on science, engineering and technology programmes is necessary to correct present imbalances, in particular, the shortage of trained personnel in these fields (HEWP, 1997: section 2.25).

> "Successful policy must restructure the higher education system and its institutions to meet the needs of an increasingly technologically-oriented economy. It must also deliver the requisite research, the highly trained people and the knowledge to equip a developing society with the capacity to address national needs and to participate in a rapidly changing and competitive global context." (HEWP, 1997: section 1.13)

The responsiveness to societal needs here clearly refers to the needs of the economy or the economic benefit of students, rather than the advancement of the individual cognitive, moral and social capabilities. Institutions for higher learning are to meet the needs of an increasingly technology-oriented economy, they are to enable SA to successfully participate in a global competitive context. Greater responsiveness to societal needs is also what the NCHE (a), 1996: section 1.3.2) calls the change in the curriculum towards the advancement of vocationally-based competencies and skills needed in the workplace.

Criticisms of the NCHE-report (a), 1996) have come from black academics who claim that the commission has not related higher education reform to aspirations for liberation. The commission is believed to have "... based its thinking on the 'western' values of self interest instead of the 'African' values of community ..." (Online Higher Education Review, May 12, 1996). Prishani Naidoo, president of the South African Universities-SRC, has also voiced this fear (Online Higher Education Review, April 28, 1996). Rather than criticising the recommendations made by the NCHE, Naidoo asserts, students are concerned about the ideological assumptions underlying the report of the NCHE (a), 1996). These assumptions are claimed to be based on a "... neo-liberal economic framework which works against the inclusion of the disadvantaged South African majority in higher education ..." (Online Higher Education Review, April 28, 1996).

The flaw in the basic assumptions of the commission is believed to lie in the acceptance of the notion that globalisation and international capital affect the South African economy. This notion

consequently leaves no alternative but to entrench an export-oriented and market-driven system that the HE-sector should feed by developing the necessary human resources. The fear that the emphasis placed on "'Relevance', 'growth', 'responsiveness', 'coherence' are now all used to clamp down on proposals for an education system which is critical, eclectic and strives for equality and social redress." (Online Higher Education Review, April 28, 1996). There is thus a marked fear that: (a) higher learning will focus on skills and competencies needed in workplaces and the economy, rather than to develop critical thinkers; and that (b) the emphasis on the market will sideline equity and redress in the transformation of HE in SA.

In terms of subject matter, the SA Government, however, claims that the focus on science and technology will not diminish the importance of programmes in the social sciences and humanities, as they contribute to knowledge production, particularly to the understanding of social and human development (HEWP, 1997: section 2.25). The economic imperative is, however, an important factor for higher education in SA, as the Draft Education White Paper (DEWP, 1997: section 1.2) and the HEWP (1997: sections 1.7-1.13) explain, in so far as this imperative is "... necessary for the growth and prosperity of a modern economy" (DEWP, 1997: section 1.2). These papers (DEWP, 1997: section 1.8; HEWP, 1997: sections 1.3 and 2.25) highlight that social aims, such as the needs of individuals, may not be neglected and should consequently be an integral part of any re-organisation of HE.

However, as Ranson (1994: 10) has pointed out, the integration of economically and socially centred subjects in HE presented by the HEWP (1997; section 2.25) might be contradictory where funds are scarce and a choice between subjects has to be made. Where departments compete for scarce funds, it can be expected that a focus on economic needs results in the preferential treatment of subjects that are believed to add to economic capacities, such as science and technology, rather than arts or humanities. The transformation process of HE in SA is, however, still at an early stage and the question whether this development will, in fact, occur cannot yet be evaluated using empirical data.

The HEWP (1997: section 2.25) clearly indicates that a greater emphasis on vocationally-based skills is necessary. It further implies that the economic function of HE is particularly important to the government, as an in-depth discussion and frequent reference to the economic imperative can be found in these papers. Reference to the needs of the individuals and to social the societal functions, on the other hand, is scarce in the authoritative publications reviewed for this thesis. The White Paper on Reconstruction and Development (WPRD, 1994: section 1.4.6) highlights the

need for an arts and culture programme, however, specific reference to higher education has not been made here. It is relevant to note that the question how the societal functions and individual needs are to be retained in a higher education system that is under great economic pressure is not thoroughly addressed in the main policy documents. Economic needs, however, compose a substantial part of policy formulation in this respect. The South African government thus highlights the urge to integrate economic and social aims, as the aims for higher education (as stated above) are multi-layered in purpose. They permeate society, economy and the polity as well as the experience of each individual studying therein (Ranson, 1994: 4).

The assessment of the functions and limitations of IT in learning, made in chapter three of this thesis, indicates that the emphasis placed on vocational skills may, in fact, be reinforced by the increasing use of IT in HE. A particular emphasis on those skills and subjects that IT tends to inhibit may be necessary in order for them to remain an inherent and important element of HE. These skills are critical thinking, the personal development of the individual in particular, and subjects which are occupied with the negotiation of meaning. With the increasing use of IT, it is thus necessary to recognise that IT may not support a genuine integration of the different aims of HE, but may, in fact, restrain them.

4.1.3 The dilemma of HE

A second significant political objective, which characterises the aims of transformation of HE in SA, is the urge to massify the HE-system. This objective is advanced due to economic and demographic realities. The social objective of equity of access to HE and the twin-objective of massification pose a significant challenge for the SA HE-system. This challenge derives out of the increasing cost of HE, which unavoidably accompanies its massification, and the threat of a declining quality of learning therein through the lack of funds available. In order to examine this challenge, firstly, the political, demographic and economic need to massify HE is examined; secondly, the problem of the cost of HE is assessed; thirdly, this development is related to the quality of HE; and, lastly, the perceived role of IT in this challenge is assessed.

Massification

A key feature of HE policy formulation by the NCHE (a), 1996: section 1.3.2) and the Department of Education (HEWP, 1997: section 1.13) is an expansion of student enrolments and diversification of feeder constituencies. The aim is to accommodate greater numbers of students; and these students are to be recruited from a broader distribution of social groups and classes (NCHE a), 1996: section 1.3.2). Most commentators and stakeholders appear to agree that the

expansion of access to HE is a necessary step especially for those previously excluded from the high quality higher education institutions, mainly addressed at the Historically White Institutions (HWI) (NCHE b), 1996: 5; Hofmeyr, 1995: section 6.; UNISA, date unknown: section 4.3; Garbers, date unknown: section 2).

The NCHE (e), 1996: 96 and a), 1996: section 1.4.1) cites demographic figures to show that the demand for HE is likely to increase over the next few years. It is asserted that in 1995 there were 800 000 students enrolled in HE and for the year 2005 the NCHE projects a participation rate of 30%, double the present number, which translates to about 1 600 000 students. Significant increases in student numbers are thus projected.

In the literature on higher education such expansion is usually described as a transition from an elite to a mass system, or as massification (NCHE a), 1996: section 1.3.2). Martin Trow (1973 as cited in: NCHE e), 1996: 90) has described the differences between three HE-systems as follows:

- Elite systems prepare up to 15 or 20% of an age cohort for a traditional set of careers in teaching, the higher civil service and established professions
- Mass higher education systems prepare up to 50% of the age cohort for a wide range of white collar occupations
- Universal access systems prepares even larger numbers for life in advanced industrial societies

Massification is more than simply the expansion of student numbers, as it also entails a series of concomitant changes, such as the diversification of programmes, curriculum's and qualifications; the introduction of multiple entry and exit points; new relations between study and the workplace; and shifts in institutional functions and missions (NCHE a), 1996: section 1.3.2).

A wide variety of policies are being pursued by the SA Government that aim to transform HE. Amongst others, these include outcomes-based education, the National Qualifications Framework, changes in student and institutional funding, and a variety of other systemic and organisational changes (See: HEWP, 1997; TELI, 1996; NCHE a), 1996). These policies are important in the transformation process, as they show that society implements measures, over and above the employment of IT, to make HE more accessible. These measures, however, don't necessarily directly relate to technology and, primarily due to limitations of space, this thesis will continue to concentrate on those factors that suggest that technology may determine HE.

Reasons for the apparent need to massify HE are further claimed to lie in labour market demands for high-level skills (NCHE, 1996: 8-9). Policy makers consequently assume that the

massification of HE is necessary for the economic upliftment of individuals as well as the nation as a whole (HEWP, 1997: section 1.3). The economic significance of an educated workforce is spelled out by the NCHE:

> "The comparative advantage in the late twentieth century had shifted from a position based on the exploitation of cheap labour to a position based on a high skill, higher value-added export-orientation." (NCHE b), 1996: 8-9).

Due to greater chances for finding employment an increasing number of the school leavers are expected to engage in some form of continuing education (Hofmeyr, 1995: section 6). The NCHE (b), 1996: 21) cites a study which reveals the trend towards higher skills in employment. According to this study 43% of South Africa's formally employed in 1971 fell in the lowest skill level corresponding to less than Std. 4 and only 11.8% fell in the highest level corresponding to degrees and diplomas. In 1994, just fewer than 25% of the formally employed were in the lowest skill level, and around 20% were now in the highest level. The NCHE summarises this development:

> "Additional perspectives on key trends in formal sector demand for skills come from another recent labour market study. Examining first the historical trend in skill distribution among the formally employed in South Africa over the period 1971 to 1994, this study affirms that:
>
> * There has been a constant increase in the demand for high-level person-power;
> * The demand for middle-level person-power has remained relatively constant; and
> * The demand for low-level person-power has been declining." (NCHE b), 1996: 21)

Gibbons (et al, 1994: 70-90) discussion of the transformation of higher education from an elite to a massified system equally suggests that the creation of a highly skilled and educated workforce is of central importance for economic growth. Lyon (1991: 61) cites Alain Touraine who believes that educational credentials are becoming increasingly important for determining one's class position. Considering the centrality of skills and education in the future, the nature of this expansion can be perceived to be central in determining the structure of the professional class produced by HE.

More equity through HE

The aim of achieving more equity of access to HE is related to the aim of achieving a reduction of income disparities (HEWP, 1997: section 1.1; NCHE e), 1996: section 4.1; ISAD, 1996: section 2.4). The economic inequalities are reflected in the highly inequitable distribution of income in

SA, which are amongst the highest in the world (NCHE e), 1996: section 4.1). The Central Statistical Services (CSS) outlines that African households tend to be the poorest in the country:

> "26% [of African households] have incomes between R0 and R6 839 per annum compared with 12% of coloured and 2% of both Indian and white households. Whites also have the greatest share of the highest income jobs with 64% of white households in this category compared with 9 % of African households." (Central Statistical Services, 1996)

The figures released by the CSS suggest that poor households are most predominantly also black households. In the WPRD (1994: section 1.4.4-1.4.15) the government has formulated its commitment to redress income disparities through the development of the human resources. Human resource development is to empower people particularly through providing them with opportunities for finding employment (WPRD, 1994: section 1.4.4). Education, training and job creation are named as tools to enable the youth to play a full role in reconstruction and development (WPRD, 1994: section 1.4.7).

The economic role of higher education is thus explicitly being employed to achieve redress and development. These figures outlining income disparities suggest that an exclusion of people according to income is likely to largely be equal to an exclusion according to race. The commitment to redress inequalities with respect to race means that HE has to admit a larger share of students, which are more likely to be poorer. This highlights that there is a distinctive need to place emphasis on the ability of people to pay for HE in order to achieve equitable access to HE.

The HEWP (1997: section 4.7) highlights that fee-free education is not an affordable or sustainable option for SA. The SA Government has voiced their belief that:

> "It is important, however, that the direct cost to students should be proportionate to their ability to pay. As the profile of student enrolment becomes increasingly representative of the general population, the proportion of eligible students from poor families is rising steeply. Financial need should not be an insuperable barrier to access and success in higher education. A realistic fee structure must therefore go hand-in-hand with a sustainable programme of student financial assistance." (HEWP, 1997: section 4.8)

Paradoxically, the SA campuses display a very different situation. While it is stated that financial need should not be an "insuperable barrier to access and success in higher education", students who are unable to pay are being excluded from pursuing their higher education (Mail&Guardian, 30.01.1998: 2). Lund (Cape Times; May 26, 1998: 3) asserts that in 1998, 20 000 students are

under threat of being expelled by higher education institutions due to their inability to pay the necessary fees. The inability to pay has thus, for some, apparently become an insuperable barrier to access. Here lies the essence of the problem of the achievement of more equity of access in particular, as well as of transformation of HE in general, in the cost involved for institutions, students and the government alike.

The realisation that the cost of HE is a significant factor determining access to HE requires an examination of the question how IT affects levels of expenditures. This examination is conducted later in this thesis. Firstly, however, one of the problems of massification is examined, namely, its increasing cost for the government in particular, in its relation to the form of learning.

The cost and the quality of higher learning

Greater numbers of students unavoidably result in greater expenditure. In a situation of financial constraints, measures have to be devised to make an expansion of HE affordable and financially sustainable (NCHE a), 1996: section 1.3.2). In an international comparison, public expenditure on higher education in SA is high (HEWP, 1997: section 4.3). Even though it is expected to continue to absorb the largest slice of government spending, it will not significantly increase in real terms and is even expected to decline (TELI, 1996: 118; STGP, 1997: section 3.4; HEWP, 1997: section 4.3). The HE sector has had to deal with dwindling funds in 1997 (Sunday Independent; March 16, 1997: 24) and in the near future it appears that solutions will have to be found to substantially increase the numbers of graduates with "limited increases" (NCHE a), 1996: section 1.4.1) in funding. The financial pressures faced by higher education in this respect can thus be expected to be substantial, especially in the case of a considerable expansion of access to HE.

New investments are, however, perceived to be crucial for saving the quality and output of higher education. The primary problem of expansion is outlined by the HEWP (1997):

> "While it is possible to achieve rapid enrolment growth without extra expenditure, the penalties for doing so are harsh. Experience both internationally and at home shows that expansion without new investment results in overcrowded facilities, low morale of academic staff, poor quality programmes, a fall in research output and quality, and, ultimately, a loss of confidence by students, employers and funders in the devalued products of higher education." (HEWP, 1997: section 4.4)

Governmental funds are vital for the ability to expand HE as well as for the employment of technology in the educational context. Increasing the internal efficiency of institutions is one of the foci of the HEWP (1997: section 4.2).

The largest component of the budgets of HE-institutions is their expenditures on staff. The South African Institute for Distance Education (SAIDE) (SAIDE b), 1995: 5) claims that staff may cost 65% of an institution's budget. In 1997 the University of the Western Cape spent around 70% of its budget on staff (Mail & Guardian; November 28, 1997). Similarly, at UCT a total of 50% of the budget was spent on academic staff and another 27% on administrative staff, mounting to around 77% of the budget[32]. Such figures have prompted the South African government to suggest the development of less labour intensive educational methods in order for HE institutions to increase their internal efficiency (HEWP, 1997: section 4.2).

Many residential institutions also see a decrease in the teacher-student ratio as a means of making education more cost-effective (SAIDE b), 1995: 3). As explained above, in the present system of university teaching this strategy inevitably leads to larger classes and less contact between lecturers, tutors and students. It is thus the massification of HE, and not the employment of IT that is primarily responsible for the increasing employment of independent learning methods. IT, consequently, cannot be made responsible for the reduction of contact in HE per se. It may, however, be a tool which can enhance independent learning and can consequently also lead to the perception that independent learning, when performed through IT, is the appropriate way to learn.

One debate in the transformation process revolves around the challenge of changing the racially skewed student body vs. the retainment of a high quality HE sector (Ramphele, 1993: 1-2). The admittance of increasing numbers of students to the HE sector is claimed to be a potential force working against the retainment of a high quality in the HE sector, particularly with respect to an increasing amount of poorly-prepared students entering the HE-system (Wolpe and Barends, 1993; Moulder, 1991; Saunders, 1992: 77). The fear that standards are dropping thus arises due to the admission of disadvantaged students into HE institutions in particular. On one level, the tension between equality in HE and the quality of HE consequently lies in the racially skewed distribution of education amongst the population at present, on another it lies in the massification of HE without significant increases in funding.

---

[32]"Re: STAFFING FIGURES " K. Theys (personal communication, May 26 1998). e-mail: FNDKA@bremner.uct.ac.za.

The discussion around the tension between equality of access and the quality of teaching in the HE sector is ongoing. Due to the focus of this chapter on the effects of the increasing use of IT in HE on the socially determined demand for more equity of access and success of disadvantaged students in particular, it is necessary to assume that an expansion of HE will, in fact, be characterised by the increasing admittance of poorly-prepared and financially poor students to HE-institutions. This is necessary in order to be able to examine the role of IT therein. Various reasons in support of the assumption that this development may occur have been brought forwards earlier in this chapter.

IT and the form of higher learning

IT is frequently claimed to be useful with respect to the reduction of the cost of education, because it offers opportunities to enhance less human-intensive ways to deliver education. Some South African analysts believe that it is not possible to continue on a human intensive path in the expansion of higher education (FRD b), 1995: 6). In order to accommodate more students with less funds, a solution for the higher education sector thus has to be found which allows it to function more efficiently than before. The FRD (b), 1995: 6) expresses the idea that IT can play a fundamental role in the transformation of education in SA:

> "The quantitative and qualitative analysis of these backlogs, in combinations with steeply rising future demand, proves beyond doubt that a linear expansion of our present education and training systems is beyond our capacity. More classrooms, more teachers, more university and technikon places, that is 'more of the same' is not going to meet the target and address the challenges in education and training. ... Advanced interactive electronic technologies in combination with state of the art telecommunication systems and top quality interactive multi-media courseware (IMC) of great variety need to be harnessed to make this learning transformation a reality." (FRD b), 1995: 6)

The notion that IT is a valuable tool for increasing the internal efficiency of higher education institutions has been raised in a number of South African publications (FRD b), 1995: 6; TELI, 1996: 16-19; STGP, 1997; section 3.4; ISAD, 1996: section 6.2.2; HEWP, 1997: sections 2.60 and 2.62). These publications highlight this potential of IT particularly with respect to its perceived ability to reduce the need for staff through the employment of distance education and independent learning methods.

This assessment suggests that the use of IT is hoped to result in an increase in the efficiency of HE. As explained in chapter three of this thesis, the employment of IT for the aim of increasing the efficiency of HE is likely to result in the employment of more DE. TELI (1996: 39) reinforces this view by claiming that:

> "... there is an urgent need to find ways of 'massifying' the provision of quality learning opportunities. Adding technology on to traditional classroom teaching and learning practices will not achieve redress in South Africa on any significant scale." (TELI, 1996: 39)

TELI (1996: 17-18) asserts that technology-enhanced learning consist of three main applications, namely technology-enhanced classrooms, technology-extended classrooms and technology-enhanced independent learning. According to the definition for these three main functions of technology-enhanced learning made by the TELI (1996: 17-18), redress through the employment of IT cannot be achieved through the technology-enhanced classroom (TELI, 1996: 17). Consequently can it only be achieved through the technology-extended classroom, earlier also referred to as the virtual classroom, or technology-enhanced independent learning, such as CBL and technology-enhanced distance education.

This assessment means that the effects of IT on equality of access and success in HE has to be evaluated with respect to these applications of IT. As explained in the previous chapter, these applications and their relationship to the need to save costs means that increasingly, students have to expect more independent learning, less face-to-face contact with teachers and decreasing opportunities for access to a social studying community.

Educational and social needs

In chapter three, arguments have been brought forwards to support the claim that the form of higher learning is related to its content, meaning that how we learn is connected to what we learn. It has further been argued that student learning is not confined to measurable outcomes. This claim is reconfirmed in a paper prepared for the NCHE:

> "Student experience cannot be reduced to one of intellectual development, educational achievement and academic prowess. The time spent by the student at institutions of higher education represents a significant developmental period. The academic development of students cannot be seen in isolation from student development in its broadest sense and value of out-of-class learning and activities." (NCHE f), 1995: section 2.2)

This assessment suggests that those who claim that learning is confined to subject matter or measurable outcomes neglect a significant part of learning in HE. DE as well as those forms of learning which exclude access to a studying community are thus limited in the several learning contents which HE may convey. Those who emphasise that the development of individual students is an important part of higher learning, such as the educationalists and substantivists cited in chapter three, are consequently critical about the role of IT in higher learning. IT, as examined in chapter three, tends to lead to more individual learning and thus limits the learning contents, simply because it limits physical contact.

The University of Witwaterstrand (1995) claims, in a submission made to the NCHE, that it is necessary to nurture students capable of independent thinking and reasoning. This thesis has brought forwards a number of reasons to support the claim that the various uses of IT in HE are inherently limited in their ability to assist in the facilitation of such skills (see chapter three). This assessment reconfirms the notion brought forwards by TELI (1996: 277) that the different educational methods, and in turn also the use of IT, must be chosen and evaluated according to particular learning contents.

It is, however, important to note that the logical conclusion of these assessments must not necessarily be the rejection of IT altogether. Instead it can lead to the conclusion that particularly in an expansion of HE which is characterised by an increasing utilisation of DE and independent learning, it is necessary to retain frequent opportunities for contact to a physical community or integrate such contact into the way we organise learning at a distance.

Furthermore, it has been argued (in chapter three) that students who are confined to learn independently are disadvantaged in terms of the difficulty of completing a course. This assessment suggests that where the use of IT results in an increasing proportion of independent and distance learning, it is also necessary to place a particular focus on equity of outcome. Racial inequalities in student success can be expected to be reinforced by an organisation of HE that places emphasis on economic efficiency, rather than student needs.

This thesis has assessed the educational needs of poorly-prepared students primarily by way of an interview conducted with Dr. Howard Pearce, co-ordinator of the Academic Development Programme (ADP) at UCT's engineering department[33]. The engineering department's ADP-

---

[33]"Learning needs of poorly-prepared students at the Engineering Department at UCT" H. Pearce (personal communication, June 5 1998).

programme was chosen because this particular department has a significant proportion of black students, namely 55% (Sunday Independent, July 19, 1998: 7). In spite of the fact that one ADP in a particular department is the basis of most of the assessments made here, the example of engineering at UCT can provide an indication for the problems of other departments and other institutions with respect to poorly-prepared students. The fact that engineering is infrequently concerned with the negotiation of meaning, a skill which has in chapter three of this thesis been connected to a need for face-to-face contact, further suggests that the findings of this section are likely to be of even greater relevance for those subjects which are occupied with the negotiation of meaning.

Howard Pearce (1998) stresses that one important factor in the teaching of poorly-prepared students is the employment of a range of different educational methods. Amongst them are RBL, groupwork, facilitated problem-solving in workshops, close-contact tutorial work and access to staff to address specific problems of individual students (Pearce, 1998). Rhodes University (1995) has proposed that students:

> "... need to be actively involved in the learning process in each course. There need to be continual opportunities for discussion, questions and feedback. The study tasks should emphasise the development of skills which will be needed in later study, e.g. written and oral communication skills." (Rhodes University, 1995)

The opportunities for discussion, questions, feedback and the emphasis placed on oral and communicational skills, mentioned above, suggest that those methods of HE that entail oral communication skills significantly contribute to learning. This emphasis is reinforced by Pearce (1998) who claims that lectures are of lesser importance in the academic development of poorly-prepared students, primarily due to language problems, the difficult terminology used therein as well as their pace. A similar view on lectures and, for that matter also large virtual classrooms, has been voiced by the TELI:

> "... many of the initiatives are underpinned by a belief that, by 'amplifying' or 'broadcasting' educational inputs, provision will become affordable and will redress imbalances of the past. However, impact assessments show that simply amplifying the outreach of teaching does not necessarily improve effective learning. Although examination pass rates increased in some cases, the rate of increase generally did not address the massive imbalances in, for example, pass rates between advantaged and disadvantaged students." (TELI, 1996: 39)

The TELI is explicit about the claim that IT, when used to amplify the reach of an education that relies primarily on imparting information, insufficiently addresses the educational needs of disadvantaged students. Poorly-prepared students, in the perception of Pearce (1998), learn best through a number of different methods, lectures being the least important, other methods being equally important, and the appropriate mix of them, supposedly, being the optimal way to learn.

CBL has been claimed to be suitable for bridging (Deacon, Walton and Wilson, 1997). The belief that IT-facilitated instruction alone is inadequate for these students is equally implied by educational software developers at UCT. In a paper presented at the "Future World Conference" at UCT, the UCT Multimedia Education Group has raised the need to integrate the particular CBL-programme presented on this occasion into a course (Deacon et al, 1997). Computer-based materials must be relevant to the course, and an essential part of it, and should not be seen as an optional extra unrelated to the course itself (Deacon et al, 1997).

The use of CBL for the purpose of assisting traditional education by creating additional learning opportunities for poorly-prepared students, however, is not without contradiction. While the idea that such programmes need to be integrated into a course is necessary and relevant, the purpose of this CBL programme, as well as many other such programmes is, however, situated in quite another reality. This reality has to do with the financial pressures outlined above and is thus subject to quite another momentum, namely that of the increasing use of less human-intensive teaching methods, as these are perceived to be more cost-effective.

The evaluation of the CBL programme of UCT was completed in May 1998[34] (Deacon et al, 1997). In the case that this programme and the numerous other programmes which are being developed are perceived to be successful in terms of the technical aspects, the learned subject content, the academic development objectives, the student evaluation and the cost-effectiveness of multimedia courseware, the use of educational software may increase significantly. Where IT is believed to be more cost-effective than teachers, institutions may just be inclined to reduce their expenditures on staff by replacing them with IT.

Individuals can, however, further be expected to require varying kinds of assistance, as they have individual learning deficits and personal problems with particular teaching methods. This assessment is reinforced by TELI (1996: 57) where it is highlighted that the different learning needs of people require consideration in the organisation of HE. In order to ensure student

success, it may thus be necessary to provide students with choices, rather than to confine them to one, namely the cheapest learning method. This thesis thus follows the recommendation made by TELI (1996: 57) that students need to be provided with choices concerning the learning methods, such as distance or face-to-face and teaching through IT or physical means. Alternatively, in the case that the provision of such choices pose significant logistical, financial or other problems, a mixture is imaginable, because it may present students with similar advantages and disadvantages.

In an educational environment where IT is an indispensable tool for communication, for access information and educational materials, the effects of IT on equity of access to HE is closely related to the accessibility of IT itself. The problems which HE-institutions, the public in general and the government face in this respect are examined below. As has been argued in this chapter three, significant additional expenditures of HE-institutions on IT may translate into higher costs for students and may, in turn, affect equity of access.

4.2 Inequitable access to technology

TELI (1996: 123) claims that inequitable access to basic infrastructural requirements, such as water supply, electricity, road access, telephone lines, and postal systems further needs to be recognised. TELI (1996: 123) further asserts that before technology-enhanced education can play a significant role in solving the countries educational problems, the basic infrastructural disparities have to be addressed as a prerequisite. A comprehensive examination into these basic infrastructural problems is, however, beyond the scope of this thesis. This thesis will continue to concentrate on IT and telecommunications in particular.

4.2.1 Cost of IT

Having explored the question of preconditions to any use of IT in higher learning in chapter three, it appears necessary to examine what the cost of IT suggests for equity of access to IT-facilitated higher learning. Accessibility of equipment is the most important factor in the greater reliance of HE on IT. The problems of inaccessibility of IT vary from institution to institution and from home to home. This inaccessibility as well as the policies pursued by the South African Government are relevant in the examination of equity of access to HE and IT.

---

[34] The results of this evaluation was not available and could not be integrated in this thesis.

Institutions

The FRD (a), 1995: section 3.5.1) reveals, that in comparison to universities in industrialised countries, South African universities are under-equipped, and that furthermore there is an unequal distribution of equipment in the various universities. HBI's only possess 5% of the total equipment available in South African universities. 95% is thus owned by HWI's. Furthermore, approximately 60% of the researchers at HBI's consider the maintenance of their existing equipment as inadequate and 55% disagree that the physical capacity in laboratories is adequate for undergraduate studies (FRD a), 1995: section 3.5.1). These figures highlight the huge disparities in the distribution of research equipment amongst the universities in the country.

A major factor for this is the lack of funds for replacing old or obsolete equipment. The age profile of the research equipment indicated that only a quarter of the research equipment of the country was purchased in the last 5 years, while 30% was acquired 11-20 years ago (FRD a), 1995: section 3.5.1). The NCHE (d), 1996: 50; & c), 1996: 305) furthermore comments on the imbalances of access to PCs for staff and students. While access to IT at HBI's at a ratio of less than 1:10 is very limited for staff and almost non-existent for students, the access ratio for staff at some HWI's is almost 1:1 and UCT strives to achieve an 'undergraduate student:PC' ratio of 10:1 (UCT, 1997: 9). Great differences thus exist between the quantity and the quality of IT-equipment available at HBI and HWI. It can be expected that unless the backlog of HBI's is addressed with additional funds of significant proportion, the increasing use of IT in the HE-sector will unavoidably intensify the inequalities that characterise the HE-sector in SA with respect to HWI and HBI. The inequalities in terms of equipment in HWI and HBI further suggest that the admittance of black students to HWI is necessary in order to achieve more equity of access to IT.

UCT provides and example of the need to provide institutional access to IT and the problems which this indicates. Due to the fact that 80% of UCT's residence students are black, and thus potentially from lower income groups, the need for UCT to provide institutionalised access to labs is critical at UCT if IT is to be made available in an equitable manner (UCT, 1997: 7). This, in turn, results in greater IT expenditures. An increasing reliance on IT is assumed necessary to cut costs, while IT itself adds considerably to the expenditures of institutions, particularly to the expenditures of HBI's, as they have a high percentage of poorer students who are less likely to have private access to IT.

The cost of acquiring and updating IT for one of the better-resourced universities, such as UCT, are not negligible. A computer-literacy programme proposed in 1997 by Ramphele (UCT, 1997)

reveals that for the provision of IT for UCT requires funds in the region of R 56,100,000, depending on exchange rates of the US$ to the Rand. These are composed of:

> *"**Start-up Costs: $2,150,000*** will make it possible to expand and upgrade our student microlab establishment, as well as provide for the new residence microlabs. It would also make it possible, for a period of three years, to train all first-year entering students in computer literacy, by providing them with 30 hours supervised instruction in Windows, word processing, a spreadsheet, and information search and retrieval. In addition, the sum would enable us to extend the hours of operation of our microlabs to evenings and weekends, thereby enhancing access and promoting a climate of learning.
>
> ***Sustainability:** an additional **$7,200,000*** will make it possible to place the Computer Literacy programme described herein on a sustainable foundation." (UCT, 1997: 19)

The expected total revenue for UCT for 1998 mounts to R 454,7m, out of which the bulk of R 268,8m derives out of government subsidies (Monday Paper, 1998). If the R 56m thus were to be financed without additional sponsors, the cost of establishing this Computer Literacy (CL) programme would consume more than 12% of the budget. This example highlights that the costs of IT are substantial for institutions, it however, does not necessarily mean that higher costs for students are necessarily a result.

The total cost of a greater reliance on IT is, however, not comprehensively addressed by providing students with an opportunity to become computer literate. A network also has to be sustained which can handle the data stream to and from institutions. Inequalities with respect to the network use can be observed on different levels. Firstly, there are inequalities within SA with respect to access to equipment and beyond that, there are vast differences between countries in terms of network costs. The network that can handle the bandwidth needs of higher education institutions around the country also has to be sustained. The problem of the cost of such a network is discussed below.

Network

In South Africa, the Foundation for Research and Development (FRD) has since 1987 founded an internetwork linking the major academic centres in this country as a result of joint action by the computer and network subcommittees of the Committee of University Principals (CUP) and the FRD (d); date unknown). The Uninet academic and research network is a non-profit collaborative project among tertiary educational institutions, research councils and the FRD. Participation is voluntary for all education centres and research organisations and requires the ability to manage

the institution's internal network. The participants in the network finance it in a joint effort. Individual sites thus pay for the network themselves.

As the networks are increasingly being used by students, teachers and researchers in South Africa, UNINET urgently and constantly needs to upgrade its infrastructure. As the FRD (a); date unknown) explains, Uninet's Internet connection is congested for nearly 24 hours a day, 365 days a year.

> "Faster circuits are readily available, but the cost is such that the subscriptions would be exorbitant -Universities such as the Witwaterstrand, Cape Town and Stellenbosch would have to pay almost R1 million per year as from 1996 to have only moderate-speed access to the Internet. Uninet cannot expect that the circuit costs should continue to be met by the sites themselves. [...] In Brazil, for example, the national network is planning to spend R40 million per year on the network - Uninet's budget for 1995 is less than R3.5 million." (FRD a); date unknown)

Figures released by the FRD claim that if UNINET is to provide a reasonable network for research and academic purposes, the costs which institutions pay would mount to R 35 million (FRD d); date unknown). At present there are R 7.7 million allocated to cover the fees for 1997, not even a quarter of the costs of the 'reasonable' network referred to by the FRD (d); date unknown). The manager of UNINET suggested that the prospected bandwidth needs for the network in 1997 were by no means excessive and that a doubling of the bandwidth for 1998 and 1999 will in fact prove to be inadequate (FRD d), date unknown). He proposes to rather quadruple the bandwidth figures in order to account for projected needs (FRD d), date unknown).

Differences in connection costs between the USA and South Africa highlight the disadvantage which developing countries find themselves in when compared to institutions in the United States. While UCT pays US $ 135.000 per year for its Internet connection, an American university pays a fraction of this for a service that has 12 times the bandwidth (UCT, 1997: 8). The cost-differences between an Internet connection from SA and from the USA highlight a considerable disadvantage and inequitable structure of access to information on a global level. The startling development in the field of computer equipment thus adds to the growing inequalities between nations and further adds to the disadvantage of poorly resourced institutions and their students. The installation of Information Superhighways, also called Internet II (White House Press Release 1996), in the developed world is thus perceived to be another factor displaying the growing gap between the information rich and the information poor, both within individual countries and between rich and

poor regions of the world. Modern technologies thus exacerbate the information divide, in spite of the increased amounts of freely available information (Hamelink, 1994: 205).

UCT's network expenditures are up by 56% in relation to the last year (Duncan a), 1997). The cost of acquisitions has constantly risen by R 2m since 1995 (Duncan b), 1997) and a saturation of IT and network needs is not in site (Duncan b), 1997). The more sophisticated applications become, the more sophisticated the equipment and the greater the bandwidth needs will be. Better financed institutions are at a great advantage with respect to equipment and networks, as they already have more equipment available and have more funds to upgrade equipment and pay for network costs. This development suggests that the richer institutions can provide more electronic education to their students.

At UCT, the forecast for network costs of R 1.2m and the R 12m for the acquisition of IT mount to a total of 20% of government funding in 1998. Adding 77% for staff expenditures shows that the total amount of the government funds spent on staff and IT mounts to 97% of the government funds. This means that UCT spends almost its entire government subsidy on staff and IT. The remaining funds are derived out of student fees (R 144,6m) and funding of academic posts (R 23,2m) and other sources (R 18,1m) (Monday Paper, 1998). These expenditures highlight the importance of student fees and other sources of income for UCT. While, however, IT and network costs are expected to rise further, there is no indication that government funding will. A shift towards greater reliance on IT will undoubtedly increase these costs even further and UCT's undergraduates don't even have full access to the Internet yet (UCT, 1997, p. 13).

Institutions are beginning to implement measures to recover the costs for the use of the network from those individuals who use it. The University of Pretoria has apparently already begun to charge individual students for their online time and the University of Potchefstroom is planning to implement such a system in the near future[35]. Some of these institutions design their online cost-recovery system keeping the poverty of many students in mind. Other institutions, such as Stellenbosch University, charge flat fees for the use of Internet services. While such measures appear to be fair, since everybody pays according to use, this adds to the costs of a higher education for the individual, and is particularly problematic for poorer students, as online access increasingly becomes a necessity for students. When the Internet makes essential information available in databanks academics, researchers and students are required to access this information

through the electronic networks. Private payments for on-line time then add to the advantage of affluent members of the studying community and the disadvantage of poorer students.

Where information is no longer freely accessible, due to the need to access it through IT, a step is taken towards the commodification of information. It is highly questionable if such a development can be favourable for South Africa. The poverty of many students suggests that social policies have to be put in place, which address the problem of the cost of accessing and using the technology. Measures which ensure that access to the networks within institutions does not replicate the inequalities of access which exist in the public sphere are necessary in an educational environment which relies on remote access to information, educational materials, tutors and experts.

Martin Duncan (1998), Director of Information Technology at UCT, has called for a strong state subsidisation of Uninet in order to prevent it from disintegrating. UCT, Potchefstroom University and the University of Pretoria have already turned to commercial service providers to obtain international bandwidth. A continuation of this trend means that wealthier institutions have substantially more international bandwidth available and poorer institutions are left with an insufficient network. If Uninet disintegrates, they will be left with no choice but to turn to commercial providers, leaving the possibility for co-operation and cross-subsidisation behind. A solution which is less oriented along the lines of the individual capacity of institutions to pay for bandwidth, and which progresses a more equitable payment structure, can ensure that further disadvantage to HBUs is avoided.

Students enrolled in distance education institutions or in the emerging dual-mode institutions may have to pay for their equipment and network access themselves. In order to address the inequalities that the reliance on individual access will undoubtedly bring about in SA, public access facilities are being developed by the government. Some of these facilities are to provide access to IT for the public at large, called Multi-Purpose Community Centres (MPPC). There are, however also facilities which are designed specifically for the purpose of learning, called Learning Centres. These facilities are explored below.

---

[35] "Re: Internet Bandwidth" M. Piperakis (personal communication, March 4 1998). E-mail: mpip@apies.frd.ac.za & "Re: Internet Bandwidth" K. Pienaar (personal communication, March 4 & 5, 1998). E-mail: JCK@it.sun.ac.za.

4.2.2 Public access facilities

Access to private fixed telecommunications lines is most frequently still a prerequisite to gaining access to electronic networks, such as the Internet. The disparities, which characterise access to telecommunications, are likely to be exacerbated with respect to access to electronic networks.

In order for services delivered through telecommunications, electronic networks and IT to be accessible on an equitable basis, it is necessary to take inequalities of public access to IT, telecommunications and electronic networks into account. South Africa has, with over 5 million instruments and 35-40% of all telephones in Africa, the greatest telecommunications penetration in Africa (Naude, 1994: 39). Due to apartheid policies, there are, however, inequalities of access. Divisions run along rural-urban lines as well as racial lines. The differences between urban and rural areas as well as between formerly white and formerly black areas are of concern to the Minister for Telecommunications, Jay Naidoo and the telecommunications provider in South Africa, Telkom SA (Naidoo, as cited in: Cape Argus, 1996: 8; Telkom's Vision 2000 Website). Hall (1997) has summarised the disparities with respect to telephone penetration:

> "Thus 87.4% of whites have telephones in their homes but only 11.6% of Africans, reflecting a parallel distinction between urban and rural communities, while 47.6% of Africans in all areas have no access to any phone, compared to only 6.4% of whites. Well over half of people living in rural areas have to travel more than a kilometer to use the telephone, (13) and less than 2% of main lines are payphones, further restricting access by marginal communities." (Hall, 1997)

While residential institutions may have the advantage of being able to provide computing facilities for students and thus give students without personal computers an opportunity to become computer literate, DE faces a different set of problems. Here, it is individuals scattered around the country, which require access to and instruction in computing.

No empirical data could be found to evaluate the racial disparities, which are likely to further exist in terms of private access to IT in SA. However, the overall diffusion of IT into South African homes is low compared to industrialised nations. IT can be found in 2.4% of all homes in SA, a number which compares unfavourably with IT penetration in the USA, where it stands at 30% (Hodge and Miller, 1996: section 2.1.1). TechWeb (Borland, 1998) reports that in the US, 73% of white students own their own home computer, while only 32% of black students do. Considering the great disparities, which characterise income and wealth in SA, it appears reasonable to assume that PC penetration into black South African homes is very low.

Furthermore, a survey conducted by the Graphical Visualization Center (1997) found that 0.38% of the total Internet population are male South Africans, while female South Africans merely constitute 0.13%. The majority of users world wide earns over US$ 50.000 per year and 54% have completed a college or advanced degree. The primary language used on the Internet is English. Over 90% of the overall Internet population uses English, 89% are native English speakers and almost 90% are White. Gartner (1998) cites Janet Schofield, who conducted researched Internet use in US colleges, as saying that in most cases advanced affluent white male students were most inclined to use and benefit from Internet access. Inequalities of Internet use according to race, education, gender and income thus exist and suggest that the disadvantaged are likely to be left behind in the shift towards the electronic provision of HE.

Schutte (1996) claimed that 46% of University of South Africa (UNISA) students do not have private access to computers. The number of these students with network access can be expected to be even lower. Furthermore, the costs of private access to IT, telecommunications and electronic networks have to be considered. Costs for calling a dialup facility (Internet Service Provider costs and telcom costs), for printing and software are amongst the main items in this respect. These costs can be substantial and may be important factors discriminating amongst users. People who are able to afford technology can be expected to invest more money into IT and private acquisition of IT, can afford to print relevant materials and spend more time researching on the Internet. They can be expected to benefit the most from the increasing use of IT and electronic networks in HE. The discrepancies with respect to access to opportunities for higher learning are thus not merely confined to the problem of access to IT, as an IT-facilitated education adds costs to studying which previously did not exist. The consideration of these costs for students is necessary to restrain imbalanced use of IT. Without the sufficient consideration of such expenditures, the use of electronic networks can be expected to reinforce existing imbalances.

The SA Government (ISAD, 1996: section 1.2.1) suggested communal approaches to this problem. Several suggestions have been made in this respect. They are called telecentres, multi-purpose community centres, teacher centres, resource centres and study or learning centres, and all aim at the provision of access to IT through publicly accessible facilities, placing differing emphases on communication (MPCC) or on learning (study centres). Jay Naidoo, Minister for Telecommunications envisions the installation of such multi-purpose communications and information-centres in "every community" (Naidoo; as quoted in; Cape Argus, 1996: 10) in the next five years. The National Telecommunications Forum, co-ordinated by Peter Benjamin, sees the centres as the logical extension of the information community and has set up a

task team for the provision of community access (Mail & Guardian; August 30 - September 5, 1996). This development is at an early stage and central to equity of access.

The question whether such centres will, in fact, be accessible on an equitable basis is thus still open. Benjamin (Reconstruct, July 12, 1998: 2) suggests that the 500 centres, which are expected to be available by 2002, are insufficient to provide access on an equitable basis. He claims that 4000 such centres are, in fact, needed. Equity of access to IT-enhanced DE is thus unlikely to arise swiftly.

Kirby (Mail&Guardian; March 20, 1998) and Standbridge (Reconstruct; May 3, 1998: 3) have further expressed their disbelief in the claim that the poor in the rural areas accept and use computers. While this may pose a problem, it is highly questionable whether a higher education that excludes the use of computers altogether is at all an appropriate education. Kirby (Mail&Guardian; March 20, 1998) raises concern about the possibility that MPCC will merely foster an elite within the disadvantaged, as it appears hardly possible to make such centres accessible on an equitable basis throughout the entire country.

In the context of higher learning, the SAIDE (a), 1995: 109) proposes the development of a "countrywide network of learning centres" in order to make open learning possible. In a context where the public infrastructures is inequitable, diffusion of IT is low and the population is geographically widely dispersed, study centres can be highly valuable as they can provide access to IT, tutors and other students. Students can travel to learning centres already established by some DE institutions in South Africa (UNISA, 1995; SAIDE a), 1995: 3-43, 86-87).

Study centres represent a compromise between delivery of materials to the home and travelling to a residential university. Such centres are a mix between residential universities and distance institutions, and could attempt to utilise the advantages of both these institutions. In 1995 UNISA, the largest DE institution country-wide, however, only had five such facilities nation-wide, all in metropolitan centres (UNISA, 1995: 51). They function as distribution centres for materials, provide assistance through face-to-face contact with tutors, provide IT for communication and remote access to information. If well-planned and managed, such a centre should be sufficiently equipped to utilise the strength of IT, namely its ability to provide remote access to information, materials and, simultaneously, can rectify one of the main deficiencies of IT, namely the way it distances us from real encounters with people.

A reconsideration of the vision of widespread electronic education, the inequalities identified with respect to IT and network use, access to telecommunications and the additional costs of the use of IT suggests that the use of electronic education may be considerably skewed and highly unequal. Considering the costs involved in the use of IT to facilitate higher learning, it appears that the technical resources should be shared and extensive co-operation between institutions is required to avoid wasteful duplication of efforts. It is, however, seriously in question whether the additional expenditures of HE institutions in SA on IT can, in fact, lead to its integration along the lines of student needs. These costs suggest that the use of IT in HE may be guided by the ideology of IT, namely its focus on efficiency and cost. This thesis has outlined various reasons for the claim that such a use of IT to decrease the expenditures of HE-institutions are likely to result in a de-humanised, more difficult and educationally limited HE-sector.

4.3 Discussion

The examination of the transformation of HE in SA has shown that HE is to be equitably expanded, meaning that the profile of the student body and the graduates of HE are to reflect the composition of the population as a whole. The expansion of access in an equitable manner stands in conflict with the need to retain a high quality of learning in HE as well as with the increased expenditures for higher education that this expansion brings about.

Funding is a key issue in the transformation of HE. In the HEWP (1997: section 4.14), goal-oriented funding is being advanced with the aims of: achieving more equitable student access; improving the quality of teaching and research; increasing student progression and graduation rates; and, achieving a greater responsiveness to social and economic needs. The discussions of the varying definitions for most of these objectives, conducted in chapters two, three and four of this thesis, have shown that conflicting interpretations for these objectives exist. The definitions for what comprises these objectives are thus a central component in the examination of effects of IT on them.

This thesis has suggested that particular definitions of these aims should guide the evaluation of IT. They are: (a) equity of access is related to the cost of studying; (b) an essential component in the definition of the quality of learning is a well-functioning student support system as well as the retention of opportunities for face-to-face contact with teachers and other students alike; (c) independent learning is more difficult than contact education; (d) IT tends to be an inappropriate tool for the negotiation of meaning, the teaching of values, culture and morality. It is consequently

necessary to examine the reasons for the use of IT in HE and the most likely effects thereof in relation to the objectives, as defined in this thesis.

The South African approaches have shown that the use of IT is propagated because it is believed to promise an increase in internal and external efficiencies. Internal, because IT is employed to replace face-to-face teaching, since expenditures on teachers have to be cut. External, because IT is employed to teach applicable skills. These aims have been shown to be inherent in the technologically-determined system of HE presented in chapter two as well as in the South African HE-system. By raising internal and external efficiencies, the use of IT appears to be compatible with the social needs, since the use of IT therein promises to relieve the relevant bodies from the financial pressures that the expansion of access undoubtedly brings about.

IT is thus believed to be a tool to reduce the expenditures on HE. This reason for using IT is, however, likely to result in a particular content and form of conducting HE. The content is likely to be characterised by an increasing emphasis on skills needed in industry and commerce, and less likely to place emphasis on the transmission of values, culture and morality. The particular form of conducting HE with IT, which is likely to be characterised by more independent learning and less face-to-face contact, supports this bias. This reason for the use of IT is thus likely to reinforce the emphasis on science and technology and may, in fact, diminish the importance of philosophically-based subjects such as humanities.

Furthermore, the cost of studying is a fundamental constraint to the achievement of more equity of access to HE. The problems which HE institutions have encountered with respect to the recovery of fees from students clearly suggest that policies which are respondent to the problems students face in this respect are necessary in order for HE to be accessible on an equitable basis.

IT has been shown to have the potential to increase the expenditures of HE-institutions and lead to higher costs of learning for students. These increases arise through the transferral of IT-expenditures to students. However, due to the early stage of this development, it is unclear how high IT-expenditures of HE-institutions will be as well as how the institutions will finance the increasing use of IT. It is thus not yet possible to determine whether IT-facilitated HE in SA will, while maintaining a high quality, be more expensive or cheaper than traditional education.

In the previous chapter it was argued that electronic education might be expensive if a high quality of learning is to be rescued. It may also be cheaper, however, not without a loss in quality due to the decreasing amount of personal contact in learning. This assessment suggests that IT-facilitated

HE is unlikely to result in both, an expansion of access and an increase in the quality of learning alike.

Equity of access to HE is intertwined with the problem of poor preparation of many disadvantaged students in primary and secondary schooling. Equity of access therefor poses particular demands on the process of learning, because equity of access refers to access as well as to success of disadvantaged students in particular. A HE system that promotes equity thus also requires a particular process of learning, namely one which ensures that students can not only access HE, but also successfully complete a degree or course therein. This process is dependent on the integration of a number of educational methods into HE provision. This integration is, however, unlikely to characterise an IT-facilitated HE that is inspired by the need to decrease costs.

It appears that the provision of choice for the students is an important factor that can allow students to determine their favoured form of educational instruction and allow for greater equality. Where students are able to choose between face-to-face contact and DE, the system has achieved the flexibility that an equitable paradigm of learning requires.

A further problem, which is likely to reinforce inequalities of access to HE when facilitated by IT, is the inequitable access to IT and telecommunications. This problem is to be addressed by the installation of MPCC's and other public access facilities for IT and telecommunications. The installation of such facilities presents an opportunity for the creation of a socially-compatible use of IT for the aim of expanding access to HE, because they can simultaneously provide access to technologies, to other students and to teachers alike. Such centres are, however, insufficiently distributed and are unlikely to be equitably accessible to the majority of South Africans in the near future.

In opposition to the claim made by technological determinists in chapter two, the use of IT for the facilitation of access to HE is thus unlikely to result in more equity of access to HE in SA. In fact, the use of IT may aggravate the inequalities of access to HE as it threatens to make HE more expensive for individual students. It further threatens to lead to the employment of more independent learning methods. The effects of this are likely to be a further aggravation of inequalities of outcome, because more independent learning is not an appropriate educational strategy for those who come to HE poorly-prepared by primary and secondary education. However, this assessment cannot mean that we have to reject the use of IT in HE in SA altogether. Instead, it suggests that we have to rethink the reasons for the use of IT in HE in SA and formulate

them with the understanding that there are grave contradictions between the aims and goals for HE and the effects of the use of IT when employed to reduce cost of HE.

Chapter 5: Conclusions

Currently, Information Technology (IT) is widely believed to lead to the advancement of economic performance in general, as well as to a greater efficiency and effectiveness of higher education (HE) in particular. This examination set out to examine how IT can be used to benefit South African society in general and the South African HE-sector in particular. In the course of this examination it has however became increasingly evident that the role of IT in HE is not as straight forward as proponents frequently make believe. IT was found to have severe limitations when used to enhance the quality of higher learning and in making HE more accessible to the disadvantaged in SA. These limitations were found to be particularly evident in educational environments where funds are scarce, as is the case in SA. Rather than an examination of opportunities, this thesis consequently evolved to become an examination of the limitations of IT in its applications in HE.

5.1 Theoretical conclusions

By examining the theories on technology and the underlying discourses of the various stances, we are better able to understand the effects associated with the implementation of IT in HE and the factors which are likely to impact on the attainment of the goals of transformation of HE in SA. The theoretical discussion of technology (conducted in chapter one), the examination of adverse effects of the use of IT in HE (conducted in chapter three) and the problem of inequitable access to IT (discussed in chapter four) all suggest that *IT is not neutral*, meaning that it has effects beyond its immediate application in HE. These effects are located on a micro- and a macro-level. On the micro-level, the non-neutrality of IT is characterised by the limitations of IT in the facilitation of learning, namely its deficiency in the facilitation of the negotiation of meaning. On the macro-level, IT impacts on HE particularly by making it more expensive and access to it more cost-intensive. This thesis places a focus on the evaluation of these effects on the transformation of HE in SA in particular.

This thesis departs from technological determinists who assess the potential and applications of IT and conclude that the social effects of IT in HE are beneficial. Rather, this thesis argues that social conditions provide the appropriate point of departure for an evaluation of IT in HE. Of particular importance are the content and form of IT-facilitated HE (as defined generally in chapter three and specifically in relation to the SA HE-sector in chapter four) and access to IT, telecommunications and electronic networks in SA (as discussed in chapter four). These criteria are adopted, because they conflict with the claimed social benefit of IT.

This thesis argues that the increasing use of IT may, in fact, have consequences that may and will impede on the aims for HE transformation. Some of these consequences can be overcome by implementing IT in HE according to student needs (as defined in chapters three and four) and by fostering an awareness of the agenda of IT (as discussed in chapter three). However, there are certain factors where the consequences are unavoidable. The factor, which this thesis has emphasised in this respect, is the cost of IT in particular (see chapters three and four). This cost, it is argued (see chapters three and four), is likely to affect the content, the form and the accessibility of HE. A focus on the potential and applications of IT in HE leaves these effects concealed.

This thesis concludes that IT has the potential to undermine the aims of HE. It is critical to identify the negative effects of IT in order to avoid the pitfalls that may and will occur. It is through the study of the negative effects of IT in HE that we can formulate the necessary principle for a more socially-compatible use of IT in HE. The substantive critique of technology is the only approach to technology that presents the case of the adverse effects of the technologies themselves. This theory permits one to critically examine the increasing use of IT in HE. It has consequently guided this examination and lead to the identification of the shortcomings of IT in its application in HE.

The rejection of IT is an unrealistic option. The study of the adverse effects is the only strategy that allows us to assess and, to some extent, shape the influence IT has on the aims of transformation of HE in SA. This examination can provide us with principles which can consequently be applied in the integration of IT into residential institutions, in the greater utilisation of IT for the facilitation of Distance Education (DE) and in the establishment of a new institution for higher learning, such as the lauded Virtual University. This thesis is relevant for institutional and governmental policy makers, as it provides the criteria for the implementation of IT in HE which can ensure that IT-facilitated HE can meet the needs of the learner and can assist in providing more equity of access.

5.2 General conclusions

This thesis concludes that there are a number of adverse effects of the use of IT in HE. The increasing employment of IT is likely to affect HE with respect to the content, the form and its accessibility. The increasing use of IT in HE tends to promote an instrumental view on HE (as discussed in chapter three). This view emphasises applicable skills and subjects that are occupied with the transmission of established knowledge. It further tends to neglect the importance of the cognitive development of students, the creation of critical thinkers and subjects that negotiate

meaning (as discussed in chapters two, three and four). The increasing use of IT for higher learning is (as discussed in chapters three and four) likely to result in a focus of HE on vocational skills in particular. This tendency threatens to contradict the aim to develop constructively critical and enlightened citizens, as formulated by SA policy makers (discussed in chapter four).

The tendency of IT to emphasise vocational skills is reinforced by the particular form of conducting higher learning which the use of IT and the mutual need to reduce expenditures result in, namely independent and distance learning. This thesis argues (in chapter three) that independent learning and distance education are limited in terms of their ability to foster debates on values, morality and philosophy and to develop critical thinkers that have emancipated themselves from dominant viewpoints. In order for HE to develop critical thinkers (as argued in chapter three) it is necessary to retain face-to-face meetings and allow discussion and debate on the various perspectives of the workings of the world.

The discussion of the problems of DE (conducted in chapter three) has shown that learning at a distance is more difficult than traditional residential education. This thesis has consequently argued (in chapter four) that DE may not be well-suited to expand access to HE for students who come to HE poorly-prepared by primary and secondary schooling. IT-facilitated HE that relies on DE alone may thus not be a sufficient strategy to ensure equity of outcomes in HE.

Furthermore, equity of access to IT-facilitated DE and contact education requires widespread and equitable access to IT, electronic networks and telecommunications. Inequalities of access to IT have been shown to exist amongst the general population; between national institutions; between institutions in industrialised countries and those in SA; and within those institutions in particular which transfer IT-expenditures to their students (discussed in chapter four). These inequalities suggest that IT needs to be made accessible on an equitable basis in order for IT-facilitated HE to be equitably accessible.

The costs involved in the use of IT in HE means that the inequalities amongst South African institutions for higher learning are likely to increase rather than decrease (as discussed in chapter four). The examination of the costs of providing IT-facilities at UCT indicates that the provision of institutional access to IT places great financial pressures on well-resourced HE-institutions. This thesis consequently argues that equitable access to well-resourced institutions is of particular importance as the computerisation of HE advances.

5.3 Conclusions for SA

The **key recommendation** this thesis makes with respect to the integration of IT into HE is that this integration continually needs to be compared to the socially determined aims for HE as well as to the needs of the learners. This can be achieved by providing students with choices, such as the choice to study independently, at a distance and through IT or face-to-face and at institutions (as discussed in chapter four).

However, this thesis argues (in chapter three) that IT furthermore carries an agenda that is inherent in particular applications of IT and therefore difficult to avoid. As one example for this agenda, the fragmentation of information in hypertext is examined and discussed (in chapter three). This thesis argues (in chapter one) that the identification of this agenda and its thorough examination is the only strategy that enables us to avoid the pitfalls of IT. It is consequently necessary for South African students, teachers, researchers and policy makers to be made aware of this agenda. Integrating the theoretical study of technology into those fields that use it can do this. Computer literacy is then not confined to knowing how to use IT, but also about knowing its limitations.

South African policy makers have voiced their belief that an emphasis on science and technology subjects is necessary in order to adjust the mismatch which exists between the output of HE-institutions and the needs of the economy (see chapter four). They have further assured critics that humanities and social sciences will not be adversely affected by this emphasis (see chapter four). However, this thesis argues (in chapter four) that it appears likely that the increasing use of IT, the increasing expenditures of HE-institutions on IT and the scarcity of funds will require HE to place a greater emphasis on skills which are in demand in the marketplace. This thesis argues that a distinct emphasis on humanities, arts and social sciences is necessary in order for them to remain a significant part of HE in SA.

Amongst the general public, access to IT has been shown (in chapter four) to be highly inequitable. This thesis argues (in chapter four) that without the provision of public access facilities, IT is likely to result in highly inequitable structures of access to IT-facilitated HE. This thesis further argues (in chapter four) that the implementation of public access facilities represents an opportunity to integrate educational needs and public access to IT. If well-planned, such centres can provide students with access to a community, to teachers and to IT. They represent valuable resources for IT-facilitated HE, because they can make access to it more equitable and more socially-compatible.

In sum, this thesis argues that IT is not neutral and this non-neutrality has the potential to redirect the focus of HE towards the application of the performance principle therein. However, this thesis further argues that a causal relationship between the use of IT and the performance principle is difficult to establish. Social choices are an important determinant for the actual effects of the increasing use of IT in HE. It appears, however, that the larger the financial pressures on HE, the greater the possibility that IT may, in fact, lead to a comprehensive re-organisation of HE. This re-organisation could threaten the attainment of goals of HE, particularly the creation of enlightened and critical citizens and the equitable access.

5.4 Further research

Due to the scarcity of critical South African publications on technology itself, rather than on access to it, this thesis recommends further research in this field. With the increasing use of IT in society in general as well as in the South African and southern African HE-institutions in particular, further theoretical and empirical research into the political relevance of IT gains increasing importance. Only with a good theoretical and empirical knowledge-base will society be able to properly understand the role of IT and avert its pitfalls. It is consequently further recommended that political scientists in SA examine adverse effects of the use of IT in HE on political objectives at both empirical and theoretical levels.

The constant development of IT and its applications further require continuous monitoring. If technology is, in fact, not neutral, as this thesis argues (see chapter one), we can expect further "social pathologies" (Habermas, cited in: Feenberg, 1996: section 1) to be revealed with its increasing use in society.

Further research is recommended into the effects of IT on the cultural prepositions of studying at South African HE-institutions. The possible existence of a cultural bias of IT in general as well as of specific educational software applications is of significant political relevance and requires examination.

This thesis further recommends research into systems that ensure that HE-institutions can recover the costs for IT and electronic networks from those who use it and are able to pay.

Further empirical research is also recommended into the recent development of Multi-Purpose Community Centres in SA. The educational value of such centres as well as their accessibility are important factors in making IT-enhanced DE socially-compatible and equitably available.

Appendix

List of appendices:

Appendix No.		Page No.
Appendix 1	List of abbreviations	ii
Appendix 2	Bibliography	iv

List of abbreviations:

ADP Academic Development Programme

AVU African Virtual University

CBL Computer-based learning

CL Computer Literacy

CMC Computer-mediated communication

CSS Central Statistical Services

DE Distance Education

Dep. of ACST Department of Arts, Culture, Science and Technology

DEWP Draft Education White Paper

FRD Foundation for Research Development

GNP Gross National product

HBI Historically Black Institutions

HE Higher education

HEGP Higher Education Green Paper

HEWP Higher Education White Paper

HWI Historically White Institutions

IDRC International Development Research Centre

IL Information Literacy

IR Information Revolution

IS Information Society

ISAD Information Society and Development Conference

IT Information Technology

ITU International Telecommunications Union

LS Learning Society

MPPC Multi-Purpose Community Centres

NCHE National Commission for Higher Education

NGI Next Generation Internet

OECD Organisation for Economic Co-operation and Development

SA South Africa

SAIDE South African Institute for Distance Education

SDNP Sustainable Networking Programme

SST Social Shaping of Technology

STGP Science and Technology Green Paper

STWP Science and Technology White paper

TELI Technology-Enhanced Learning Investigation

UCLA University of California in Los Angeles

UCT University of Cape Town

UNDP United Nations Development Programme

UNESCO United Nations Cultural and Scientific Organisation

UNISA University of South Africa

WPRD White Paper on Reconstruction and Development

Bibliography

Print Publications:

Books

1. Armin, A. (Ed.) (1994). *Post-Fordism: A Reader.* Cambridge: Blackwell Publishers Inc.

2. Bailes, K. (1978). *Technology and Society under Lenin and Stalin.* Princeton: Princeton University Press.

3. Bates, A. (1995). *Technology, Open Learning and Distance Education.* London: Routledge.

4. Bell, D. (1976). *The Coming of the Post-Industrial Society: A Venture in Social Forecasting.* Harmondsworth: Penguin.

5. Bell, D. (1980). The social framework of the information society. In T. Forester (ed.). *The Microelectronics Revolution.* (pp. 500-549). Oxford: Basil Blackwell Publisher.

6. Berge, Z. & M. Collins (ed.) (1995). *Computer mediated communication and the online classroom.* (Vol. 1 An Overview and Perspectives & Vol. 2 Higher Education). Cresskill: Hampton Press Inc.

7. Borgman, A. (1984). *Technology and the Character of Contemporary Life.* Chicago: Univ. of Chicago Press.

8. Bunting, I. (1994). *A legacy of inequality: higher education in South Africa.* Rondebosch: UCT Press.

9. Cawkell, A. (1991). *World Information Technology Manual.* (Vol 2 Systems and Services). Amsterdam: Elsevier.

10. Drucker, P (1969). *The Age of Discontinuity.* New York: Harper & Row.

11. Ellul, J. (1964). *The technological society.* New York: Vintage.

12. Ellul, J. (1980). *The technological system.* New York: Continuum.

13. Feenberg, Andrew: The written world: On the theory and practice of computer conferencing. In R. Mason & A. Kaye (eds.). *Mindweave: communication, computers and distance education.* (pp. 22-39). Oxford: Pergamon Press.

14. Foundation for Research Development (1996c). *SA Science and Technology Indicators.* Pretoria: FRD.

15. Gates, B. (1995). *The road ahead.* New York: Viking.

16. Gibbons, M., C. Limoges, H. Nowotny, S. Schwartzman, P. Scott & M. Trow. (1994). *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies.* London: SAGE Publications Ltd.

17. Gibbs, G., N. Pollard & J. Farell. (1994). *Institutional Support for Resource Based Learning.* Oxford: Oxford Centre for Staff Development.

18. Goldstone, J. (1993). Revolution. In J. Krieger (ed.), *The Oxford Companion to Politics of the World.* (pp. 786-790) Oxford: Oxford University Press.

19. Habermas, J. (1968). *Technik und Wissenschaft als 'Ideologie'.* Frankfurt am Main: Surkamp.

20. Hamelink, C. (1994). *The politics of world communication.* London: Sage.

21. Hay, D. & D. Morris. (1993). *Industrial Economics and Organisation. Theory and Evidence.* Oxford: Oxford University Press.

22. Heidegger, M. (1977). *The question concerning technology and other essays (trans. William Lovitt).* New York: Harper & Row.

23. Hughes, T, T. Pinch & W. Bijker. (1989). *The Social Construction of Technological Systems.* Cambridge: MA: MIT Press.

24. Kling, R. (1996). Hopes and Horrors: Technological Utopianism and Anti-Utopianism in Narratives of Computerisation. In R. Kling (ed.). *Computerisation and Controversy. Value Conflicts and Social Choices.* (pp. 40-58). San Diego: Academic Press Inc.

25. Kranzberg, M. (1985). The Information Age: Evolution or Revolution? In B. Guile (ed.). *Information Technologies and Social Transformation.* (pp. 35-54). Washington D.C: National Academy Press.

26. Laurillard, D. (1993). *Rethinking University Teaching; a framework for the effective use of educational technology.* London: Routledge.

27. Lemmer, E., A. Bergh, N. van der Linde, P. van Niekerk, N. van Wyk. (1995). *Distance Learners and Their Experience of Text. Report of a research project conducted under the auspices of the Faculty of Education and the Educational Research of the University of South Africa.* Pretoria: Institute for Educational Research, University of South Africa.

28. Lickindorf, E. (1993). Contexts for New Approaches to South African University Education. In I. de Villiers (ed.). *Southern African Conference on the Restructuring of Education.* (Vol. IV). (pp. 60-72). Pretoria: Human Science Research Council.

29. Lyon, D. (1991). *The Information Society: Issues and Illusions.* Cambridge: Polity Press.

30. Lyon, D. (1995). The Roots of the Information Society Idea. In N. Heap, R. Thomas, G. Einon, R. Mason and H. Mackay (eds.). *Information Technology and Society. A Reader.* (p. 54-73). London: Sage.

31. Lyotard, J. (1984). *The Postmodern Condition: A Report on Knowledge.* Manchester: Manchester University Press.

32. Machlup, F. (1962). *The Production and Distribution of Knowledge in the United States.* Princeton: Princeton University Press.

33. Marx, L. & M. Smith. (1994). Introduction. In: M. Smith and L. Marx (ed.). *Does Technology Drive History? The Dilemma of Technological Determinism.* (pp. ix-xv). Massachusetts: MIT Press.

34. MacKay, H. (1991). Technology as an Educational Issue: Social and Political Perspectives. In Mackay, H., M. Young and J. Beynon (ed.). *Understanding Technology in Education (pp. 1-11).* Bristol: The Falmer Press.

35. Malecki, E. (1996). Revolutions. In Magill, F. (ed.). *International Encyclopaedia of Government and Politics (pp. 1195-1198).* (Volume 2). London: Salem Press Inc.

36. McLuhan, M. (1997). *Medien Verstehen.* Mannheim: Bollmann Kommunikation & Neue Medien.

37. Mendrinos, R. (1994). *Building Information Literacy using High Technology: A Guide for Schools and Libraries.* Englewood, Colorado: Libraries Unlimited.

38. Mesthene, E. (1970). *Technological Change: Its Impact on Man and Society.* Cambridge: Harvard U.P.

39. Monk, P. (1989). *Technological Change in the Information Economy.* New York: Pinter.

40. Moulder, J. (1991). "Africanising" the Predominantly White Universities: Some Ideas for Debate. In J. Jansen (ed.). *Knowledge and Power in South Africa.* (pp. 111-126). Johannesburg: Skotaville.

41. Negroponte, N. (1995). *Being digital.* New York: Knopf.

42. Nel, H. (1993). The need for Technology in Education. In I. de Villiers (ed.). *Southern African Conference on the Restructuring of Education.* (Vol. IV). (pp. 205-216). Pretoria: Human Science Research Council.

43. Porat, M. (1977). *The Information Economy: Sources and Methods for Measuring the Primary Information Sector.* Washington DC: US Department of Commerce, Office of Telecommunications.

44. Postman, N. (1992). *Technopoly.* New York: Knopf.

45. Ramphele, M. (1993). *Standards - The Loaded Term. Occasional Papers: No. 1.* Cape Town: University of Cape Town.

46. Ranson, S. (1994). *Towards the Learning Society.* London: Cassell.

47. Saunders, S. J. (1992). *Access to and Quality in Higher Education in South Africa.* Cape Town: University of Cape Town.

48. Smith, M. (1994). Technological Determinism in American Culture. In L. Marx & M. Smith (eds.). *Does Technology Drive History? The Dilemma of Technological Determinism.* (pp. 1-35). Massachusetts: MIT Press.

49. South African Institute for Distance Education. (1995a). *Open Learning and Distance Education in South Africa.* Manzini: Mcmillan Boleswa.

50. Thomas, R. (1995). Access and Inequality. In N. Heap, R. Thomas, G. Einon, R. Mason and H. Mackay (eds.). *Information Technology and Society: A Reader.* (pp. 90-99). London: Sage.

51. Touraine, A. (1971). *The Post-industrial Society.* New York: Random House.

52. Tuman, M. (1992). *Word Perfect: Literacy in the Computer Age.* London: Falmer Press.

53. Webster, F. (1995). *Theories of the Information Society.* London: Routledge.

54. Weiland, R. (1996). 2001 A Meetings Odyssey. In R. Kling (ed.). *Computerisation and Controversy. Value Conflicts and Social Choices.* (pp. 59-66). San Diego: Academic Press Inc.

55. Williams, R. & D. Edge. (1996). The Social Shaping of Technology. In W. Dutton (ed.). *Information and Communication Technologies: Visions and Realities.* (pp. 53-68). Oxford: Oxford University Press.

56. Winner, L. (1987). *Political Ergonomics: Technological Design and the Quality of Public Life.* Berlin: International Institute for Environment and Society.

57. Winner, L. (1993). Do artefacts have politics? In D. MacKenzie and J. Wajcman (eds.). *The social shaping of technology.* (pp. 26-38). Bristol: Open University Press

58. Woolgar, S. (1996). Technologies as Cultural Artefacts. In W. Dutton (ed.). *Information and Communication Technologies: Visions and Realities.* (pp. 87-102). Oxford: Oxford University Press.

59. Wolpe, H. & Z. Barends. (1993). *A Perspective On Quality and Inequality in South African University Education.* Belleville, South Africa: University of the Western Cape.

Conference papers, reports and speeches

1. Christensen, P. (1997). *Educational Technology and Educational Reform: Lessons for South Africa.* Paper Presented at the Future World Educating for the 21st Century Conference, SBS Conferences in association with the Computer Society, UCT and IOI '97, Dec. 2-4, 1997, Cape Town.

1. Cochrane, P. & R. Smith. (1994). *21st Century Information Systems.* Expert Systems '94 Conference. British Computer Society, 12-14 December 1994, Cambridge.

2. Culpeper, R. (1997). *Creating Uncommon Knowledge for Disenfranchised Citizens.* Position Paper. Report of the preliminary Canadian Consultations. Montreal. [Online] As found at: [http://www.globalknowledge.org/english/archives/document-archives/gk97.pdf] [14.8.98]

3. Garbers, J.G. (1992). Address delivered at the SAIDE Conference, September 1992, Johannesburg.

4. Gultig, J. (1992). *Educating teachers in the 'new' South Africa: What role can distance education play?* SAIDE Conference, September 1992, Johannesburg.

5. Haupt, S. & G. Mintoor. (1997). *Computer Literacy at Vista University - An Educationalist / Business Perspective.* Paper Presented at the Future World Educating for the 21st Century Conference, Dec. 2-4, 1997, Cape Town.

6. Information Society and Development Conference (ISAD). (1996). *The Information Society and the Developing World: A South African Approach.* South African submission to the ISAD Conference, May 1996, Johannesburg. [Online] As found at: [http://www.csir.co.za/isad/sapos.htm] [10.12.97]

7. Packer, A. (1997). *Educating for Future Work.* Paper Presented at the Future World Educating for the 21st Century Conference, Dec. 2-4, 1997, Cape Town.

8. Paquet-Sévigny, T. (1997). *Discussion of the Think Pieces of the Global Knowledge Revolution.* Report of the preliminary Canadian Consultations. Montreal. [Online] As found at: [http://www.globalknowledge.org/english/archives/document-archives/gk97.pdf] [14.8.98]

9. Swift, D. (1992). *Distance Education and Open Learning.* SAIDE Conference, September 1992, Johannesburg.

10. Deacon, H., M. Walton, & F. Wilson. (1997). *The Use of Computers in Teaching Humanities Subjects at UCT.* Paper Presented at the Future World Educating for the 21st Century Conference, Dec. 2-4, 1997, Cape Town.

Government papers

1. Department of Arts, Culture, Science and Technology. (1997). *South Africa's Green Paper on Science and Technology. Preparing for the 21st Century.* (STGP). [Online]. As found at: [http://wn.apc.org/technology/stgreen/toc.htm] [14.8.98]

2. Department of Arts, Culture, Science and Technology. (1996). *White Paper on Science and Technology. Preparing for the 21st Century.* (STWP) [Online] As found at: [http://www.polity.org.za/govdocs/white_papers/science.html] [14.8.98]

3. Department of Education: Education White Paper 3. (1997) *A Programme for the Transformation of Higher Education.* Government Gazette No. 1196 of 1997 (HEWP). [Online] As found at: [http://www.polity.org.za/govdocs/white_papers/highed.html] [14.8.98]

4. Department of Education. (1996). *Green Paper on Higher Education Transformation.* (HEGP). [Online] As found at: [http://www.polity.org.za/govdocs/green_papers/hegreenp.html] [14.8.98]

5. Government of National Unity. (1994). *White Paper on Reconstruction and Development.* Discussion Document. Government Gazette No. 16085 of 1994 (WPRD). [Online] As found at: [http://www.polity.org.za/govdocs/white_papers/rdpwhite.html] [14.8.98]

Journals

2. Besser, H. & M. Bonn. *Impact of Distance Independent Education.* Journal of the American Society for Information Sciences, Vol 47, No. 11, 1996, pp. 880-883.

3. Beyers, E. *Towards a formulation of a philosophical base for education in South Africa.* South African Journal of Psychology, Vol. 26, No. 3, 1996, pp. 191-197.

4. Brooks, David: Universities in a Time of Transition. Perspectives in Education, Vol 17, No. 1, 1996, pp. 187-190.

5. Chafy, R. *Exploring the Intellectual Foundation of Technology Education: From Condorcet to Dewey.* Journal of Technology Education, Vol. 9, No. 1, 1997, pp. 8-21.

6. Chandler, D. *The educational ideology of the computer.* British Journal of Educational Technology, Vol 21, No. 3, 1990, pp. 165-174.

7. Darch, C. *The Economics of Information and the Information Society: Is Social Equity still on the Agenda in the 1990s?* Innovation, No. 10, 1995, pp. 3-12.

8. Draper, S. & A. Anderson. *The Significance of Dialogue in Learning and Observing Learning.* Computers in Education, Vol. 17, No. 1, 1991, pp. 93-107.

9. Forrester, M. *A Conceptual Framework for Investigating Learning in Conversations.* Computers in Education, Vol. 17, No. 1, 1991, pp. 61-72.

10. Glover, D. *Computerising the classroom.* IT Review, Jan/Feb/March 1995, pp. 16-22.

11. Goodson, I. & M. Mangan. *Computer Literacy as Ideology.* British Journal of Sociology in Education, Vol 17, No. 1, 1996, pp. 65-79.

12. Hartley, D. *Teaching and Learning in an Expanding Higher Education System (the MacFarlane Report): a technical fix?* Studies in Higher Education, Vol 20, No. 2, 1995, pp. 147-158.

13. Hornborg, A. *Distinctions That Mystify: Technology Versus Economy and Other Fragmentations.* Knowledge and Policy: The International Journal of Knowledge Transfer and Utilisation, Vol 6, No. 2, 1993, pp. 37-45.

14. Hornborg, A. *Machine Fetishism, Value and the Image of the Unlimited Good: Towards the Thermodynamics of Imperialism.* Journal of the Royal Anthropological Institute, Vol. 27, No. 1, 1992, pp. 1-18.

15. Iseke-Barnes, J. *Educational uses of the Internet.* Journal for Educational Computing Research, Vol 15, No. 1, 1996, pp. 1-23.

16. Lauglo, J. *Banking on Education and the Uses of Research A Critique of: The World Bank Priorities and Strategies for Education.* International Journal of Educational Development, Vol. 16, No. 2, 1996, pp. 221-233.

17. Mbeki, T. *Shaping the information society.* IT Review, Jan/Feb/March 1996, pp. 16-19.

18. Moriarty, G. *My Response to Nartonis' Answer to Postman's Technopoly.* Bulletin of Science, Technology and Society, Vol 14, No. 5-6, 1994, pp. 262-267.

19. Mwabu, G. & T. P. Schultz. *Education Returns Across Quintiles of the Wage Function: Alternative Explanations for Returns to Education by Race in South Africa. Human Capital and the Labour Market in South Africa.* AEA Papers and Proceedings, Vol 86 No. 2, 1996, pp. 335-339.

20. Nartonis, D. *An Answer to Neil Postman's Technopoly.* Bulletin of Science, Technology and Society, Vol 13, pp. 67-70.

21. Naude, L. *Telecommunications in Africa - growth opportunities?* Elektron, November 1994, pp. 39-42

22. Du Plessis, J., J. Van Biljon, J. Tolmie & T. Wollinger. *A Model for Intelligent Computer-Aided Education Systems.* Computers in Education, Vol 24, No. 2, 1996, pp. 89-106.

23. Slack, J., *The information revolution as ideology.* Media, Culture and Society, Vol. 6, 1984, pp. 247-256.

24. Thomas, D. *Education across Generations in South Africa. Human Capital and the Labour Market in South Africa.* AEA Papers and Proceedings, Vol 86 No. 2, 1996, pp. 330-334.

25. Timms, D. *Computers and the Teaching of Sociology and the Policy Sciences.* Computers in Education, Vol 19, No. 1/2, 1992, pp. 97-104.

26. Torres, C. *Adult Education and Instrumental Rationality: A Critique.* International Journal of Educational Development, Vol. 16, No. 2, 1996, pp. 195-206.

27. White, J. *Philosophy and Higher Education.* Studies in Higher Education, Vol 22, No 1, 1997, pp. 7-17.

Newspaper articles

1. *Africa's virtual university reaches six countries.* Reconstruct, July 7, 1998, p. 7.

2. *Between a rock and a hard place.* Sunday Independent, Higher Education Review. May 12, 1996. [Online] [http://www.inc.co.za/online/hero/may_12/rock.html] [14.8.98]

3. Darch, C., C. Karelse and P. Underwood. *Alternative routes to the Information Superhighway.* Sunday Independent, Higher Education Review. May 19, 1996. [Online] [http://www.inc.co.za/online/hero/may_19/hiway3.html] [14.8.98]

4. Chapman, G. *Digital Nation: Will Technology Commercialise Higher Learning?* The Los Angeles Times, January 19, 1998.

5. Ewing, D. *The problem with distance education is – distance.* Sunday Independent, Higher Education Review, April 28, 1996. [Online] [http://www.inc.co.za/online/hero/april_28/distance.html] [14.8.98]

6. Naidoo, P. *We will march if we must.* Sunday Independent, Higher Education Review, April 28, 1996. [Online] [http://www.inc.co.za/online/hero/april_28/march.html] [14.8.98]

7. *Strategic plan guides UCT's 1998 budget.* Monday Paper. Vol 17, No. 1, February 16-23, 1998.

8. *Technology versus development.* Mail & Guardian, August 30 to September 5, 1996.

9. *The Bill Gates of small arms tells SA his reward is glory, not money.* Sunday Independent, November 16, 1997.

10. *Subsidy cuts reverse the gains made in higher education and amount to an act of betrayal, says technikon rector.* Sunday Independent, March 16, 1997.

11. *UCT flies transformation flag high. Sunday* Independent, July 19, 1998, p. 7.

12. *US scours the world for young computer experts willing to work for less that its citizens.* Sunday Independent Business, March 29, 1998, p. 4.

13. *Ultimatum for student debtors.* Cape Times, May 26, 1998, p. 3.

14. *Why the cost of telephone calls is soaring.* Cape Argus, January 20, 1997, p. 8.

NCHE Documents

1. Foundation for Research Development. (1995a). *Higher Education Sector and the New South African Society: Cultivating a Shared Vision.* Submission to the National Commission on Higher Education. [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

2. Foundation for Research Development. (1995b) *Vision Document on Technology Infrastructure to Support Learning.* [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

3. Garbers, C. (Date unknown). *Report on the Role of Private Educational Institutions in a Diversified Mass Higher Education System.* As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

4. Hofmeyr, J. (1995). *Summary of Supply Trends and Issues for Higher Education.* As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

5. Kotecha, P. (1995). *A National Profile of AD and Bridging Programmes: issues, trends and policy considerations.* Technical Committee on Student Access, Support and Development. Draft. [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

6. Kraak, A. (1995) *Globalisation, the Learning Society and the case for a Unified National System of Higher Education in South Africa.* [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

7. Muller, J. (1995) *Some international trends in the new production of knowledge: A background paper.* Submission to the National Commission on Higher Education. [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

8. National Commission for Higher Education. (1996a). *An Overview of a New Policy Framework for Higher Education Transformation.* [Online] As found at: [http://www.polity.org.za/govdocs/policy/educ.html] [14.8.98]

9. National Commission for Higher Education. (1996b). *Report of the Future Needs and Priorities Task Group.* [Online]. As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

10. National Commission for Higher Education. (1996c). *NCHE Report: A Framework for Transformation. Libraries and Information Technology: Executive summary.* [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

11. National Commission for Higher Education. (1996d). *WGLIT; Policy, Planning & Co-operation: Smart Solutions for Information Provision.* [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

12. National Commission for Higher Education. (1996e). *A Framework for Transformation. Report of the NCHE.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

13. National Commission on Higher Education. (1996f). *TC2: Student Access, Support and Development. Draft Outline of Paper 4: Student Services.* [Online] As found at: [http://star.hsrc.ac.za/nche.html] [14.8.98]

14. Rhodes University. (1995). *Academic Development Programme. Submission to the NCHE.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

15. South African Institute for Distance Education. (1995b). *Cost Efficiency of Teaching in Higher Education.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

16. South African Institute for Distance Education. (1996). *A Conceptual Analysis of the Costs of Distance Education.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

17. University of South Africa. (date unknown). *Distance Education Afstandsondering. The NCHE Discussion Document. A UNISA Perspective.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

18. University of South Africa. (1995). *Submission to the NCHE.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

19. University of Witwaterstrand. (1995). *Mission Project.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

20. Young, M. (date unknown). *International Comments on the New Knowledge and Globalisation Papers. Perspectives on the future of higher education in South Africa. A paper commissioned by the National Commission for Higher Education.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

21. Young, M. & M. P. Maaga. (1995). *Information Technology (I.T.) in Higher Education. National Commission on Higher Education, Task Group on Future Needs and Priorities.* [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

22. Zuma, S. (1995). Bridging and Access: From Further to Higher Education. Task Group 5, Technical Committee 4, Paper 4, Draft 1. [Online] [http://star.hsrc.ac.za/nche.html] [14.8.98]

Internet:

Books, web pages and articles:

1. Baranshamaje, E., E. Boostrom, V. Brajovic, M. Cader, R. Clement-Jones, R. Hawkins, P. Knight, R. Schware, H. Sloan. (1995). *Increasing Internet Connectivity in Sub-Saharan Africa. Issues, Options, and World Bank Group Role.* [Online] As found at: [http://www.idsc.gov.eg/aii/iici1.htm] [14.8.98]

2. Baranshamaje, E. (1995). *The African Virtual University (AVU): Concept Paper.* Washington, draft of June 7. [Online] As found at: [http://www.avu.org/documents/concept.html] [14.8.98]

3. Bellanet Web Site. [Online] As found at: [http://www.bellanet.org/aboutmore.html]

4. Bruce, C. (1994). *Information Literacy Blueprint.* Griffiths University. [Online] As found at: [http://www.gu.edu.au/gwis/ins/infolit/blueprnt.htm] [14.8.98]

5. Central Statistical Services. (1995). *Statistical Release P0317. Demography: October Houshold Survey – RSA.* [Online] As found at: [http://www.css.gov.za/releases/demograp/p0317.htm] [14.8.98]

6. Chandler, D. (1995). *Technological or Media Determinism.* [Online] As found at: [http://www.aber.ac.uk/~dgc/tecdet.html] [14.8.98]

7. Choksi, A. (1994). *Higher Education -The Lessons of Experience.* World Bank. [Online]. As found at: [http://fox.china.com/cww_html/grepsite/wb/html/hcovp/educ/publicat/hi-ed1.html] [14.8.98]

8. Duchastel, P. & S. Turcotte. (1996). *Online Learning and Teaching in an Information-Rich Context.* [Online] As found at: [http://www.wcape.school.za/inet96/papers/c4/c4_1.htm] [14.8.98]

9. Duncan, M. (1996). *How can we improve our access to the Internet?* [Online] As found at: [http://www.uct.ac.za/depts/its/dit/quovadis.htm] [14.8.98]

10. Duncan, M. (1997a). *UCT's network access strategy for 1997.* [Online] As found at: [http://www.uct.ac.za/depts/its/dit/strat_97.htm] [14.8.98].

11. Duncan, M. (1997b). The drivers of growth in the ITS budget. [Online] As found at: [http://www.uct.ac.za/depts/its/dit/growth.htm] [26.5.98]

12. Ebersole, S. (1993) *Media Determinism.* [Online] As found at: [http://www.regent.edu/acad/schcom/rojc/mdic/md.html] [13.8.98]

13. Education Centre. (date unknown). *Coping with a Revolution: Will the Internet Change Learning?* Handout by the Education Centre, Lincoln University, Canterbury, New Zealand. [Online] As found at: [http://www.lincoln.ac.nz/educ/learning.htm] [13.8.98] (Education Centre)

14. Feenberg, A. (Forthcoming) *From Essentialism to Constructivism: Philosophy of Technology at the Crossroads.* [Online] As found at: [http://www-rohan.sdsu.edu/faculty/feenberg/talk4.html] [13.8.98]

15. Feenberg, A. (1991) *Critical Theory of Technology.* Presentation by Andrew Feenberg, September 1991, Simon Fraser University, Vancouver, Canada. [Online] As found at: [http://omni.cc.purdue.edu/~sbenning/el102c/Tech_Theory/Feenberg.html] [13.8.98]

16. Feenberg, Andrew. (date unknown). *Summary Remarks on My Approach to the Philosophical Study of Technology.* [Online] As found at: [http://www-rohan.sdsu.edu/faculty/feenberg/method1.html] [13.8.98]

17. Forge, S. (1995). *The Consequences of Current Telecommunications Trends for the Competitiveness of Developing Countries.* Information for Development Programme, World Bank. [Online] As found at: [http://www.infoamericas.org/library/documents/wbp_3.html] [10.12.97]

18.Foundation for Research Development. (d). *UNINET Home Page.* [Online] As found at: [http://www.frd.ac.za/uninet/] [14.8.98]

19.Hall, M. (1998). *Virtual University / Segregated Highway? The Politics of Connectivity.* Cape Town. [Online] As found at: [http://www.uct.ac.za/depts/meg/virtual.htm] [14.8.98]

20.Hamelink, C. (1997) *New Information and Communication Technologies, Social Development and Cultural Change.* Discussion Paper No. 86. [Online] As found at: [http://www.unrisd.org/engindex/publ/list/dp/dp86/toc.htm] [21.4.1998]

21.Herremans, A. (1995) *New Training Technologies.* Turin. [Online] As found at: [http://www.education.unesco.org:80/pdf/23_90.pdf] [14.8.98]

22.Hodge, J. & J. Miller. (1997). *Information Technology in South Africa, The State-of-the-Art and Implications for National IT Policy.* Working Paper No.3. Cape Town. [Online] As found at: [http://wn.apc.org/nitf/dpruwp.htm] [14.8.98]

23.IBM. (date unknown). *Living in the Information Society: Transforming Higher Education.* [Online] As found at: [http://www.ibm.com/IBM/publicaffairs/pdf_file/higher.pdf] [14.8.98]

24.infoDev Website. [Online] As found at: [http://www.worldbank.org/infodev/] [14.8.98]

25.International Telecommunications Union. (1995). *World Telecommunications Development Report.* [Online] As found at: [http://www.itu.ch/wtdr95/] [14.8.98]

26.Kling, R. & R. Lamb. (1996). *Envisioning Electronic Publishing and Digital Libraries: How Genres of Analysis Shape the Character of Alternative Visions.* In G. B. Newby, & R. P. Peek. (eds.) *Scholarly Publishing. The Electronic Frontier.* Cambridge, Massachusetts: MIT Press. [Online] As found at: [http://www.slis.indiana.edu/kling/pubs/EPUB6.htm] [14.8.98]

27.Knight, P. (1996). *Destined to Leapfrog: Why a Revolution will Occur in Brazil, Russia, and South Africa.* [Online] As found at: [http://www.knight-moore.com/html/leapfrog.html] [14.8.98]

28.Knight, P. (1995) *The Telematics Revolution in Africa and the World Bank Group.* [online] As found at: [http://www.knight-moore.com/html/telematics_in_africa.html] [14.8.98]

29.The Andrew W. Mellon Foundation. (1998). *Initiative on The Cost Effective Uses of Technology in Teaching.* [Online] As found at: [http://www.mellon.org/cutt.html] [14.8.98]

30.Next Generation Internet. (date unknown). *NGI Overview - NGI and Internet2.* [Online] As found at: [http://www.ngi.gov/overview/ngi_i2.html] [14.8.98]

31.Large Scale Networking Next Generation Internet Implementation Team. (1998). *Next Generation Internet Implementation Plan.* [Online] As found at: [http://www.ccic.gov/ngi/implementation/ngi_ip.pdf] [14.8.98]

32.Malhotra, Y. (1994) *On Science, Scientific Method And Evolution Of Scientific Thought: A Philosophy Of Science Perspective Of Quasi-Experimentation.* [Online] As found at: [http://www.brint.com/papers/science.htm] [29.5.98]

33.Media Release University of Stellenbosch. (1998). *Distance Education.* [Online] As found at: [http://www.sun.ac.za/local/news/afondrekt.html] [14.8.98]

34. Moonen, J. (1995) *Communication and Information Technologies as Change Agents.* In B. Collis, I. Nikolova & K. Martcheva (eds.). *Information Technologies in teacher education: Issues and experiences for countries in transition.* (pp. 13-25) Paris: UNESCO Publication. [Online] As found at: [http://www.education.unesco.org/pdf/412_37.pdf] [14.8.98]

35. Organisation for Economic Co-operation and Development. (1996). *Globalisation: What Challenges and Opportunities for Governments?* Paris. [Online] As found at: [http://www.oecd.org/puma/gvrnancc/strat/pubs/glo96/toc.htm] [14.8.98]

36. d'Orville, H. (1996). *Technology Revolution Study.* United Nations Development Programme, New York. [Online] As found at: [http://eagle.uccb.ns.ca/undp/] [14.8.98]

37. Paulsen, M. (1995). *The Online Report on Pedagogical Techniques for Computer-Mediated Communication.* [Online] As found at: [http://www.nettskolen.nki.no/ekko/fag_art/19/cmcped.html] [14.8.98]

38. Plomp, T. & J. van den Akker. (1995). *In-service training and Information Technology from a Curriculum Innovation Perspective.* In B. Collis, I. Nikolova & K. Martcheva (eds.). *Information Technologies in teacher education: Issues and experiences for countries in transition.* (pp. 26-33) Paris: UNESCO Publication. [Online] As found at: [http://www.education.unesco.org/pdf/412_37.pdf] [14.8.98]

39. Rushkoff, D. (date unknown). *Upgrade Cycles: Learning to Say Enough.* [Online] As found at: [http://www.levity.com/rushkoff/upgrade.htm] [14.8.98]

40. Russell, T. (1997). *The "No Significant Difference" Phenomenon as reported in 248 Research Reports, Summaries, and Papers.* 4th edition. [Online] As found at: [http://www2.ncsu.edu/oit/nsdsplit.htm] [14.8.98]

41. Shenk, D. (1997). *The Problem with Hypertext.* Commentary for NPR's "All Things Considered" broadcast May 14, 1997. [Online] As found at: [http://www.technorealism.org/ATC2.html] [14.8.98]

42. Talero, E. & P. Gaudette. (1996). *Harnessing Information for Development. A Proposal for a World Bank Group Strategy.* World Bank. [Online] As found at: [http://www.worldbank.org/html/fpd/harnessing/] [14.8.98]

43. Technology Enhanced Learning Initiative in Southern Africa (TELISA). (1997). *Report on Workshop. Held on 25 of September 1997.* (WEST) As found at: [http://pgw.org/telisa/workshop_970925_1.htm] [14.8.98]

44. *Telkom's Vision 2000 project.* [Online] As found at: [http://www.telkom.co.za/vision%5F2000.htm] [14.8.98]

45. Thorngate, W. (date unknown). *Measuring the Effects of Information on Development.* IDRC. [Online] As found at: [http://www.idrc.ca/books/focus/783/thorn2.html] [14.8.98]

46. Twigg, C. (1996). *Academic Productivity: The Case for Instructional Software.* Colorado Springs. [Online] As found at: http://www.educom.edu/program/nlii/keydocs/broadmoor.html] [14.8.98]

47. United Nations Educational, Cultural and Scientific Organisation (1995a). *Policy Paper for Change and Development in Higher Education.* Paris. [Online] As found at: [http://www.education.unesco.org/pdf/24_235.pdf] [14.8.98]

48. United Nations Educational, Cultural and Scientific Organisation. (1996b). *UNESCO and the Information Society for all.* [Online] As found at: [http://www.unesco.org/webworld/telematics/gis.htm] [14.8.98]

49. United Nations Development Programme. (1994). *SDN Information Series.* [Online] As found at: [http://www.undp.org/sdnp/sis.htm] [14.8.98]

50. West, P. (1997). *Technology Enhanced Learning Initiative in Southern Africa.* Draft Plan. [Online] As found at: [http://pgw.org/telisa/Concept_Document/concept_document_9807.htm] [14.8.98]

51. West, P. (date unknown b). *On-Line Education in Developing Countries.* [Online] As found at: [http://pgw.org/pw/et2000.html] [14.8.98]

52. White House Press Release. (1996). *Background on Clinton-Gore Administration's Next-Generation Internet Initiative.* [Online] As found at: [http://www.iitf.nist.gov/documents/press/internet.htm] [14.8.98]

Government Papers and Reports

1. Ministry of Education. (1997). *Draft White Paper on Higher Education. Draft Education White Paper 3.* General Notice 712 of 1997 (DEWP). [Online] As found at: [http://www.polity.org.za/govdocs/white_papers/educwp3.html] [14.8.98]

2. Technology-enhanced Learning Investigation Team (TELI). (1996). *Technology Enhanced Learning Investigation in South Africa. A discussion document.* Report of the Ministerial Committee for Development Work on the Role of Technology that will Support and Enhance Learning. [Online] As found at: [http://teli.mikom.csir.co.za/welcome.html] [14.8.98]

Electronic Journals

1. Alvarez, L., C. Barone, P. A. McClure, M. Ringle, J. Stuckey, T. West. *Why Technology?* Educom. Vol. 31, No. 3, May/June, 1996. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/31324.html] [14.8.98]

2. Borland, J. *Study: Blacks Use The Net Less Than Whites.* TechWeb. CMPNet, 16.4.1998. [Online] As found at: [http://www.techweb.com/wire/story/TWB19980416S0023] [13.8.98]

3. Braga, C. *The Impact of the Internationalisation of Services on Developing Countries.* Finance and Development. Vol. 33, No. 1, March, 1996. [Online] As found at: [http://www.worldbank.org/fandd/english/0396/articles/070396.htm] [14.8.98]

4. Chandler, D. *Shaping and Being Shaped.* CMC Magazine, February 1, 1996. [Online] As found at: [http://www.december.com/cmc/mag/1996/feb/chan4sp.html] [14.8.98]

5. Ehrmann, S. *The Bad Option And The Good Option.* Educom, Vol 30, No 5, September/October 1995. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/30541.html] [14.8.98]

6. Feenberg, Andrew b). *Marcuse or Habermas: Two Critiques of Technology.* Inquiry, Vol 39, 1996, pp. 45-70. [Online] As found at: [http://www-rohan.sdsu.edu/faculty/feenberg/marhab.html] [14.8.98]

7. Gartner, J. *Net Access May Increase Inequalities.* TechWeb. CMPNet, 11.5.1998. [Online] As found at: [http://www.techweb.com/wire/story/TWB19980511S0017] [14.8.98]

8. Graphical Visualisation Center. *WWW user survey.* [Online] As found at: [http://www.gvu.gatech.edu/user_surveys/survey-1997-04/] [14.8.98]

9. Hall, J. *The Revolution In Electronic Technology And The Modern University: The Convergence Of Means.* Educom, Vol 30, No 4, July/August 1995. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/30442.html] [14.8.98]

10. Herring, S. *Gender and Democracy in Computer-Mediated Communication.* Electronic Journal for Communication, Vol. 3, No. 2, 1993. [Online] As found at: [http://dc.smu.edu/dc/classroom/Gender.txt] [14.8.98]

11. Herschbach, D. *Technology as Knowledge: Implications for Instruction.* Journal of Technology Education, Vol. 7, Number 1, Fall, 1995. [Online] As found at: [http://scholar.lib.vt.edu/ejournals/JTE/jte-v7n1/herschbach.jte-v7n1.html] [14.8.98]

12. Kay, A. *Revealing the Elephant: The Use and Misuse of Computers in Education.* Educom, Vol 31, No 4, July/August 1996. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/31422.html [14.8.98]

13. Kernan, J., A. November, S. Papert, J. Grillos, B. Gifford, C. Stout, & D. Niguidula. *Transforming and Preserving Education: Traditional Values in Question.* Educom Review, Volume 29, Number 6, November/December 1994. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/29636.html] [14.8.98]

14. Kling, R. *Reading "All About" Computerization: How Genre Conventions Shape Non-fiction Analysis.* The Information Society, Vol 10, No. 3, 1994, pp. 147-172. [Online] As found at: [http://www-slis.lib.indiana.edu/kling/read94a.html] [14.8.98]

15. Kling, R. & L. Covi. *Electronic Journals and Legitimate Media in the Systems of Scholarly Communication.* The Information Society. Special Issue: Electronic Journals and Scholarly Publishing. November 1995, Vol. 11, No. 4, pp. 261-271. [Online] As found at: [http://www-slis.lib.indiana.edu/TIS/klingej2.html] [14.8.98]

16. Massy, W. & R. Zemsky. *Using Information Technology to Enhance Academic Productivity.* Educom, National Learning Infrastructure Initiative. [Online] As found at: [http://www.educom.edu/program/nlii/keydocs/massy.html] [14.8.98]

17. Noble, D. *Digital Diploma Mills: Automation of Higher Education.* First Monday, 1998. [Online] As found at: [http://www.firstmonday.dk/issues/issue3_1/noble/index.html] [14.8.98]

18. Oppenheimer, T. *The Computer Delusion.* The Atlantic Monthly. July, 1997. [Online] As found at: [http://www.theatlantic.com/issues/97jul/computer.htm] [14.8.98]

19. Potashnik, M. & J. Capper. *Distance Education: Growth and Diversity.* Finance and Development. Vol. 35, No. 1, March, 1998, pp. 42-45. [Online] As found at: [http://www.worldbank.org/fandd/english/pdfs/0398/0110398.pdf] [14.8.98]

20. Sale, K. *Lessons from the Luddites.* The Nation, June 5, 1995. [Online] As found at: [http://www.ensu.ucalgary.ca/~terry/luddite/sale.html] [14.8.98]

21. Sherry, L.: Issues in Distance Learning. International Journal of Distance Education, 1 (4), 1996, pp. 337-365. [Online] As found at: [http://www.cudenver.edu/public/education/sherry/pubs/issues.html] [14.8.98]

22. Solomon, M. *What's Wrong With Multimedia In Higher Education?* The Journal, Feature 2/1994. [Online] As found at: [http://www.thejournal.com/past/feb/42sol.html] [14.8.98]

23. Stahlman, M. *The Big Picture: Prisoners To Technology?* TechWeb, December 9, 1996. [Online] As found at: [http://techweb.cmp.com/iw/609/09uwms.htm] [14.8.98]

24. Theunissen, Christopher. *An age of knowledge: contextualising politics in the twenty-first century.* Politeia No. 152, 1997. [Online] As found at: [http://www.unisa.ac.za/dept/press/politeia/152/theun.html] [14.8.98]

25. Williamson, S. *When Change is the only Constant.* Educom, Vol. 31, Number 6, 1996. [Online] As found at: [http://www.educom.edu/web/pubs/review/reviewArticles/31639.html] [14.8.98]

26. World Bank. *African Universities: The Way Forward.* Findings, Africa Region, No. 10, January, 1994. [Online] As found at: [http://www.worldbank.org/aftdr/findings/english/find10.htm] [14.8.98]

Special Publications

1. Schutte, C.J.H. (1996). *Graduation Ceremony speech.* Unpublished. April 9, Pretoria.

2. University of Cape Town (1997). *A Computer Literacy Program at The University of Cape Town.* Unpublished. April 25, Cape Town.