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Does the notion of "The digital divide" have descriptive validity in South African Education?

Ndlovu, Nokulunga Sithabile

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UNIVERSITY OF THE WITWATERSRAND

School of Education

Masters in Education Research Project

Research Topic

Does the Notion of "The Digital Divide"
have Descriptive Validity
in South African Education?

Name: Nokulunga Sithabile Ndlovu **Student Number:** 0618698K

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Abstract

The attempt to bridge the "digital divide" by giving physical access to ICTs in educational institutions is believed to have the potential to improve quality in education, and subsequently contribute to the development of the economic status of impoverished communities. The assumption in the broader aspect and use of the term tends to be that equal provisioning of technology in schools automatically makes school populations computer literate and ready to participate productively in an information society. In this vein, ICT in education projects like *Gauteng Online* that have been launched in South Africa have focused on equity in the distribution of computers. However, this thesis suggests that this endeavour is driven by the misconception that advocates that irregular distribution of physical access to digital technologies is basically responsible for the presence of the digital divide, thereby overlooking social constituents that might actually be fundamental to the gap. This has brought about a systemic failure to achieve the prospective goals related to equity. For this reason, the thesis seeks to understand the term "digital divide" and its relevance in the South African education context. The argument here is an explication and conceptual analysis of data collected in two schools with diverse economic backgrounds that are a replica of disparities in South African education institutions inherited from the previous apartheid government. This data is drawn from the *Pan African Research Agenda on the Pedagogic Integration of ICTs* and is available to the public on its database. The comparison of the schools brings up elements of the concept that suggest that we must divert emphasis from physical access as a way of bridging the gap, to the underlying societal structures that appear to be accountable for producing the 'digital divide'. More research on the validity of these results in more diverse South African education contexts would reinforce the findings of this study.

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May God bless you all.

Declaration

I declare that this research report is my own unaided work. It is submitted for the degree of Masters in Education at the University of the Witwatersrand, in Johannesburg. It has not been submitted before for any degree or examination at any other university.

Nokulunga Sithabile Ndlovu

(Name of candidate)

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(Signature)

25th day of February 2010

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CHAPTER 1

Introduction

South Africa has less access to information technology, bandwidth, Internet access, and the like than developed countries. Poor people have less access to computers than wealthy people, and therefore remain behind. Township schools have inadequate computer facilities and skilled computer teachers, and thus cycles of inequality are perpetuated. The promise often is that if access to ICTs, particularly in schools, were provided, much of the basis of social inequality would disappear. One finds these ideas as much at work in academic circles as in everyday life discourse.

But is the situation so straightforward? Is access to ICTs and ICT skills just a symptom of a much deeper issue or not? This research report suggests that the notion of 'digital divide' has limited descriptive validity in South African education. It bases this claim on an analysis of conditions in two South African schools that use computers in schoolwork, one highly 'advantaged' and the other significantly 'disadvantaged'.

1.1. Background

The concept of the digital divide seems to have emerged from the idea of "information haves and have-nots" used in public debates in the 1980s to describe the supposed gap resulting from unequal access to information technology. Discourses in this domain have basically evolved around issues that portray the concept as either a technological or a social concern. In the African

context, this issue takes on a particular flavour, because of the deep social inequalities that characterise countries in this continent. The concern is that the real issue is not digital divide, but rather one of fundamental social inequality, in which access to ICTs and the like is just a symptom of a deeper problem. The different interpretations of the term 'digital divide' have induced various responses from participants that have manifested the significance of understanding what the concept entails in one's environment. It is for this reason that this research seeks to interrogate the description of digital divide in South African education.

Simply put, this research project is concerned with whether the idea of a digital divide accurately describes the situation of ICTs in education in South Africa or not. Does it have descriptive validity?

Terminological Issues

In this research report, I am concerned to analyze the concept of *digital divide*. Wikipedia (2009) defines the term as follows:

> the term digital divide refers to the gap between people with effective access to digital and information technology and those with very limited or no access at all. It includes the imbalances in physical access to technology as well as the imbalances in resources and skills needed to effectively participate as a digital citizen.

This usage of the term defines it in terms of access to ICT itself. It is a definition which works only with the presence of absence of technology itself. So, to close the digital divide in a

community would be to move people in that community from a situation in which they do not have access to ICTs to one in which they do have access to ICTs.

This is the sense in which I use the term in this research report. My argument is that it does not go deep enough as a concept to describe what the divide is between people.

Some authors try to change the meaning of 'digital divide' to include all social inequalities that give rise to lack of access to ICTs (Adesina 2006). So as examples, poverty *in relation to* computers, racial oppression *in relation to* the digital world, social class *in relation to* ICT access and usage, would all be taken to be part of a concept of a digital divide. These writers do this because they argue that the Wikipedia definition is ideological – it hides the truth about the roots of the ICTs inequalities.

However, in this research report I shall use the term *social divide* to refer to these deeper causes of the digital divide. My argument is that the term 'digital divide' does not go deep enough and far enough to be able to describe this social divide in South Africa. This is what I mean when I say that the term digital divide has limited or no descriptive validity in relation to South African education.

The debate as to whether the issue of digital divide is a technical or social concern would be futile without a good picture of what the main source of inequalities is. Being in possession of technology is not enough to cause disequilibrium in the structure of a society, but using it to participate in the society gives one the medium to function in a network of some sort. Castells (2004) advocates that in such a society, ICT becomes the sole source of power and productivity. The beginning of the 21st Century marked the beginning of an "information society" in the modern western world. This society has grown and become the mastermind, so to speak, of the digital gap. Van Dijk (2004:133) defines information society as "a substantial characterisation of

societies in which information increasingly is the primary means and product of all processes". Its labour market has the majority of its functions based on information processing, requiring that one is skilful enough to produce knowledge.

This contemporary society has power to form networks that ultimately estrange relationships with those outside the system, producing what would be considered as the digital divide. Participation in this society requires possession of and access to the tool (which in this study predominantly is the computer), acquisition of the instrumental skills (computer literacy) and utilising these to enhance one's position in the society. It is evident from this account that one stands to benefit more if the participation is of a higher level; implying that absence of some aspect of this description deems one disadvantaged. If that is so, one needs to acknowledge what it is that gives that power to possess these tools. It is financial power. The stronger one's economic status is, the higher the probability that one will prosper in this society and be further away from those who are economically disadvantaged. The Matthew effect (from the Bible implying that the rich become richer) in Van Dijk, (2004:96) applies well in this scenario.

It is not surprising that developed countries have more access to technology than developing countries. Although information and communication technology has been adopted by developing countries, what constitutes their description of the information society differs from nation to nation. What makes the difference is the diversity of the concepts and measuring instruments we use to evaluate each society or the divide.

Whatever instrument we use cannot be detached from either the social structure or the technological aspect. People in the western world, by the way, also have their description based on their unique social setting. In their case, the percentage of those with access is higher. On the other hand, the disadvantaged communities will have a higher percentage of those lacking access than those who have, making the gap wider.

South Africa is considered one of the leading countries in Africa in giving ICT access to its citizens as an attempt to ensure participation in the information society by all. Its initiatives are laid on foundations that are already defined by its historical background, making it a challenge to bridge the digital divide. Ocampo (2004:4) declares, "It is impossible to address the inequalities in education without taking into account the economic disparities resulting from apartheid education". The apartheid era designed this country's society through its education system in such a way that wide gaps in terms of physical, economic and educational resources (in favour of politically and economically empowered whites) were formed and established. Unfortunately it has been a challenge to deconstruct these establishments to give way to equal access to resources.

The leaders of this country have sought to redress or restructure this scenario by promoting computer access in schools. The White Paper on e-Education DeE(2004) for instance, in its policy goals stresses the need for making every effort to ensure all South Africans participate in the knowledge economy to prevent social exclusion. It is hoped that all learners in this country will have access to computers by the year 2013 and will thus be equally empowered to participate effectively in this new information society. People without ICT skills are rapidly

becoming unmarketable in South Africa and a large gap between them and the few who have them is growing rapidly (Bovee et al, 2005).

Research has shown evidence of a 'digital divide' within and across developing countries as well. Jenson (2000) reports that there are one million users in Africa and 650 000 are from South Africa. In 2000, the South African ICT market was valued at US 4.1 billion, making it the ICT leader on the continent. Although this nation is leading in ICTs, its biggest challenge in bridging the gap is the absence of connectivity in the rural areas. Some of these remote places (a few) are benefitting from telecentres. Users of the internet are mostly wealthy whites (Mohamed and Miller (2001:281).

However, the essence of the preceding discussion is that we must look at deeper levels in the society to explain these inequalities. The divide, it seems is not merely 'digital', but part of it is certainly 'digital'.

This research will attempt to examine the validity of the concept of the digital divide in the South African Education context. A case study of two South African schools, with data drawn from the observatory of the PanAfrican Research Agenda on the Pedagogic Integration of ICTs (PanAf) at www.observetoiretic.org, will be analysed in order to validate the claim that the concept of a digital divide has limited descriptive validity in the South African context.

CHAPTER 2

Research Questions

2.1. Rationale for the research

Although provisioning of ICTs in South African schools is one of the matters of urgent attention, the Education Department's objective in this regard is not achieved consistently. It seems to be perpetuating inequalities in the system. The PanAf data base displays evidence of adoption and appropriate implementation of the *White Paper on e-Education* (2004) policy by a school with resources. However, the previously disadvantaged schools are fumbling with the computers they have and has not initiated the first step toward fulfilling the ICT policy goals. The concept 'digital divide' is used loosely to describe this state of affairs, but there are reservations on whether the discourse is accurate enough to be of any use in understanding and overcoming such inequalities.

This research seeks to bring some new evidence to bear on the understanding of the concept of the digital divide that South African Education policy makers may use to develop practical solutions to inequalities in physical and human resource distribution in its institutions. It is also hoped that they will realise the need to "develop a language of description for actual classroom teaching and learning" in its institutions (Moll and Ndlovu, 2009:7). Educators will probably realise the importance of understanding the implications of ICT integration into their teaching in order to contribute effectively to bridging the digital divide. This research will also make a

significant contribution to South African Literature on ICTs on a conceptual level. The majority of local literature is case study based. These mainly highlight a variety of aspects of the concept of digital divide that do not inform educational practitioners on approaches to ICT usage in the classroom. What is lacking is a model that can guide the understanding of the concept to help policy makers, authors and educators engage in activities that will effectively redress digital inequalities in education institutions.

2.2. The issue of validity

Validity is basically a determination about whether or not a concept matches reality. There are two types of validity, internal and external. The first "refers to the accuracy or authenticity of the description being made" (Scott and Morrison, 2007:253) when we use a particular concept or measurement. The second is about whether we can generalize it to other aspects of society. In this study, the concern is with the internal validity of the concept of *digital divide.*

Conceptually, the central question in this research can be set up as follows: There is a documented inequality in South African education (more specifically, in South African schools) concerning ICTs. *Table 1* below tells the story of these inequalities.

Province	Total assessed	Number of "operational" ordinary public schools		
		No computers	>=100 learners per computer	<100 learners per computer
E Cape	5,724	4,810	355	559
F State	1,717	1,319	91	307
Gauteng	1,972	660	373	939
KZN	5,822	3,137	1,590	1,095
Limpopo	4,037	3,323	314	400
Mpumalanga	1,981	1,283	408	290
N Cape	620	293	32	295
N West	1,796	1,427	54	315
W Cape	1,476	829	67	580
Total 2006	25,145	17,081	3,284	4,780
%2006	100.00%	67.93%	13.06%	19.01%
Total 2000	27,148	18,197	2,972	
%2000	100.00%	67.03%	10.95%	
% change since 2000	N/A	0.90%	21.12%	
Total 1996	26,736	18,348	2,714	
%1996	100.00%	68.63%	10.15%	
%change since 1996	N/A	-0.70%	21.92%	

National Assessment Report (Public Ordinary Schools). Department of Education, September 2007, P.41.

Table 1: Computers for Teaching and Learning: Ordinary Public Schools: 2006 Assessment

This inequality has a number of dimensions, including access to ICTs, the use of ICTs in school administration, the use of ICTs in teaching and learning, computer literacy skills, and teacher preparation in relation to ICTs. However, there are two ways of describing these inequalities when they are thought of as a 'gap' or a divide':

- On one hand, the notion is that the divide is purely a matter of access to and use of digital technologies. It goes with the claim that if we give people ICTs and train them to use them, the divide will disappear.
- On the other hand, the notion is that the divide has more to do with access to wealth, access to material goods, access to education, etc. which are broader social issues that give rise to unequal access to and use of ICTs in education. This notion does **not** assume that if we give people ICTs, the divide will disappear.

Essentially, the ICT divide that we are talking about is either a digital divide, or it is a social divide which *inter alia* entails that there is unequal access to digital technologies. The question is which out of the first notion or the second notion has greater descriptive validity as concerns South African education.

2.3. Specific Research Questions

This research is concerned with validating the notion of digital divide in the context of South African education. By using data of two South African schools selected from the PanAf database, it seeks to answer three questions:

a) Does the notion of "Digital divide" accurately describe the nature of the inequalities that exist in the South African education context?
b) If it does, what kind of digital divide is it?
c) Does the description of the information society resemble that found in the South African education system or institutions?

CHAPTER 3

Literature Review

Introduction

Van Dijk(2004) has attempted to address the issue of digital divide from different angles and has brought to light the effects of social attributes that explain the reason behind the inequalities. He uses studies from the United States of America and Netherlands to develop his argument that reveals to a large extent that the digital gap is not only a technological problem but is a social issue as well. His account has been used in this study as a basis for the generic description and understanding of the notion in discussion. Although his findings may describe a situation that is inherent in developed economies, what he articulates can be witnessed in any "information society". The other literature used in this study addresses and at times strengthens elements of Van Dijk's description.

African researchers have attempted to study and discuss the nature of the divide in specific domains. They have portrayed the existence of discrepancies related to physical resources, computer literacy and participation in the information society. South African literature has used case studies to try and access the effectiveness of a number of initiatives the government and NGOs have launched in an attempt to engage all citizens in this information society. This literature review will present different views on the description of digital divide. Studies carried out in South Africa and the effects of its initiatives on ICTs will initiate the description of the notion.

3.1. What is the Digital Divide?

The term, "digital divide", denotes inequalities or disparities related to technological access. Technological access encompasses being equipped physically and technologically to perform specific tasks that will yield a desired product. Compaine (2001: xi) extends this premise by defining the digital divide as "the perceived gap between those who have access to the latest information technologies and those who do not". The divide is caused by possession of a range of technological appliances. If that is so, the implication is that mastering a skill in technology is a continuous process which, if broken, will result in one lagging behind in one's participation in the information society.

The term "perceived" in Compaine's definition implies that the space is not easily measurable and there is a possibility that the gap exists or might not as it depends on what level of operation or participation one is in. If it does exist, how one would define it could be difficult as its characteristics are multifaceted, bearing both technical and social factors. Finch and Kenny (2003) bring to light the different features of the digital divide in the following descriptions: 1) A gap in access to use of ICTs – measured by the number of web-computers. 2) A gap in the ability to use ICTs – measured by the skills base and the presence of numerous complementary assets. 3) A gap in actual use – the number and times of on-line users. 4) A gap in the impact of use – measured by financial and economic returns. What is remarkable about these gaps is that they can be present in any context and yet be used separately or in any combination to describe or measure the extent of the divide.

The empirical evidence that will be used in this study relates to computers as technology. To inform this data set, Van Dijk's definition is used as a guideline: this says the digital divide is "the gap between those who do and those who do not have access to computers and the internet" (2004:1). Accessibility in this case is determined by the presence or interaction with the machine itself and obtaining information from the Internet. Although the two are presented as compatible entities, there are instances where the internet is not available or connected. This implies that operating the computer without being able to search for information is a handicap and, if that is so, societies that find it difficult to have internet connectivity for whatever reason and use other means (like CD Roms) to access information are excluded. That assumption is valid depending on the extent of accessibility and the capacity to which one can manipulate what is offered by the machine. Such an assumption is obviously drawn from a context whose description of access is different from a developing country like South Africa where possession of a computer is something to be celebrated and the attitude is to best use what is available.

3.2. Digital or technological access

An understanding of whether the supposed digital divide is a social or technological matter is crucial as it affects the extent to which technology is accessed. Should it be perceived as an acquisition of technology in isolation or an element whose character is based on the status quo of the diverse social structures that exist?

Some developing countries like South Africa have focused on accessing physical resources in the hope to bridge the divide and have neglected empowering their people with adequate computer

skills and this has led to many disappointments. Bertot (2003) blames the misfortunes on the misconception of what the divide denotes. He elaborates his position by pointing out that the divide has the following adapted dimensions that are pertinent to the success of integrating ICTs: 1) Technology - having access to computers and the internet. 2) Telecommunications - access to broadband telecommunications services. 3) Economic - technology and telecommunications infrastructure is linked to the economic development. 4) Information Access - a right of all living in a democratic society. 5) Information Literacy - knowing how to use technology, locate and retrieve useful information, evaluate and assess the relevance of the information, synthesise the information in order to solve societal information problems (Bertot, 2003:186).

The features above call for the involvement of political leaders to set up an infrastructure that would facilitate access to the computer and internet. Although this might sound like an obligation for those in authority, costs have control over the achievement of equal distribution of resources. Rural areas for instance are disadvantaged as internet connectivity is expensive and the communities cannot afford to pay for the service. Kenny (2001) asserts that such communities are usually excluded from more advanced ICTs in particular and suggests that locals be encouraged to participate and create social institutions to support the new technologies. There are technologies specially designed for the rural people that have been adopted by some countries and one such is the radio that is used as an interface between rural people and the internet in Sri Lanka – a joint project with UNESCO.

Researchers have demonstrated that giving physical access does not guarantee restoration of inequalities if issues of creating infrastructure to promote acquisition of appropriate skills and

sustainability are neglected. The social structure is significant in the system used to distribute technology. Capitalist societies have promoted exclusion of the disadvantaged in the resources. The reason is that their ideology promotes individual (from the advantaged group) development, and those who are powerless to uplift themselves remain in those lower positions in their societies. Daunting as this might appear it has contributed a lot to the struggles African countries have in bridging the divide within and in their interaction with the developed world.

Van Dijk (2004) has constructed what he considers to be a theory of the digital divide that helps to illustrate the connection between technology and the society in the following adapted table:

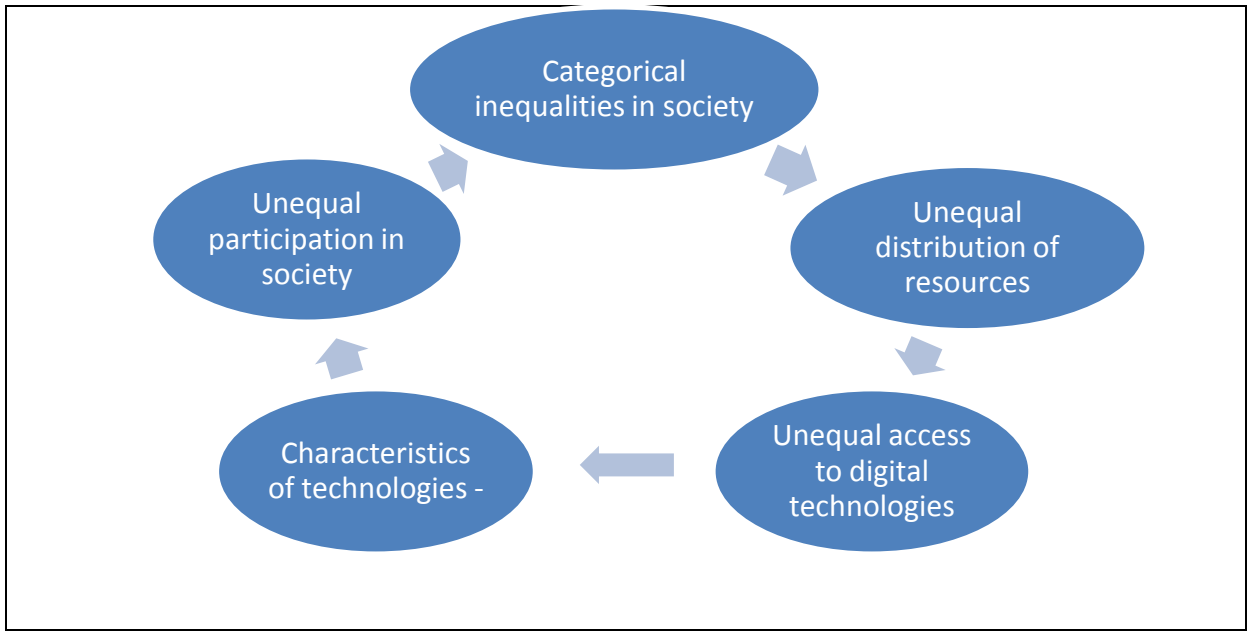

Figure 1: Relationship between society and technology

Categorical inequalities are significantly responsible for the formation of social classes. These groups determine the distribution of resources as needs for those units vary. Van Dijk (2004) describes categorical inequalities in society as relational categories like teacher to learner or

doctor to patient. He groups these categories into personal (e.g. age – generation gap, sex-gender differences) and positional (labour, nation, education) clusters. The extent to which these clusters orient themselves to technology corresponds with the nature of their involvement within the circle. They institute barriers that prevent outsiders (those with no capacity to participate in their societies) from reaching higher goals (that would enhance their lives). Technology characteristics like irrelevant content, unfriendly programs and its consistent progression make it difficult for those with no means to maintain them to keep up with the skills needed to participate. These structures evidently and collectively contribute considerably to unequal distribution of technologies.

The categories above can be found in the South African society but they do not contribute significantly to technology access because its social structure is constructed differently. This is evident especially in its education context where access to computers in institutions is not much of a positional (the way he describes it) or individual matter but one of whether technology is in the class that can afford to give adequate access and sustain it. The social structures that have been in place for years control technological accessibility to educational institutions. Data collected shows that government initiatives to balance distribution of resources have failed to penetrate these social variables.

If social structures are responsible for the digital divide the question that arises is, should the focus be on rectifying the social aspect or the method of distributing technology? Adesina (2006) advocates that if developing countries are to narrow the divide, they need to consider their contexts when distributing technological resources. He indicates that they are poverty stricken

because of the debts they owe to developed countries, making most of them unable to provide for their citizen's basic needs. He refers to ICT as a "distracter" because when they should be catering for their urgent social needs, they spend on computers. In other words, their main concern should be to stabilise their social structures first in order to lay strong foundations for the demands associated with acquiring resources like technology. Unfortunately such a move would jeopardise the countries' capacity to participate globally, reducing their chance to generate income that could contribute to raising their standards of living. Reconstructing social structures cannot be done in isolation but should embrace technology concurrently.

Adesina (2006) presents a logical argument above in the sense that he demonstrates that as long as societal structures do not have means to acquire material goods, it becomes a challenge to obtain them. The validity of that proposition stands and attempts to bridge the digital divide becomes a secondary matter. It is a result of circumstances beyond the society's capacity. The South African education system is developed from a foundation that possesses characteristics of both developed and undeveloped societies that were created during the apartheid era. For that reason a blanket definition of a digital divide in this country's institutions would not apply due to the condition of its diversity.

The South African constitution has played its role in advocating equality. The education departments have responded to that effect by allocating resources to the disadvantaged schools as a way of giving all the same opportunities to quality education. Although the results of these endeavours have not brought recovery to disadvantaged communities, the country's ability to

participate globally has exposed it to tools that can be used to strategise and continue to raise the social and economic status of the rich classes.

3.3. Types of Access

The three facets crucial to participation in an information society (physical access, computer or technological literacy and participation) have already been highlighted in the introduction and at this point their relationship with the notion of the digital divide will be addressed.

3.3.1. Physical Access

Physical access in this study refers to possessing or having contact with a computer. Generally, income is the main determinant of access to physical resources, followed by education. Van Dijk (2004) points out that social contact also assists in the acquisition of computers. This implies that acquisition of the machines does not necessarily depend on one's ability to finance them, but digital networking makes accessibility easy. Mental resources and positional categories also determine one's chance of acquiring the appliances. In other words, cognitive skills to work on the computer and using it to perform functions that need the use of a computer can be a motivator and perhaps a reason to buy one. Norris, (2001) in Van Dijk (2004) summarises this discussion by stating that context is paramount to possessing digital technologies. Both an individual's and the society's characteristics contribute to the decision to purchase or own technology.

Time spent working on computers in homes, work places or schools is greater for those occupying high positions or belonging to a higher class. This is evident in developed countries

where many transactions can be done electronically. The majority of the population in developing countries are deprived of this kind of access as they do not have computers in their homes. Most people have access to computers in community centres or institutions. Access time in these public places is limited and that reduces the probability of them participating in the information society. Broadband users stay longer on the computer or internet and "are more active in creating online content than are dial-up users", Madden as cited in Van Dijk (2004:115).

James, (2002) suggests that developing countries need to focus on providing cheaper basic technology with reasonable important services such as the internet. The problem with such equipment is that it does not give the users advanced functions, thus disadvantaging them.

3.3.2. Computer Literacy

Computer literacy in this study incorporates possession of skills that enable an individual to operate, search for information and use it to construct knowledge. Van Dijk (2004) describes operating skills as instrumental skills. These are fundamental abilities that help one to work on the computer using the different programmes offered by the service provider. These skills orient the user to the machines and need to be developed if productivity is to be achieved.

When the instrumental skills are used and developed to search for information they become informational skills. Information skills are crucial to the acquisition and construction of knowledge. Lelliot et al (2000) say that these skills enable one to handle information

technologies at a level desirable for specific fields of study and to be equipped to use it correctly to develop one's cognition. Cognitive skills are needed in more advanced operations that Van Dijk (2004) refers to as strategic skills. At this point the skill one has enables one to use information available to produce other forms of knowledge.

De Silva as cited in Akoojee *et al* (2007) says, "Information technology, like knowledge, is easily and widely accessible, but is valueless without the knowledge and skills to use it productively". Strategic skills are attained by a few whose positions in the society enable or demand that they have that ability to engage productively. These may be the educated, the youth or members of a "privileged race" that automatically places them in different or higher levels in the society.

Warschaner (2006) describes computer skills as computer literacy, information literacy, multimedia literacy and computer-mediated communication literacy. These are skills that are in the labour market and are in demand. However Adesina (2006) and Light (2001) highlight the crisis of brain drainage caused by inability to pay fair salaries to those with advanced computer skills. This is the element that makes disadvantaged societies struggle to be full participants globally even after producing human resources with advanced technological skills.

Barriers to acquiring operational skills are lack of connections, lack of social networks and low tenacity to learn the technical skills. These contribute to the widening of the digital divide. Those belonging to higher socio-economic status acquire knowledge faster as they can afford to stay longer on the machines and know where to get it on the Internet.

Institutions of learning with computers in African countries fail to impart these skills because educators do not have adequate skills themselves (PanAf Project on pedagogical integration of ICTs in schools database). These countries need both physical and institutional access if ICTs are to be successfully integrated into the education system (Lelliot *et al* 2000). They say that merely having physical access is not enough for epistemological access. It actually impinges on the prospects of bridging the digital divide.

3.3.3. Participation

Van Dijk (2004) highlights the importance of community networks that act as motivation to work and learn more skills. They facilitate effective participation in the environment that the society has created. The question that arises, though, is if participants in the each network within a society are all equal? As long as the information society has variables in the social structures, it becomes a challenge for its members to be equal.

The digital divide can be found amongst those with high positions in society. Castells et al (2004) say decision makers themselves are not well versed in technology and their decision making depends on experiences of their subordinates who belong to information societies. It is therefore not surprising that provision of computers in South African previously disadvantaged schools has had little impact in integrating ICTs in schools where the managers are computer illiterate. South African data shows that some principals do not use computers for their daily activities. As a result they do not promote use of computers for pedagogical purposes in their schools

Young people in today's society acquire computer literacy faster than do adults. The reasons recorded in Catalan are related to early exposure to technology of the young who are between 15 and 19years of age as they "keep in touch" (Van Dijke, 2004). One author who stresses the fact that age difference contributes to acquisition of computer skills is Prensky (2001). He calls on old teachers to join the young in using computers as they have a different way of grasping and processing content. It is for that reason that Prensky calls them "digital natives" and the old "digital immigrants". Exposure to technology makes them instant participants to the society and the old people have to make an effort to adjust to acquire the skills necessary to operate successfully otherwise they will be excluded.

Prensky's assumption is yet to be proven. Nevertheless if computers are used as tools for learning and teaching their effect can be as good as any aid. However what makes the difference in this scenario is that computers are a tool that is used in the "Information society" that is in control and sets rules in the modern world.

Prensky's view is in line with the "community of practice" concept instituted by theorists who advocate situated learning. Lave (1996) believes that once one is in a particular practice, he or she is encultured to the practice. Castells *et al* (2004:239) cite Haythornthwaite and Wellman, (2002) who accentuate this position by stating that the use of technology has nothing to do with what it offers, but is "an extension and specification of what people do, want, and feel in their everyday lives". To become a participant in the practice one must learn the ways of participating, and how the participants and the practice change. Without this adjustment one becomes socially excluded.

3. 4. ICTs in South African Education

In South Africa, it is mainly the independent (elite) schools and the ex-model C schools (that used to be white public schools) that have access to computers and the previously disadvantaged (black, Indian and coloured) schools that either have no computers or are not fully utilising the machines that have been donated by the government or NGOs.

The National Assessment Report (Public Ordinary Schools (2007) cited in Moll and Ndlovu (2009) shows that in 2006 only 33% of schools in the country had computers for use by learners. The richest province, Gauteng had a higher access percentage (77%).

Within Gauteng, one of the richest provinces, there is none the less a remarkable discrepancy in the distribution of technology. The previously advantaged schools usually have a computer expert who is able to maintain and or teach them. On the other hand, the other public schools (situated in townships or in the rural areas) are bound by restrictions that prohibit them from maintaining the computers or installing current and relevant software. Learner population in these schools is too high to allow learners to make meaningful contact with the machines. Some only work on computers for 30 minutes per week and some fortnightly (PanAf) while the privileged learners have enough access on any day as their subject educators integrate ICTs in their teaching. Most educators in these schools who were given basic computer skills are not using them in their teaching activities – they are still using the old methods that do not expose learners to technology.

The South African government has put an ICT policy (The White Paper, 2004) in place to give guidance on how technology should be distributed and utilised for the benefit of all. It is hoped that through education learners will gain computer skills that will help them become active members in the information society and thus raise or speed up the country's economical development.

In 1987, the NECC (National Education Co-ordinating Committee and NGEO (Non-Governmental Education Organisation) initiated the setting up of EPUs (Education Policy Units) in universities to carry out research in education. CUMSA (Curriculum Model for Education in South Africa) in 1991 drafted a curriculum model that recommended that technology be compulsory for grades 1-9. Thereafter learners would choose vocational oriented subjects that would have two components: design and information technology.

The new curriculum seems to have placed a platform that promote the digital divide by enforcing a rule that can only be adopted by schools with adequate resources. Other issues that contribute to the divide are ensuring computers are well maintained and educators who are proficient in using computers for teaching are deployed in each and every school. The vocational technology subjects can only be taken by those with facilities and those who do not have (who mostly come from disadvantaged communities) are technologically excluded because their institutions cannot offer the subjects. Meanwhile learners in previously advantaged schools enjoy the pleasure of choosing and taking the subjects they want.

The recommendations pose a problem in the sense that they seem to promote acquisition of operational skills only. In fact a technology educator in a township schools, Mveledzandivho Primary,(PanAf) reported that he teaches learners instrumental skills from Grade R to 7. The richer school in this study offers more advanced skills that lead to attaining strategic skills in higher grades.

The other challenge facing South African education that is highlighted in the literature is on how to integrate ICTs in the country's diverse contexts. McCormick (1994) *et al* in Ankiewcz (1995:247) accentuates this by pointing out that it is challenging to teach "in a domain like technology" as there is lack of literature for a general problem solving capability and a lack of specific context of any problem. Learners with little exposure to ICTs remain disadvantaged and fail to compete with their counterparts in job contests.

NGOs have attempted to rescue the situation by instigating programmes that equip educators from previously disadvantaged institutions with skills in using ICTs for pedagogical purposes. Issacs (2002:10), has reported how SchoolNet in South Africa is engaged in projects that promote bridging the digital gap. She says it is involved in capacity building where the focus is on teacher training and the use of ICTs as a teaching device. In that year 4000 teachers had been trained. ThinkQuest Africa promotes the development of local content from the perspective of African learners. They encourage them to be both consumers and producers of information.

This literature has set groundwork and provided a language base that will be used in the data analysis. The South African account gave a broader spectrum from which to work from in determining the validity of the digital divide in the education system.

3. 5. Analysis and Critique

Looking back over the literature review, it becomes clear that physical access is a basis for entry into the technological world. The review enumerates the following three motivations for acquiring ICTs: 1) Time spent working on the computer determines the extent to which one participates in the society technologically. Availability of that time depends on what role one plays at a positional or personal level. These are social issues as stated by Van Dijk.(2002). 2) Cognition determines whether one has mental capacity to explore different avenues present in technology to a point whereby their participation with it is of benefit to self or society. 3) Association with a social class that uses technology can be a motivator for acquiring computers. It becomes easier to purchase them at a lower price.

Computer skills do contribute to a social divide as the level one reaches becomes the basis for social division. The three skills – instrumental, information and strategic – give those who have them an advantage over those who do not. The strategic skills are associated with those with high positions in their societies and the rich, as they can afford to have access for longer times at work and in their homes.

Participation usually is dependent on whether one has tools or not to engage in the group's activities. The tools may be access to physical resources and the skills to use them. Again in this case, possession of these depends on the social level one is at. Those who are not able to participate in developing countries are excluded from contributing in the activities that should alleviate their social status while the rich keep raising theirs.

The notion of the digital divide seems to have been misinterpreted by the public in general; this has had unpleasing consequences that have led developing countries in particular to adopt measures that do not work in their domain, simply because they were not relevant to the context. Research has brought light to the characteristics of this subject. I consider the most significant findings to be those that have revealed that this concept of a digital divide is not a technological issue but one that needs social factors to be taken into consideration as they are the ones which indirectly dictate who does and who does not participate in the information society.

Van Dijk (2004), the principal contributor in this review, concludes his discussion on the digital divide by pointing out that it is worsened by new and more advanced technology that keeps coming in, making those who have it already and can afford to have better access excel in the information society. Those in lower positions of the society remain with old technologies that are limited in terms of information access or operation. He says that in developed countries, physical access is gradually becoming solved and yet in developing countries, skills and usage access is not disappearing but growing. Even if there is physical access in disadvantaged communities, people still grapple with acquiring and using advanced skills to create products that will be of benefit to them.

We have seen that most of the discussions on the digital divide are often associated with acquisition and use of technology. They focus on who has technology, under what circumstances and how they use it. The assumption is that once these resources are present in a society, the digital gap inevitably disappears. Because technology is available to the members of the society, they become active participants in the social networks based on the level of their mode of participation. Such a society obviously has an influx of technology and daily engagements involve using it. The description obviously suits a society that is developed and is rich. . This is the information society. This study will try and identify similarities, if they do exist, of this description and that of one of the schools to be investigated.

This study is based on an education system that is situated in a different kind of society to mainstream "developing" nations. South Africa has two extremes in its structure: there are people whose standard of living equates to that of those living in first world countries, and those whose conditions are those of underdeveloped countries. It is not surprising that the rich school in this study has learners competing with those in the western world in activities involving creation of new products, while the disadvantaged school is still considering offering just basic instrumental skills to its learners.

There is a wide social gap between these two institutions, so much so that they appear to be operating in two worlds. One operates in a society that has abundance of technology (at school and at home) and the other. Although the computers are present they are not in use. What makes matters worse is that they do not have access in their homes. They are simply not surrounded by

technology as are their counterparts. The concern in this scenario is not so much whether the institutions have physical access or not, but that of finding out what it is in their environments that is creating an atmosphere that promotes or does not promote acquisition and adoption of technology. It is for that reason that the South African education context will be analysed.

The two institutions to be analysed portray a strong impact by the society on the extent to which they participate in the information society. Each one of them has inherited social structures from a history that created segregation on economic grounds through its education systems. That had an influence on the formation and establishment of these two different worlds where one has an abundance of resources and the other has close to none. One has access to wealth to the extent that it can acquire any equipment that promises to enhance its pedagogical activities while the other is still dealing with learner computer ratios that are high.

The fact that the broader community has not made technology available to all its citizens puts the education system in a situation where it is expected to balance resources in isolation to other government departments and yet the challenge affects the whole society. Even if the poorer community may wish to support its institution, it is unable even to supplement the government stipend. It is not even educated enough to draw up plans for how the school can maintain its resources; it merely trusts the education authorities for the care of its children. This society has little or nothing to offer to its children in terms of exposing them to the information economy – an economy that operates and processes its goods mainly by using technology. The richer society in this country is able to adopt the latest trends in the information society and this has put the whole country on a pedestal above other African developing countries and yet part of its

population is living below the standard reflected. What is coming strongly in the South African context is the social divide that can be used and this study debates its relationship with the digital divide.

This research report seeks to demonstrate that the description of "the Digital Divide", according to Van Dijk and most authors in this subject, is not fully valid as the tendency in their observations are somewhat an over generalisation. For instance they address the issue as that of a developed and of a developing world problem. Evidence that follows from the South African research data in the PanAf report and website poses a different description of the notion. It has been demonstrated above that the composition of its social structure accounts for that discrepancy. The case studies that have been carried out in South Africa have given data that has informed the society about the patterns that should now help researchers to do conceptual research to formulate models that are relevant to our contexts.

CHAPTER 4

Research Design

Introduction

This research employs a two pronged approach. In the first place, it is a piece of conceptual research that seeks to examine the descriptive internal validity of the notion of the digital divide in the South African education context. However, in the second place it draws on second-order empirical research, in that it depends on data from an existing public data base in order to support and strengthen its argument. No primary research has been conducted – instead, the researcher makes use of the PanAf research observatory, for purposes of this analysis. .

A case study of two schools with diverse ICT resources has been used to validate the argument. The purpose is to determine if a *divide* exists in relation to ICTs, and if it does, to what extent does it get accounted for or described accurately by the concept, the digital divide.

4.1 Data collection

To interrogate the validity of the concept of the digital divide in the South African education context, the data for the case study of the two schools has been drawn from a PanAf ICT research project database. The two focal schools were chosen out of ten institutions participating in the project for their different historical backgrounds, computer- physical resources, computer literacy, and usage, geographical positions, and socio-economic status. The institutions are

situated in the South Africa's richest province, Gauteng. The main reason for this was that the available data on the data base is exclusively about schools in Gauteng.

The purpose of the PanAf research data base is to investigate the pedagogical integration of ICTs in African schools. 10 countries with 10 institutions each are participating in the research. 12 indicators were designed by project sponsors and used as instruments to solicit relevant data. Information on the general description of the institutions together with statistics of computer physical access and demography of the schools was collected and entered into the database. The next phase involved interviews with the principals, educators and learners to ascertain the extent to which they interacted with the machines for both administrative and pedagogical purposes. Researchers recorded the interviews and collected samples of computer generated work by educators and learners that were to be attached to the database. Anyone in the world has access to information on this website and the idea behind this openness is to provide a resource base for educational researchers and policy makers in the continent who are instrumental in the implementation of ICT integration.

The data was collected within a time frame of 2½ years from 2007 to 2009. While there are no direct ethical concerns for this researcher in relation to the use of a public data base, it is worth noting that permission was requested from and granted by the Gauteng Education Department for researchers to collect data in their institutions. Interviewees signed, to confirm that they will take part in the data collection. Ethics permission was granted to the University of the Witwatersrand in Johannesburg, South Africa where the research project was based to ensure that the rights of the participating institutions and individuals are protected.

4.2 Data analysis

This research is an attempt to make sense of the existing data collected on ICT pedagogical integration in South African schools. Data analysis in this case study will be done in the context of the research question, and the PanAf data base will be used as the source of empirical evidence to seek to validate the relevance of prevailing descriptions of the digital divide in South African education.

There is no suggestion here that the analysis offered of the two schools is necessarily representative of either the full diversity or the extremes of schooling in South Africa. What it does offer, though, which is consistent with the aims of qualitative research of this type, is the ability to interrogate some basic assumptions about notions of 'digital divide' as they pertain in South African education. As Moll and Ndlovu (2009:1) put it, "selected case studies that between them can sketch an initial picture of the incorporation of ICTs into teaching and learning in classrooms. It can be conceived of as theory-generating and hypothesis-generating research".

The following methods have been used to tap into the data base for this study:

- Conceptual analysis of the main data categories relevant to the study in the identified database.
- Conceptual outcomes of the study will be presented to establish the validity of the concept in the South African education context.

CHAPTER 5

Data Findings and Analysis

Introduction

The findings in this study refute the idea that technology has the potential in itself to bridge social and economic disparities that exist in present societies. Instead they direct the focus from the notion of a digital divide to that of a social divide. Attempts to adopt and adjust to the new environment created by the drive to economically compete globally have left countries like South Africa shocked by the results of the way they have introduced technology in their educational systems. Its ICT in Education policy clearly demonstrates the kind of future society it aspires to produce through its institutions. Analysis of data in this study reveals appalling recurrence of past inequalities brought about by the apartheid government.

Computers in particular have been poured into educational institutions at high cost with the hope of physically closing the digital gap. This also has not brought favourable results to the new government's aspirations. This chapter will hopefully elucidate elements in this quandary that contribute to the seemingly widening gap in the South African education system, thereby facilitating a description of this country's digital divide. It will draw out seven major conclusions from this analysis of the data in support of the main arguments of the research report.

5.1 Socio-economic status of the school communities

The two selected South African schools represent extremes in social and economic settings likely to be found in educational institutions in this country that seem to replicate social trends present in communities in which they are located. Magaliesburg State School represents the previously disadvantaged institutions that were and still are controlled by the state with minimum technological resources. St John's Preparatory School is a previously advantaged school with an abundance of technological resources.

Magaliesburg State School is situated in the outskirts of Gauteng Province and falls within the jurisdiction of this rich province. This particular locale is a growing tourist attraction area with hotels and farms scattered in this prolific region. The learners are all black South Africans with 90% of the parent body working in farms, and the rest employed as labourers in hotels or as office workers. The living conditions of their homes resemble those of a poor populace living in the rural areas. Their employers' properties have electricity and other appliances found in city suburbs. The farm shacks they live in have no electricity and as a result, most of them do not own or use cell phones. The principal of the school confirmed that those who have them either charge the phone batteries at school (where there is a risk of thievery) or have permission to do so in their "masters' houses". The rest either cannot afford the gadgets or are constrained by the absence of electricity. School children who live far from Magaliesburg State School are transported to and from school by government funded mini buses that only operate at given times. Learners in this school pay low school fees and because the state is the main funder for its financial resources it has more control over its running. In fact the 24 computers that the school has were purchased and installed by the government's ICT project called Gauteng on Line (GoL).

St John's Preparatory School is also situated in the Gauteng province. It is an elite school located in Johannesburg, one of the richest cities in the country. It has a learner population that comes from rich communities in the city and in neighbouring countries. This school has boarding facilities to cater for those who live far away and the rest are transported by their parents on a daily basis. Learners come from homes that have electricity and most have computers connected to the Internet. Given that their parents are rich they can afford to buy the expensive technological gadgets and software they indulge in to their contentment. Learners of St Johns' Preparatory School are able to extend their learning whenever they need to as tasks can be emailed to them any time. This school enjoys autonomy in its running, giving it full authority to do or purchase whatever resources that promise value to its pedagogical activities.

5.2 Accessibility

The two schools were selected for this study based on the impression given by the existing definition of the digital divide that entails having access to physical technological resources. The resources in this (educational) context pertain to those that are used to enhance pedagogical activities in the institutions. In this discussion, technological resources will specifically apply to all that an educational institution would use as ICT, including both physical and human resources This description is in fact what emerges from the data: the distribution of both categories of resources contributes significantly to the narrowing or widening of a 'digital divide' in South African education institutions. Secondly, the data exhibits convincing evidence that the socio-economic status of a community determines the school's capacity to prepare its learners for effective participation in this contemporary society. In fact, the school located in a poor community is struggling to adopt the use of ICT into its pedagogy while the richer school is going over bounds in its adoption of technology.

5.2.1. Access to physical resources

The description of physical resources in this study applies to computers (either desk or lap tops), computer laboratories, bandwidth and the Internet. Access to these resources has serious repercussions on the effectiveness of ICT integration or the introduction of technology in schools. The implications serve as an instrument for measuring the extent to which the state of societal structures affects development in the field of ICT in education. These structures incorporate all stakeholders for the particular institution – learners, educators, management, parents and sponsors. *Table 2* below shows the distribution of both human and physical resources as presented in the PanAf research observatory.

	Magaliesburg State School	St John's Preparatory School
Number of Learners	938	539
Number of computers for learner use	24 (At the time of data collection, these were not in use by learners)	120 desk tops and +/- 20 laptops
Number of educators	32	35
Number of computers for educator use	0	160 desk tops in classrooms and lap tops that can be signed out
Number of computers connected to the Internet	0	300
Bandwidth	0 Internet connection not functioning	1024 kbps (learners) 512kbps (staff)
Number of laboratories	1	3

Table 2 : Distribution of resources for Magaliesburg State School and St Johns' Preparatory School.

There are three conclusions that directly emanate from the figures in this table:

- The fact that both institutions have computers does not guarantee technological access.
- St John's Preparatory School, the richer school, has a learner population that is greater than that of the poorer school, yet its resources far more than double those in Magaliesburg State School.
- Educators at St Johns' have more access to computers than their learners. That gives them adequate time to integrate ICT into their lesson preparation and presentation. On the other hand, Magaliesburg State School gives no computer access to its educators.

Such empirical evidence simply contests the argument that the digital divide is merely a technological issue. For instance, technology is present and yet the school community is not given access to it. This suggests that there is more to the subject of the divide than just a technological issue.

This distribution of physical resources reflects a clear connection between socio-economic background and the distribution and accessibility of physical resources. What is clear though is that in the case of Magaliesburg State School the presence of computers does not instigate usage of the machines by the school community. If the divide is caused by the absence of technology, why then is it that an initiative of correcting lack of resources fails to encourage or compel the

school to use the machines. The implication is that the divide in such a context goes further than the observable social aspects that are supposed to narrow the gap.

Bialobrzeska and Cohen (2005:14) suggest a resolution to the description of the divide in this country. They state, "Narrowing the digital divide means ICT resources must be provided to those who do not have them, and that their competencies to access and process the knowledge that these resources make possible must be developed". This assertion draws attention to one of the most important aspects in the adoption of technology in schools. Where this is not applied; initiatives fail to achieve their set goals in bringing equality. In fact, data on Magaliesburg State School confirm that in the absence of human resources with expertise, ICT in education activities come to a standstill (Indicator).

The principal thinks this is the main reason why no one (including educators) will be allowed in the computer lab until an Information and Technology educator is deployed to this school (PanAf Indicator 7.7.1). It is unfortunate that even those who should be responsible for preparing and processing knowledge (educators) as Bialobrzeska and Cohen (2005) suggest do not have contact with the technology even after instruction on its usage has been offered. The training that educators were given as shown in Indicator 3 was obviously not adequate enough to commence the change in their use of computers. On the other hand, St Johns' Preparatory School has taken measures to ensure its school community does not only have access but has made provision for continuous development in the use of computers by all (both learners and educators). This is evident in its ICT plan in the PanAf data base that will be dealt with later.

Analysis of ratios in Table 2

The following evaluation summary renders an examination of how the distribution of physical resources in *Table 2* affects the state of ICT in education in the two schools under study:

1. The Learner / Computer ratio affects *competency development* in using computers.

If there are more learners to a computer in a classroom, the chances of all learners acquiring and developing competency in using computers is slim. This is elaborated in the section that deals with the influence of time access to learner competency.

2. The Educator / Computer ratio affects *human resource capacity* to produce quality and quantity of work for educational purposes.

Educators need to have adequate time with resources they will use to prepare and present lessons. It therefore makes sense that St Johns' is giving its educators unlimited access to computers to facilitate development in the use of the machines. They are therefore able to work efficiently, producing more work within a short space of time. Templates for instance can be used for work that needs to be reproduced and storage of records is effortless as it will be saved on the computer. Magaliesburg State School educators take longer to achieve what is achieved at St Johns' in terms of quantity. Technology access contributes to the differences that already exist in the performance of educators in this country, as inherited from the apartheid education system. This discrepancy affects the learning environment that learners in South Africa are exposed to.

Learning environments for a society that aspires to participate in the information society by 2013 need to incorporate technology in their activities. Although the society at large is aware of this urgency, it is disturbing to realise that there are institutions that are not utilising the resources they have. The figure below seeks to bring attention to some social trends that partially explain failure to use available resources.

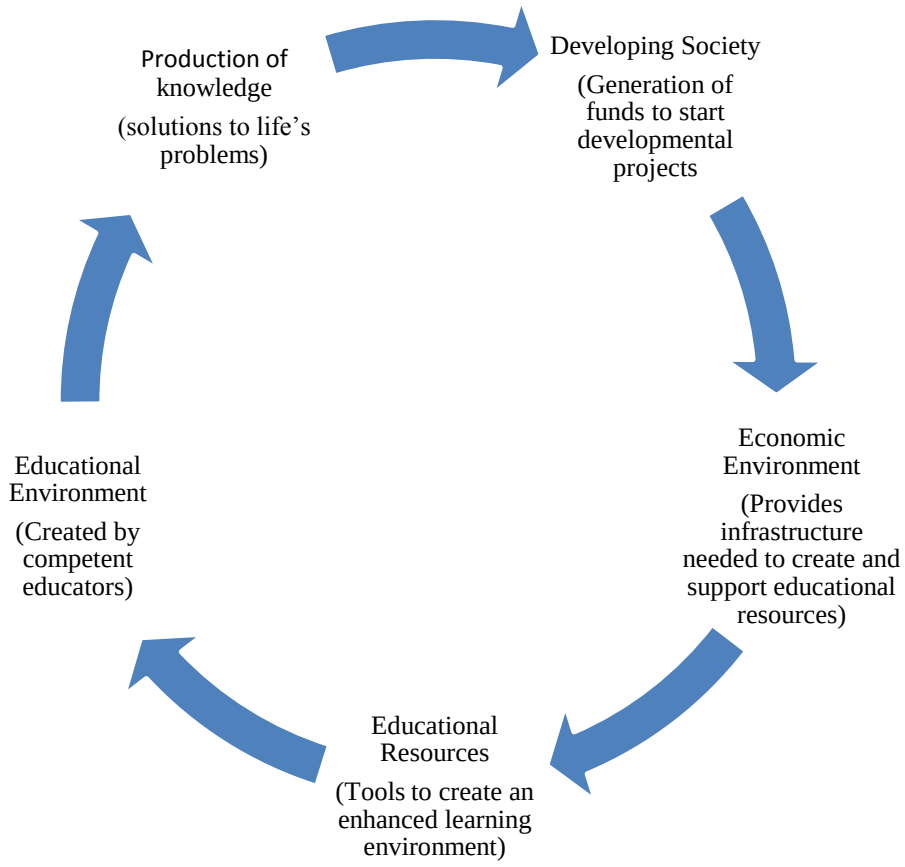

Figure 2: Relationship between society and education

The society needs to create an environment that will promote economic development in order to set up an infrastructure that is needed to support, provide and encourage utilisation of educational resources.

In the case of Magaliesburg State School, the socio-economic setting is such that technological development cannot successfully be launched because the school and its surrounding lack basic structures necessary for sustainability. They do not have working electrical sockets (PanAf Indicator 4.7.1) and electricity in homes (Indicator 7.9.1) for instance.

St John's learners and educators are surrounded by technology at school and at home and this makes it easy to extend exposure and endorse development in using the machines. The result is the creation of a learning environment that promotes the production of knowledge that will help

solve societal problems. Creation of knowledge can also be merchandise that can help source funds for the society. It is these funds that can be used to start developmental projects.

St John's deputy headmaster, Lees (2008) PanAf Indicator 4.12 shows the progression that takes place in the acquisition of computer skills by learners:

Grade 3	from Computer literacy to Microsoft (MS) Office suite introduction – focus is on Word Processing.
Grade 4	MS Office suite – from Word Processing to Excel and PowerPoint.
Grade 5	Utilisation of the Internet and engaging in software programmes where they "design and animate their own cartoons and games".
Grade 6	Consolidation of skills learnt in Grade 5 to designing programmes and testing professional looking computer games.
Grade 7	Introduction to picture editing using Adope Photoshop and to video editing using Apple iBooks.

This kind of development would not be possible if learners had little access to computers. It would probably take double the resources if not more for learners in Magaliesburg State School to achieve the same aptitude, if the same plan were to be used. The reason is that the learner: computer ratio is higher, and limited access to the machine (only at school during school hours) makes it difficult to advance one's technological skills to the level of learners at St John's School.

A study of the effects of learning resources in improving performance in South African schools by Crouch and Mabogoane (2001) has proved that the key to quality in learner performance is not just a result of access to resources but one where effective mediation takes place. The data collected disclosed, "When it comes to resources, the learner: educator ratio seems to matter much less than the quality of the educators" (Crouch and Mabogoane, 2001:64).

While the large numbers of learners at Magaliesburg State School do not seem to bear much negative effect on learner performance, an Indian University study by Ghosh (1999) proved that

smaller classes have a likelihood of performing better if numbers were reduced. Crouch and Mabogoane (2001) have proved that in South African classrooms the quality of educators and the availability of resources like computers and the media centre contribute significantly to learner performance. However it should be noted that how this tool (the computer) is used, determines whether learning is enhanced or not. In other words, if quality of educators is high, learners' ability to adapt to the desired social technological trends are advanced while poor quality instruction contribute to low performance in the contemporary working envirionment.

Learning is enhanced or established when "the students' activities" help them make meaning (Biggs, 1999:60). If that is not achieved there are lesser chances that learners will raise their productivity potential and reduce the possibility of stagnancy in adopting technology. The use of technology (by using images for instance) enhances learners' understanding of the world. Learners who are not using it are bound to have a different conception of the world. Such learners as those in Magaliesburg and in other parts of this country form their own society that is not in touch with the information society that this country is advocating. They simply do not belong and are not being guided toward participating in it.

St John's Preparatory School is also a high performing institution both academically and in extra murals. It has fewer learners, more computers and two more laboratories than Magaliesburg State School, with enough machines for each class. In addition to that, there are +/- 20 portable computers reserved for use in other subject classrooms in case learners need to work on a task during the lesson. These are also connected to the Internet. The Foundation phase has two computer laboratories and it uses one of them (smaller) for learners who need extra tuition during lessons.

All learners are given access to computers in this school irrespective of age or intellectual ability. Lees (2008) confirms "All our boys have a minimum of one hour of timetabled IT a week..." The time these boys have with computers is at least double that of what most South African learners in public schools have. This shows that the value computers are given in this school is not only based on the learners' future but at developing the present skills to the highest level. Computer use for extra lessons, motivating or "developing learners' thinking skills" was stated by one of

the educators. Indicator 6.1.2 reports benefits of using computers by educators on learners as to improve (1) written and oral presentation skills (2) research skills (3) motivation to do more than is expected. These gains are actually ingredients not only for an excellent work ethic but also for lifelong learning that is initiated and developed as they progress to the next grade. Such a quality in their schooling acts as a mechanism for sustainability in productivity that is crucial for both educational and economic growth.

Learners in this primary school are already equipped with tools at Grade 7 that will orient them into what the government, through the *White Paper on e-Education* (2004:19), aspires to achieve. "...a new generation of young people who are growing up in a digital world and are comfortable with technology". There is no doubt that learners in this school are given enough exposure that not only makes them comfortable but makes them "fly" as one of the educators pointed out. "Flying" in this context denotes deliverance from ignorance, possession of means of survival in a given environment, being able to advance in the direction one wants to take and being in control of what and how to survive while in transit. The policy makers envisaged such a future citizen who could then contribute in alleviating economic status for all, especially the poor, in our society. It is unfortunate that this goal is achieved by the rich and helps to consistently raise their productivity levels, while poorer communities struggle to enter or engage with the new tools.

Attempts by government to focus on provisioning of physical resources and offering of short courses to educators through Gauteng on Line have been unsuccessful, simply because the initiatives did not begin at community level for the poorer schools. Instead the school is expected to support the community with minimal resources they have. The well resourced institution in this study is able to implement ICT policy appropriately because it has support from all its stakeholders who make sure there is finance to purchase enough physical resources including software. Educators are inadequately trained to integrate ICT into their teaching. This is evidence that a description of a digital divide that does not focus on the socio-economic status cannot be valid in the context this research is based on.

While schools like St John's have been cushioned by their historical background and their present environment, an analysis of its position has brought up strong evidence of the importance of both the societal environment and that created by the school. The school environment plays a big role in accelerating the technological gap. The divide in South African education is not only caused by external influences but internal (within the school).

The first major conclusion to be drawn from this data analysis, then, is the following:

The two schools reflect a marked ICT resource inequality, but this is related to socially distributed inequalities inherent in the surroundings of the institutions. These indirectly determine the extent to which technology is adopted.

5.2.2 Inequalities in access by age

Another claim that is believed to be responsible for widening the digital gap is drawn from a concept introduced by Prensky (2001). The notion of digital immigrants and digital natives focuses on the differences in age as the cause of the divide. Prensky's claim that all children and young adults are computer literate is based on the assumption that they have grown up immersed in technology. He adds that their exposure to these new tools or toys has made them develop thinking and processing of information skills that are different from the adults (the digital immigrants). This view is supported by Crook (1994:38) who says, "By virtue of participation within such communities we become socialised into possible ways of thinking". This premise implies that the emergence of technology is instrumental in the formation of a social class for young people that has excluded adults based on the generation gap concept and cognition rationale. Those who contest Prensky's idea refute it on grounds that it is an over generalisation, and applicable only to certain highly developed technological and socio-economic contexts. Data in this study seems to bear out this view, as it reveals elements that contradict Prensky's belief.

The descriptions in *Table 3* below suggests how much these tools have been adopted by and influenced young people (or 'digital natives') with access to technology. They obviously familiarise themselves to a point where they are able to run their lives with it. It is for this reason that it is assumed that their fundamental way of thinking is affected by it.

Digital Natives say	**Digital Immigrants say**
Teachers are a population of heavily accented, intelligible foreigners and don't understand what they are saying.	*Today's students are less attentive and as a result they are illiterate, failing to engage in critical thinking.*
They prefer to receive information fast	They choose to teach slowly.
They prefer parallel processes and multi-tasking	Don't believe children can learn successfully while watching TV or listening to music, because they can't do it themselves.
They prefer graphics before their text.	Understand writings and ideas of the past – characterised by logically structured facts.
Prefer random access like the hypertext	*To learn is to concentrate, focus on an object (knowledge)*
They function better when networked	Legacy content – listening, reading, writing is the best in gaining knowledge
Thrive on instant gratification and frequent rewards	*Manual feedback is more personal and effective*
They prefer games to serious work	Think learning can't be fun
They have little patience for lectures, step-by-step logic, and "tell-test" instruction	They choose to teach step-by-step, one thing at a time, individually and above all, seriously

Table 3: A comparison of digital immigrants and digital natives

The young generation described here is obviously at a higher level in manipulating the computers and has access for longer periods. Situated learning theories associate achievement of mastery in a field with longer experience spent in the community of practice. The issue to be established now is whether South Africa has young people that would fit that description. As has been pointed out before, if they do exist, the picture painted in their education environment is a reflection of the nature of the society and its economic status in which they live. A study of the calibre of learners at St Johns' Preparatory School can assist in pointing to the highest level on the yard stick and that of a learner from Magaliesburg will be at a lower level.

The IT educator at St Johns' (PanAf indicator 4.10.1) accepted during the interview that he is challenged by the knowledge and skills his learners possess. The implications attached to this observation are as follows:

1) these learners come to school with advanced knowledge, meaning that their exposure to technology is not confined to school, but takes place in the home as well.
2) their knowledge about computers can only reach a high level if they are receiving instruction
3) this instruction comes from the networked society in which they live, as much as in formal schooling
4) digital networking entails being connected to the Internet in their homes
5) ownership of software that can be used to facilitate working with programs that expose them to a wide range of functions that help them in getting access and creating products that can be utilised to solve life's problems.

Such learners have all it takes to possess "digital native" qualities, as described in *Table 3* above, in their living environment. The social class they have grown up in has provided them with physical resources they need to form their own society that provides them with informal coaching. These structures are so well established socially (as they give instrumental support) and economically (for financial support) that learners are able to sustain their activities giving them an opportunity to extend their knowledge and skills.

The IT educator also admitted to struggling to keep up with what the learners know as new technology keeps flowing in. This could imply that where his learners are concerned, he becomes a digital immigrant and that humbles him. One of the reasons for the gap between them could be the difference and the strength of the network structure and functions even if it is informal. To illustrate the effectiveness of this society, the deputy principal expressed the same sentiments as Prensky when he acknowledged (Lees, 2008) that the school has taken a position of "joining them". The plan he presented demonstrates a concerted effort by the school to guide its learners toward accomplishing knowledge production at primary school level.

School managers' decisions reflect the society's values, and some of these lie at the root of discrimination within social groups. Children in our society are often excluded from handling fragile objects. It is not surprising that involving them in what we consider delicate and important tasks is risky. Another reason could be associated with the urgency associated with preparing senior learners for life after school – at tertiary or work places where they will be using the computers to perform their daily duties. The management at Magaliesburg State School excludes learners in Grades 8 and 9 from having access to computers in the school. Interviews at Magaliesburg School revealed that when learners were given access to the machines, basic computer literacy lessons were offered to the FET (Grade 10 – 12) band only. It is assumed that the rest of the school could not fit into the timetable for computer lessons as numbers are big and lessons cannot be extended because the majority of the school uses government funded transport that operates at given times. This scenario inadvertently creates limited access to a resource that needs an abundance of time to achieve proficiency. Again, in this case, the society's failure to create an environment in both homes and school to "surround" learners with technology positions these learners not even immigrants status in the digital divide but they are socially excluded. Learners here are unable even to enter the first stage in preparing for participation in the information society.

According to Prensky (2001), all young people are surrounded by technology as they grow up but such a claim does not apply to a young generation raised in a South African disadvantaged community. Some of these children are excluded from having access to technology based on their age. The rest of the young people do not have access simply for the reason that they do not have a mediator to guide them into using the machines. The headmistress at Magaliesburg State School confirmed that she had not allowed anyone in the school, for the past two years to use computers because there was no IT educator. The question is whether there is a realisation of the pressure to expose the young to technology within the environment these learners are living, at home or around the school. The fact that there is no pressure from the society at large that would compel every learner or school to offer technology is clue enough to understand the stage at which some segments of this society are, where encouraging participation is concerned The community, including the school is doing well with what they have in terms of generation of

necessary resources to survive. In this case it is not learners (as Prensky suggests) that are driving the innovation, but they wait at the mercy of their society to give them access.

Learners at Magaliesburg State School expressed a strong desire to be computer literate but unfortunately they cannot have access to the lab at the moment (Indicator....) . Although this digital tool does not contribute much to the learners' performance, there is an awareness of its value or esteem. The growing need for computer literacy as a requirement for most white collar or office jobs the learners can get in hotels could be another inspiration for these learners to acquire the skill. It is therefore evident that even if these learners do not have a sound understanding of the full potential of using a computer in or outside the classroom, they realise the importance of working on the computers if they are to be part of the modern society. Failure to do so for whatever reason takes us back to the apartheid era where lack of knowledge and skills for particular careers deemed the disadvantaged unfit for good and well paying jobs. The education system, then prepared the segregated classes for the subsistence economy by using approaches that would equip and keep them there to prevent them from rising and competing with those of the higher class.

While the data on Magaliesburg expresses the helplessness of the learner in orienting him or herself to technology, that of St John's demonstrates appropriation of the tool to the extent that their expertise gives them respect from their educators. Age in the South African education can only be considered a cause for the digital divide as long as it is linked to the societal and economic features that determine the position one takes in the information society. To a large extent young people even in South Africa are excited by technology but evidence in this study shows that with some it ends with that excitement. Their social environment (including the schools) fails to expose them to ICTs.

The social environment responsible for creating the divide begins in the home, moves to the outside world (that promotes use of technology) and lands in the school (where learners should actually be prepared for their participation in the contemporary society).

The second major conclusion to arise from this data analysis, then, is the following:

There is not a generational or age divide with regard to access to ICTs reflected across the two schools. Rather, there is a social discrepancy between the contexts of the two schools, which itself must be understood as a divide between the social worlds within which young people grow up and encounter technology.

5.2.3 Impact of new technology on accessibility

The ICT in Education Toolkit (tool 6.3) (not dated) and Van Dijk (2004) concur that what exacerbates the digital divide (especially in developing countries like South Africa) is the fast rate at which new and more advanced technologies keep cropping up, causing those who cannot afford them to "remain insufficient" with regard to new skills and knowledge.

St John's Preparatory School discloses in PanAf Indicator 7.2.2 that seven to ten computers are replaced every year with new ones. Lees' (2008) article accentuates this by declaring, "The quest to extend the boys even further has seen the school invest in top-of-the range computers for the computer labs". Keeping up to date with the latest technology keeps its learners at the same level as the digital natives Prensky describes, placing them at a high level of proficiency in the use of the machines.

Magaliesburg State School is considered to be a better institution in terms of academic performance compared to those with no technology in the country; it has 24 computers (locked in the laboratory). Those computers have not been replaced (not that there is a reason for replacing them as they are not in use) like the rest of them that were installed in other public schools in this "rich" province, Gauteng. Considering replacement of computers with better ones is obviously far-fetched at the moment especially when concerns of giving access to both learners and educators have not been addressed. Giving access especially when the resources are available, whether old or new might seem important, but it is something that comes secondary after issues of "security" in the case of computers in Magaliesburg State School that were provided and managed by Gauteng on Line project.

The fluidity of this modern information society contributes to a large extent to the challenges the ICT in education policy implementers have in planning programs for the disadvantaged, especially if the recipients are in a position where they cannot participate in the initiatives independently. St John's school is coping because it has governance over decisions to be taken on what, when and how technology should be accessed. Its financial capacity makes it easier to acquire whatever equipment they need. Meanwhile, Magaliesburg State School is surrounded by restrictions characterised by financial, safety and lack of control over issues of accessibility. This set-up is a catalyst for the huge gap that South African education institutions or administrations are creating, making the disadvantaged learners worse off than their rich counterparts.

New technologies in the South African education system help users to acquire the latest skills and machinery that is faster and offers more functions. The latest technology enables recipients to participate effectively in the global economic and social arenas. They can communicate at the same level with those of the first world countries. Those who are not even exposed to the old models of computers do not feature in this society and yet they all follow the same curriculum. The new curriculum is supposed to redress social inequalities but the education system's failure to control acquisition of new machines worsens the divide.

Another important issue in this regard is the importance of time and its impact on quality access. Van Dijk has pointed out that there are benefits in contact over longer periods together with having access to a broader bandwidth, as it facilitates advancement of computer skills to strategic capabilities.

Both learners and educators at St John's Preparatory School are trained and taught how to create their own knowledge, in their usage of game creation programmes for instance. By the time learners are in Grade 7 they are able to consolidate all the necessary IT skills they need to design programmes. Emphasis in this institution is on developing computer programming and for that reason the school has purchased 10 Apple iBooks and 10 Lego-Robotics programming kits for video editing. The learners use software like Adope Photoshop for editing pictures, Alice for

games and short animations in class**.** Other software that they use for consolidating lessons are "Mathletics" for Maths and "Readers are Leaders" for English.
Ironically, a community that cannot afford to purchase technology realises its value and goes out of its way to get access by paying for the short contact. Access to computers by some learns and educators at Magaliesburg School is gained by visiting cyber cafés in the neighbourhood. In the café they can search the Internet and prepare for their lessons. Time spent in the café is limited and does not allow space for innovative involvement with computers. Even if they wanted to, their funds would not be sufficient as usage is paid for per time spent on the computer or Internet. Although this takes care of the need temporarily, it definitely cannot be compared to the access that is available at any time of the day for St John's School learners and educators.

Time – specifically time-on-task – is crucial in developing ICT skills, exposure to it may be a matter of choice to the rich societies, but is not in poor communities until there is satisfactory access to technology. It appears that as long as resources are limited, previously disadvantaged education institutions in South Africa will perpetually be faced with the challenge of affording its educators and learners adequate time to develop their skills in using technology.

Without adequate resources at home and in learners' living environments, the question of having quality time is not debatable and yet its impact on widening the divide is remarkable especially in the advancement of computer skills for educators as well. The effect of time on technology access in South Africa is a consequence of social features that either constrain or support availability of time to learners and educators. It is also a matter of how much time human resources are given by authorities to prepare for the use of computers in their teaching.

So the third major data-driven conclusion to arise in this chapter is the following:
Minimal or low levels of access to technology are not only driven by an underlying social divide, but they further deepen these social divides because access to both basic hardware and software continually generates needs for more complex hardware and software for learning.

5.3 Human resources

Human resources in this study include educators (core to the pedagogic use of ICTs), managers (for support and guidance) and ICT advisers and technicians (for maintenance).

5.3.1 Educator capacity

Educators are the key instrument to a successful paradigm shift in an educational system. The change at stake is one of integrating ICTs into pedagogical activities in order to prepare learners for the emerging information society. Learners need to see the use of technology modelled by their educators, and that means in the form of effective lesson presentations, worksheets, evidence of latest information from the Internet.

Bialobrzeska et al (2005) discuss different uses for computers in the classroom. These can be (1) to produce documents (2) present information orally or graphically (3) store data and retrieve it whenever it is needed (4) search for information and (5) create new knowledge or products with it. Each of these uses demand an amount of skill to apply it. The more confidence one has to exploit any of the above the better the chance they have to execute a specific approach that will be of benefit to their teaching activities. The National Curriculum Statement advocates learner-centred approach and one of the benefits for using this style is that it promotes learning at own pace and lifelong learning. It is hoped that this way of teaching will help learners coming from disadvantaged backgrounds to develop to higher levels of performance - having been given more time and individual help to learn. The pedagogical approach that a school or educator adopts needs to be one that will facilitate achievement of educational goals stated in the curriculum.

Responses from educators in Magaliesburg State School do not indicate explicitly what approach they have adopted, but it is implied in what they say. They have admitted to using computers for preparing lessons and searching for information. Nothing beyond that is indicated. It is therefore obvious that traditional methods of teaching and learning – without the use of computers are used in this school to achieve their goals. They also say that the computer helps learners to improve their English grammar and spelling errors. The impression one gets is that if computers

were in use, they would be used for producing documents in Word. This shows how limited their knowledge and understanding about computers is. In this school, computers would not take a particular position in upholding a particular approach of learning other than just preparing for lessons.

St John's Preparatory School clearly states the approach they use and they state how computers assist to achieve their educational goals. Indicator 4.6.1 says the "cross-curricular approach they have adopted in the school encourages them to explore with technology". This encourages teamwork and the IT educator confirms working with other subject educators to design projects that they can work on. Another advantage of using computers in this approach is that learners master two fields of study at the same time where one polishes the quality of content and the other, the technical aspect that actually focuses on the quality of the product to be presented in a different medium. Lees (2008) points out an example where "boys were taught how to type out essays, create tables, shoot and edit videos, manipulate pictures and develop coding that would be used in the administering of the knowledge that was learnt in these various disciplines". Learners in such a case see the value of each subject in solving real life problems, as they do not come in isolation.

The learner-centred approach is augmented by the use of software like "Readers are Leaders" where learners' reading is developed and assessed at the learners' pace. An educator from St John's Preparatory School said as learners work on their projects, they are taught how to research, "preparing them for life in the world at work places" (Indicator 6.1.2). What is clear in the use of computers in this school is that it takes advantage of the learners' excitement in discovering new potential with computers. That gives them learning experiences that expose them to ways of converting what they have discovered to produce tangible solutions to life. In that approach, learners naturally enjoy the challenge they experience and they acquire knowledge using modern resources.

The games they are introduced to in Grade 5 for instance, assist them in developing their thinking skills. They use a program called "Scratch" to "design and animate their own cartoons

and games" (Lees, 2008). The mathematical aspect of computer programming in this program helps them develop logic they need to solve problems.

The aspect of integration of ICTs is very critical as it either narrows or widens the gap. If learners are taught instrumental skills in one school and strategic skills are used in the other, the results of both can never be the same. This is an issue that the education system needs to address urgently. ICT integration plans ought to show progression toward making learners becoming producers of knowledge. If they leave school without the innovative skills they will not be able to compete with their counterparts. This divide is one of having basic skills in contrast to having advanced skills. The fact that our education system does not promote acquisition of strategic skills will leave many learners still lacking.

Impact of educator: computer ratio on learners

Public schools situated in economically disadvantaged communities in this country are highly populated as they are affordable and consequently the teacher learner ratio escalates. Although that does not necessarily affect learner performance, it becomes an obstacle in a case of a poorly resourced school like Magaliesburg State School, where resources need to be individually used as a tool for learning. The thought of using computers for instance for teaching purposes is overwhelming as attempts to engage in whole class activities or those meant to develop operational skills might not be viable.

It has already been mentioned that educators play a leading role in preparing participants for transition to the new age. That implies they need to become active players in this environment by first, familiarising themselves and adequately preparing to utilise the machines so they can model them to learners they teach. In fact, the educator is part of the ICT environment that should create and facilitate access to learners to an extent that maximum exposure is gained and sustained. Access and training needs to be given to the educators as a priority or perhaps as groundwork for promoting use of technology in schools.

Table 2 shows a marked discrepancy in the accessibility of computers to educators where one school gives access to computers that are actually more than the number of educators, whereas the other is not given access at all within the school. St John's Preparatory School has a desktop for each educator to use in every classroom. Educators are also allowed to take laptops home to help them prepare for their lessons or communicate with their learners in case they need help. In other words they have access to computers 24 hours a day, 7 days a week. Both learners and educators are surrounded with resources that create a learning environment and this plays a big role in motivating and sustaining their will to continue learning even after school hours. It is evident that this school realises the importance of ensuring the educator is familiar enough with computers and has enough time to prepare for effective use of technology in his or her teaching. Giving access to educators in St John's Preparatory School promotes one of the National Curriculum goals of lifelong learning by inculcating habits of always seeking and gaining new knowledge and understandings. Educators can model this trait to their learners as their presentations display depth in content and form. Content for instance is enriched by research through the Internet and form is enhanced by the attractive presentations brought by the use of multimedia. The children described as digital natives enjoy this way of processing knowledge as it aligns itself with their way of living in the societies or networks they have formed – that which is a representation of the present one.

In Magaliesburg State School educators are not given access at all to computers. If ever they do, it is in their homes - if they own a computer. Those who have computers use them to write lesson plans or worksheets and to search the Internet if they are connected. Computer access is therefore limited to their homes. They obviously cannot use computers to communicate with their learners; nor can learners do the same as they do not have them in their homes. The question to ask in this scenario is: How does one measure the effectiveness of an educator in Magaliesburg State School and one in St John's Preparatory School?

The disadvantage of an educator in Magaliesburg State School who is very creative or innovative in using and teaching resources that are not used in the job market is that he or she cannot give learners the language or tool that they will need to immediately fit into the market without having to be trained at the expense of companies. Their lack of computer skills makes them

unattractive to the labour and business world. The responsibility of preparing learners with relevant skills cannot be placed on educators in this case but on the school management or at a larger scale, the provincial departments of education as the main sponsor. When restrictions are to the extent that the educators themselves are unable to get access to available resources or the Internet for information, the system needs to loosen its regulations, otherwise its attempt to bridge the digital divide in this case is futile.

It is vital that education authorities ascertain the sequence they need to follow before technology is introduced in schools to avoid creating situations similar to that at Magaliesburg State School. Haddad (not dated), in the UNESCO ICT in Education Toolkit stresses the importance of establishing educational goals first before using technology to achieve them. He says:

> Technology is only a tool: no technology can fix a bad educational philosophy or compensate for bad practice. Therefore, educational choices have to be made first in terms of objectives, methodologies, and roles of teachers and students before decisions can be made about the appropriate ICT interventions, (Part 1: Not dated)

In other words, teaching and learning resources should be used to achieve educational goals. Educators play the chief role in fulfilling educational objectives once they are identified and for that reason, giving them access first is not an option but an obligation. The effectiveness of an educator is measured by the calibre or the ability of outputs he or she produces to quickly adapt to the style of life prevailing at that moment. Failure to produce such outputs promotes the perpetration of tendencies that existed during the apartheid era where educators in black schools did not prepare their learners for top jobs or occupations in the society because they did not have the capacity to do so. There needs to be an awareness of the enormity of the impact of not exposing and equipping educators with skills that will initiate an envisaged society.

While it is true that it is important that educators are sufficiently trained in the integration of ICTs as a package for bridging the divide, evidence given above keeps redirecting focus to the social divide. In the case of Magaliesburg, for instance, training was given. However, what fell short is the nature of training, implying that the tuition was either too basic to give teachers

adequate preparation to integrate it into their teaching, or it was not suitable for the context of the school. Hence, teachers are not enthusiastic to try it in their lessons. The conclusion is that there are social tendencies inherent in their specific community of practice, and perhaps even the community of the school, so that there is not much in it that acts as a stimulus to give them good reason to use computers.

The educators' responses to the indicators in the PanAf observatory are significant here. Table 4 brings up features that can be used to describe their capacity and its impact in their context. Their reactions actually reflect how much they know and can do in the integration of ICTs into their teaching. The following table can also be used to understand the responses of educators better.

Indicator description	Magaliesburg State School	St John's Preparatory School
Total number of Educators	32	35
Number of educators who have participated in 1-50 hours of continuing education /professional development, which included ICT integration	28	35
Number of educators who have participated in more than 50 hours of continuing education /professional development, which included ICT integration	15	35
Average ICT use by educators for academic purposes (hours per week)	4	17

Table 4: Training of educators and their use of ICTs for teaching.

The table clearly shows that there are some educators in Magaliesburg State School who have not been trained in the use of computers. It should be noted that the 1 to 50 hours training was offered by the Department of Education giving them basic computer literacy skills and those who had more hours trained at their expense, during their time. Of those that were trained, only 4 are using computers in their preparation for lessons or teaching. Amongst the 4 there is an Engineering Graphics and Design educator whose learning area demands that he uses computers. Whenever his or her class has to use them, learners are transported to another school that has the

software that is needed for the activity (Indicator ....). Those who use them confessed that they were encouraged to use them by a few learners who use Cyber cafés.

On the other hand, St John's is continuously training its educators and equipping them with the latest technological skills like teaching using an interactive whiteboard. This apparatus costs thousands of rands, a fee that can only be afforded by the elite schools. It is unfortunate that whenever our education departments make an effort to give resources to those who do not have them, newer models are introduced and educators in most public schools are not in a financial position to keep up to date with technology. This causes a digital divide within the educators that deprives them of benefitting from social networks that can help enrich their performance, giving them an opportunity to continuously improve their skills. Their positions in the society are still a major hindrance in their chance to narrow the digital gap.

A digital divide as described by Van Dijk (2004) assumes education is a motivator for owning and using a computer, but evidence from both schools show that there are educators that actually choose not to use technology (like some at St John's). Some of these are technophobic and some are still comfortable with using the old methods of teaching. There are also those who do not have access because it has not been made available to them at their work place. For those reasons, I would like to argue that access to technology need not be associated with having it only but equal emphasis should be given to its adoption. Although there is a wide gap between those who are "exposed" to technology in this country's education system, there are different classes within those who have access, comprising different levels of competency in its usage. The varying educator aptitudes is determined by the quality of training that they have and where it is continued, more use it for educational purposes.

This section, then, points to a fourth major conclusion that emerges from the data:
The two schools reflect a discrepancy in teachers' pedagogic use of and access to technology. However, this is a social divide characterized by differences in systematic access to the use of computers – both through socialisation into ICT culture and structured training – which is best understood as an absence or presence of a community of practice engaged with the use of ICTs in the classroom..

5.3.2 Restrictions

There are a number of issues that need to be looked at in this account that highlight aspects justifying their interest and their level of competency in adopting technology by educators in Magaliesburg State School have in integrating computers into their teaching. The first one is that they do not have access to computers at school despite the Department training them for their use. The principal of this school stated that she does not allow anyone to use the lab for computer use because security will be compromised, as there will be no one to account for any damage.

These computers are protected at any cost, even if it means educators fail to efficiently do their preparation for lessons and this is cause for concern and pushes one to ask the question: why so much restriction especially when government monies have been spent training educators to use them? When an education official was asked why (not only at this school but at others involved in this research) they were so anxious about the computers' safety, she reported that the schools were told that if anything goes wrong with them, or they are stolen, the school was going to be responsible for the repairs.

The experiences of educators at Magaliesburg State School bring up the intensity of the shortcomings of imposing such tight restrictions to people who should be driving the change in the education system.

If educators are not familiar with the tools that are used in the corporate world they promote perpetration of inequalities in the education system. The masters (educators) have not been given an opportunity by virtue of experience and exposure to practise and apply what they have been introduced to in less than 50 hours as shown on the *Table 2*. Unfortunately the products of such educators automatically remain in that low class and the circle is repeated and can only be broken once focus is given to the providers of the knowledge and skills that are needed. Educators should be given priority in having access to technology before learners are. It is the educators who should actually plan how and what learners need in terms of the type of computers and software needed for the environment they are working from. Efforts need to be made to ensure they progress and reach higher levels of competencies before computers are

given to learners by acquiring the following competencies suggested in the *White Paper on e-Education* (Clause 5.2):

- Entry level
- Adoption level
- Adaptation
- Appropriation
- Innovation

Leaving educators at "Entry" level before they adopt technology for teaching purposes is the reason why institutions like Magaliesburg State School have not been able to participate in the drive to produce computer literate learners as envisaged in the ICT policies because no professional development programs have been designed and run consistently to upgrade their status in utilising computers for teaching purposes. It is apparent that educators at St John's Preparatory School are able to fulfil educational e-learning goals because efforts have been made to give them more access to computers than learners and they are offered constant tuition to keep them up to date with even the latest technologies.

The digital divide stretches to prohibiting people from using computers for any reason. While St John's has no restrictions where giving access is concerned, its educators continue to excel in the use of technology as more and more resources are made available to them (Lees,2008). Van Dijk (2004) and the rest of the authors referred to in this study do not even mention anything about these prohibitions and that is because the approach to adopting computers in developed societies is liberal. The atmosphere at St John's is so free that it creates and promotes an attitude of wanting to explore technology to gain more flexibility in using it. Magaliesburg has closed doors for anyone that wants to work on computers. The discrepancy in the technological access is caused by the education system itself as it suppresses accessibility through its restrictions. This move has strained the divide as some schools have not been able to have access to the machines.

So the fifth major conclusion from the data relates to this question of restrictions placed on teachers in their use of ICTs in the classroom:

Teachers have unequal access to innovative hardware and software resources across the two schools. However, this is not so much a question of technological access as it is one of a social regime which restricts their freedom to use the ICT resources that they do have available to their full potential.

5.4 Technical and academic support

Much as technology enhances efficiencies and pedagogy in education or any organisation for that matter, it needs constant maintenance. Whenever anything goes wrong, personnel with technical expertise play an important role, by restoring whatever has gone wrong. Without this support, work comes to a standstill and information may even be lost, causing great frustration and disturbances in the organisation. The two South African schools under study draw attention to variables indicating the importance of technical and academic support in ensuring that goals for education through ICT integration are achieved.

Magaliesburg State School has no technical or academic support from the school or the department of education. Its access to resources depends solely on the providence of GoL services that seem to have come to a halt in this province because of the project's failure to support and sustain public schools under its jurisdiction. The service provider that was supposed to technically support the schools in this project failed to offer its service as agreed initially in the initiation of the project. This has led to institutions like Magaliesburg State School with a computer laboratory not functioning at all. What worsened the situation is that GoL imposed restrictions on the use of both computers and software to be used with them. No interference with what had been installed was to take place, otherwise the school or individual would be held accountable. It should be realised that these constraints were given to communities who were not familiar with using the machines and were anxious not to break these precious entities whose presence gave status to the school concerned.

The absence of an adviser or educator at Magaliesburg School with both the technical and pedagogic know-how paralysed even those who were eager to use these machines for educational purposes. The interviews carried out in Magaliesburg State School confirmed the

eagerness of the whole school community in wishing to use these "preserved" educational resources. Ideally, the word that should be used in this scenario is "maintained" and not preserved, as something preserved has no benefit except that it might be occupying space and not making any change that it might be meant to. Failure to maintain and support the use of computers in Magaliesburg State School, inadvertently leads to exclusion of this community from the current information society.

St John's Preparatory School on the other hand is flourishing because of all the support one can think of in an educational institution in this country. The IT Director's core duty is to make sure all staff in the school gets both technical and academic support. For technical maintenance, there are two personnel contracted by the manufacturer of the computers who are always at the staff's service and managed by the director. The task of making certain that computers are "effectively" used for educational purposes is also under his responsibility. Indicator 2.5.2 of the At John's Preparatory School articulates that he:

- organises ICT professional development sessions for all the staff
- focuses on developing educators' computer skills and ensuring they are conversant with new technology like the interactive whiteboards they use in their classrooms
- finds programmes and advises teachers on how and what software to use
- gives guidance on how they can use computer programmes to enhance learning in their specific subjects

In addition to all this support, educators have access to computers all the time, making it easy for them to practise and apply what they have learnt in the regular training sessions. In fact some of these educators can design activities for their learners on the Moodle Learning Management System (LMS), making it easy for their learners to understand as they work from local content – prepared by their own educators. The Moodle LMS is renowned for its constructivist's approach that is aligned with the project-based method used in ICT integrated lessons by some educators at St John's Preparatory School. Learners are able to continue working anywhere at any time in this Management System as long as they are connected to the Internet. The educators' ability to design programmes gives advantage to learners as they can extend their learning, making them

spend more time on the learning environment that can only make them become familiar with lifelong skills. Educators on the other hand benefit from the experience they get and this develops them to specialists in their subjects, preparing them for 21st Century skills.

It is evident from this description of the director's responsibilities that whenever a new concept in the technology or its use is introduced, educators are not left alone to stumble (wasting time in the process) with it, but they are continuously supported. Educators in this country in particular have been overloaded with too much paper work and expecting them to find time to look for software that will supplement their teaching is really asking for too much from them. It is not surprising in this regard those educators at Magaliesburg State School are managing to keep up to date with the department's requirements in the absence of additional stress of planning for ICT integration. Unfortunately, the department does not compel them to submit electronically or to use technology to produce the documents otherwise there would be more interest in using computers by all staff. The environment created by the abundance of support from the IT director at St John's facilitates compliance to an environment that puts so much emphasis on technology. The PanAf observatory confirms that all educators in this school use computers, at least to prepare for their lessons and some of them integrate it into their pedagogical activities.

The advantage that St John's Preparatory School educators have over those in Magaliesburg State School is that they are able to carry out their administrative chores quickly and more efficiently. For instance producing self-made documents themselves avoids wasting time looking for suitable content, texts or exercises for their specific classes. The other advantage is that they do not have to think and prepare extra information for extended learning to supplement their teaching as saved templates are available in the software recommended by the IT director. The other advantage is that their learners are motivated to learn by their usage of the latest technology and by the challenging tasks they give them that encourage them to explore their use of computers (their toys at home).

Technical and academic support is necessary if continuity in using technology is to be achieved. Unfortunately since its service needs funds, it is the rich again who are able to employ such staff, giving them no reason for not excelling in their operations. The poorer schools remain frustrated

when things go wrong with technology. That encourages an adoption of a passive attitude to computers. The digital divide is widened in a case like this as there are some who do not have access due to lack of support and being in an environment that is not conducive to sustainable exposure to technology.

The data for the two schools, then, leads to a sixth major conclusion:
The provision of technological support is unequal across the two institutions, but this is also rooted in a deeper social divide.

5.5. The influence of managers and school governance

'Managers' in this case refers to the principal as the head, the deputies, the director for IT (in the case of St John's Preparatory School) and the heads of department for the subjects offered in the schools. The following table displays differences between the competences of managers in the two schools.

Competence	Magaliesburg State School	St John's Preparatory School
Number of managers in the institution	9	15
Number of mangers trained to use ICT (Instrumental skills)	7	15
Number of managers with email address	3	15

Table 5: ICT competencies of school managers

Some literature has pointed to the importance of managers' support in the integration of ICTs into the classroom. There are different descriptions of managers' behaviour toward this change in the education system as implied in the South African institutions of the PanAf observatory:
There are those who:

(1) will do anything thing to support any initiatives suggested by educators to integrate ICTs. These are fully aware of what technology can do, believe in the learners and their educators to a point where they give freedom to explore with the latest technologies.

(2) claim to be aware of the benefits of using computers and will support the integration from a distance and these use them for administrative purposes and know nothing beyond that. Van Dijk (2004) would probably describe these as those who feel technology is for the younger generation and as long as they have subordinates who are familiar with solving intricate problems for them, they feel no need to advance themselves or the school with more skills.

(3) are genuinely interested in knowing more and exposing their school community to more computer skills but the are restrained by financial constraints. These will give access to computers and will devise plans of how all can be exposed and benefit from the contacts. There is not much use of technology for pedagogical enhancement but for acquisition of basic computer skills in their case.

(4) are interested but restrained by restrictions imposed by the Education Department or project sponsors.

(5) just talk about it but are preoccupied with requirements that must be met in terms of timetables. They are not daring enough to explore or allow its academic staff to try new possibilities and will use these demands as an excuse for not supporting ICT integration.

Not all managers in Magaliesburg State School have been trained to use computers for their administrative duties and the few that have not are probably unable to communicate or operate electronically. Their effectiveness is questionable and they could be dragging the administration's efficiency. The majority do not have email addresses and this is understandable because the Internet is not connected. It is therefore not surprising that the rest of the staff is still comfortable with using the old methods of presenting their work either in or outside the classroom.

St John's Preparatory School's managers are familiar with technology and they can all communicate with each other or with their subordinates electronically since they all have email addresses. It is easy to create a community in a culture that thrives in discovering new knowledge and skills and one that supports each other. There is evidence of that culture in this St John's Preparatory School and it is not surprising that so many of the staff members have bought

into using ICTs to teach. This culture can only make the educators go higher and higher in the knowledge ladder while those in Magaliesburg State School remain at the bottom of the ladder.

It seems one of the strong qualities of technology is that it flourishes where there is freedom to explore new knowledge and other areas. Managers at any level of the education system who fail to create that atmosphere encourage the digital divide. The education system has done little to ensure managers in schools create that atmosphere. At times it has worsened the situation (like the rules that came with the installation of computers in the GoL project) and deprived learners and educators of access to technology. In the South African education system there are some managers in these less privileged institutions who do not make much effort to promote the use of technology while some of those in richer schools have the potential to do all they can to get funds to buy the latest versions of software for instance. It must be something to do with enculturation. It may be caused by whether their living environment, or where the schools are, if computers are an important tool to use in their daily routines. If not, life goes on without involvement with technology for many while the divide widens.

School governance issues take on a similar frame to those of management. The issue of who should give and get access to technology in public schools, what technology is to be accessed, and how access should be given to poor schools, relies at the moment solely on Provincial governance. The provinces themselves are not at the same level in terms of economic status and even in their academic performance. That then leads to discrepancies in the quality of education that exists at the moment in its institutions.

The example set by GoL provides us with lessons to learn where governance is concerned. Total control over the distribution, type of computers and even software, servicing and security was not given to schools but to the project authority, which process disregarded contextual differences completely. For instance the existence of a secure lab with a full house of machines should not have been the basic requirement for introducing technology in an educational institution.

There are crucial elements in an education system that needs to be addressed before even the lab is erected. Haddad (not dated) in the UNESCO ICT in education Toolkit attempts to set the priorities right by advocating that educational preferences must be stated first. Objectives, methodologies and roles of educators and learners must be established before decisions on what technological intervention must be adopted. Domain specificity comes into light in this notion due to the fact that alongside the curriculum objectives, each school has its own way of achieving them depending on its context and availability of resources (financial, physical and human) for instance.

The seventh major conclusion, then, is related to management in the two institutions in question: *Management and governance shortcomings are evident in the disadvantaged school, when compared to the advantaged institution. However, this is as much an issue of social context, as it is a question of missing skills within the surroundings of the schools concerned.*

5.6 Conclusions

The critical question at this stage of this study is: Is the South African education system doing or has it done much to bridge the digital divide or has it opened the gap further? The difference between the divide created by the old government is that the tool used to discriminate this time is technology. The gap is not directly and intentionally instigated but comes about through lack of informed decision making, not at national level but at regional level where projects are launched to implement policy like in the case with GoL. Educators needed to be thoroughly trained on the new pedagogical approaches that utilise technology as a resource to give all its learners the same exposure to tools they would use in the 21st Century.

This chapter has drawn seven major findings out of the analysis of the PanAf data on Magaliesburg Farm School and St. John's Preparatory:

1. The two schools reflect a marked ICT resource inequality, but this is related to socially distributed inequalities in educational expertise.

2. There is not a generational or age divide with regard to access to ICTs reflected across the two schools. Rather, there is a social discrepancy between the contexts of the two schools, which itself must be understood as a divide between the social worlds within which young people grow up and encounter technology.
3. Minimal or low levels of access to technology are not only driven by an underlying social divide, but they further deepen these social divides because access to both basic hardware and software continually generates needs for more complex hardware and software for learning.
4. The two schools reflect a discrepancy in teachers' pedagogic use of and access to technology. However, this is a social divide characterized by differences in systematic access to the use of computers – both through socialization into ICT culture and structured training – which is best understood as an absence or presence of a community of practice engaged with the use of ICTs in the classroom.
5. Teachers have unequal access to innovative hardware and software resources across the two schools. However, this is not only a question of technological access but also one of a social regime which restricts their freedom to use the ICT resources that they do have available to their full potential.
6. The provision of technological support is unequal across the two institutions, but this is also rooted in a deeper social divide.
7. Management and governance shortcomings are evident in the disadvantaged school, when compared to the advantaged institution. However, this is as much an issue of social context, as it is a question of missing skills.

The question then to be asked is, having identified all these facets that seemingly contribute to the description of the digital divide, where does one start to describe it in such a context? One element that has dominated this analysis is the presentation of the environment created by the society as the source of what passes as a 'digital divide'. It is important to acknowledge that it is not easy to describe a multifaceted scenario like the one presented here and simplifying it is even more difficult. The main thing is that the divide in question exists primarily as a social divide, and not just a divide in an exclusively digital domain.

CHAPTER 6

Conclusion

6.1 Introduction

Issues of digital inequalities in the South African education system that have been presented so far revolve around physical and human resources. These serve as empirical evidence for a social digital divide in this study. It has been suggested that they determine the extent to which one participates in the information society only in the context of a broader, more deeply rooted social and historical divide.

The previous chapter reported on and analysed seven major empirical findings that emerged from analysis of the selected data on the PanAf website. Germane to all of them was the proposition that to explain fully the supposed digital divide that forms the description of each, one needed to look at the deeper social context. It is for this reason that this research report argues that the divide in question – which centres on the integration and use of ICTs in education – is best accounted for as a social divide rather than as a digital divide. In this concluding chapter of the report, I offer an interpretation of the main findings of the research, and build up towards a conclusion that the concept of the 'digital divide' has only limited descriptive validity in the South African educational context.

What matters in one's participation in this new (Information) society is not how much or how many devices one possesses but what one actually does, and is able to do, with the tools in a social context. The extent to which teachers and learners are able to manipulate the machine or machines they have is closely correlated with the social class to which they belong or from which they operate in this society.

The evidence that has been presented in this study goes beyond the broad descriptions of the digital divide and related social divide provided in the introduction of the Report. One reason is

that the investigation is focused on one specific aspect of South African society – existing schools in the education system. Another reason is that South Africa's social structure is constituted both by communities that can economically compete with developed countries and those whose status is at the same level as those of the developing countries.

6.2 Empirical findings

The society at large consists of groups of people who have particular, diverse ways of living and resources that help them function in their living environments. In this study, what emerged is that although the two groups represented by the focus schools may have access to much the same technological environment, the tools that they use to participate in this society and the way that they use them separates them distinctly. What actually pulls them apart is that one is in full possession of these modern tools used by this contemporary society, whereas the other has them but is not using them. This full possession vs. partial possession must be explained using the concept of a social divide.

The failure of utilisation of computers distributed to previously disadvantaged schools like Magaliesburg State School was due to a project that was not well planned and managed. The project had a technological focus and as a result, the complexity of the unique social environments was overlooked. In the preceding pages, I have explored a number of dimensions of this problem.

First, the poor or disadvantaged school is situated in an environment where an ICT culture is not well established. This is a question of a lived community of practice. Because the use of technology is not prevalent in the lives or homes of these people, the education system is not able to impose use in the school by learners and educators. Within this framework, there are many reasons that contribute to the use or non-use of technology. Reasons range from lack of infrastructure, to day-today support for the use of computers, to an organisational culture in schools that does not promote usage of the machines. This scenario frustrates every effort (including having the presence of computers) to make this school's community prepare to

participate in the information society. The fact that it is such a broad network of practices that is responsible makes it clear that the issue is a broad social one.

Second, the rich school has an environment driven internally (principal and technical director) and externally (parents) that supports all its attempts to sustain its technological needs. This system of ICT socialization and support exists far beyond the walls of the institution, as it extends into the homes and other social contexts of the learners, from the very earliest days of their lives. The school works with a very broad community of practice, and cement this in the classroom activities. As has always been the case, even before this country's independence, this gives the institution encouragement to move up the technological ladder unhindered. This school demonstrates the importance of drawing plans for ICT development to ensure there is progression in the acquisition and application of computer skills that is subject to the teaching and learning needs of the school. These features contribute to the status that some rich schools have accomplished technologically. Differences in human resource capacity within the schools also contribute to the state of the divide. If educators are only trained for instrumental use and there is no continuity into pedagogical integration, adoption challenges arise and they remain hesitant to try the new resources. The influx of new technology necessitates regular training for educators if they are to keep up with the fluidity of technology. Again, this provides evidence that a broad network of social practices is responsible for success with ICTs in education, rather than mere technological provision.

The South African education system reflects these two tendencies in its institutions. The empirical findings of this study show beyond doubt that the 'digital divide' in South African education is more of a social issue than just a technological one. A society is described by its culture, people's behaviour, its way of doing things, and all of these come in when the divide is explained. The divide in question can therefore be described as socially grounded, emanating from all the social facets present within or outside the school.

6.3 Conceptual outlook to the findings

As much as South Africa is considered as one of the leading countries in Africa in giving access to technology, the two schools examined in this Research Report reflect the huge gap that exists in its citizen's economic status. The government may have the capacity to alleviate the lives of the disadvantaged communities, but Magaliesburg's situation represents some of its failures in these attempts. It needs to look into the socio-economic root causes of these malfunctions that at present seem to be beyond its power.

Applying corrective measures to different contexts, without consideration of the overall social divide, is bound to fail. The Gauteng Education Department, through its ICT project (GoL) , is a case in point. It tried to implement a one-size-fits-all approach, in which all schools received the same basic suite of computers in a standard computer laboratory, and teachers all received the same standardized training in ICT literacy. This made little difference to the narrowing of a 'digital divide', precisely because it ignored underlying social issues and inequalities by giving short instrumental courses and giving the same number of computers to some previously disadvantaged schools. All schools, regardless of their unique social and school environments received the same offerings. A needs analysis was not done adequately to ensure effective distribution and use of resources. Continuous academic support should have been planned for to make sure educators were guided into new approaches to teaching.

Another aspect of ICT integration that was ignored was preparation of societal structures that would anchor technological developments in the educational system. The computer laboratory as an infrastructure was not enough to carry all the needs for the functioning machines. The bandwidth and connectivity issues were not well catered for and as a result they were inactive within a short space of time. Not much time could be spent by educators searching for information on their subject content. Learners in impoverished schools remain at the bottom of the technological ladder because they do not spend enough time on computers. This is because of inadequate resources that have been given to schools with large numbers of learners. Under such circumstances only instrumental skills are given to learners, making them unfit to effectively compete with those whose skills have reached higher levels of participation.

This theoretical view suggests that the term "digital divide" amounts to a description of the *status quo* with regard to technology in this country's education system. Although technology is important, ignoring the bearing that the social structure and education system of the past has on it means that attempts to remedy the situation have aggravated the situation. The Magaliesburg State School story is evidence that these initiatives have not promoted the use of technology, but rather caused institutions to shun engaging with existing machines.

6.4. Future research

Although South African ICT in education goals aim to give access to technology uniformly across all institutions, implementers fail to understand the social, economic and educational needs for specific institutional contexts has resulted in its activities widening the digital divide instead of closing it. There is a dire need for extensive research across multiple contexts to understand the full extent of this problem in South Africa.

Some previously advantaged schools seem to have been able to adopt ICT in education goals as stated in the *White Paper on e-Education (2004).* My argument here has been that it is not just because they can afford to acquire whatever technology is necessary for the success of integrating ICT into pedagogy, that they are able to achieve the goals. The conditions for their success have much more to do with the fact that they are social communities of practice, and are embedded in broader social contexts, that take the practices of ICT culture seriously. The concerns to be addressed by education authorities are: what creates the gap, what mechanisms are put in place to close the gap, and how effective are the interventions used to redress the differences regardless of what historical or economic background institutions have. The answer to these questions arises in the acknowledgement of the significance of the social context in the description of the gap between ICT 'haves' and 'have nots'.

In the South African education system, the digital divide is a matter that needs to be given in-depth analysis and understanding before it can be given any valid description. Findings in this research highlight the need for comprehensive case studies to be launched by provinces at district level that would help define examples of each level in the quintile scale in order to understand

the diversity of the individual contexts. Giving attention to these realities could result in informing those responsible to set up structures for development to draw up programmes that will make it easy for service providers like the education system implement changes that will ensure all benefit from its pedagogical activities.

6.5 The validity of the 'Digital Divide'

The notion of "digital divide" as widely used is limited in its description of the problem of ICT inequality in the South African education context. A better description would be that which analyses the social aspect (divide) in depth to help in the understanding of where the divide could be coming from. It would then be easier to formulate a structure that might be helpful in bridging the real character of what appears to be a digital divide. Therefore on the basis of my findings, I would like to propose that the state of technology (both provisioning and usage) in the education system is the result of a social divide and not a digital divide. My overall conclusion is that the notion of "digital divide" has limited descriptive validity in the South African education context. In relation to each one of the specific research questions that I posed earlier, my findings are as follows:

(a) Does the notion of a "Digital divide" accurately describe the nature of the inequalities that exist in the South African education context?

No, it does not. In limiting the description of the divide to one of access to technologies and to the abilities on the part of people to operate those technologies, it silences or fails to take account of its deeper social constituents.

(b) If it does, what kind of digital divide is it?

The divide relating to ICTs in the South African education context is a "social divide".

(c) Does the description of the information society resemble that found in the South African education system or institutions?

The social divides and cleavages of South African society have led to creation of diverse categories of practice within an information society. Exposure to and the level of manipulation of technology is both determined by and determines the position the information class takes.

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APPENDIX A

INDICATOR 3 for MAGALIESBURG STATE SCHOOL

3.11 Educators who have participated in continuing education / professional development, which included ICT integration

3.11.1 Number of educators who have completed 1 to 50 hours of continuing education/professional development which included ICT integration	28 *2007-10-11*
3.11.2 Number of educators who have completed more than 50 hours of continuing education/professional development which included ICT integration	15 *2007-10-11*
3.11.3 The percentage of educators who have participated in less than 50 hours of continuing education/professional development which included ICT integration	87.50 % (28 / 32) *2007-10-11*
3.11.4 The percentage of educators who have participated in over 50 hours of continuing education/professional development which included ICT integration	46.88 % (15 / 32) *2007-10-11*
3.11.5 Number of female educators who have participated in 1 to 50 hours of continuing education / professional development, which included ICT integration	14 *2009-01-15*
3.11.6 Number of male educators who have completed 1 to 50 hours of continuing education/professional development which included ICT integration	14 *2009-01-15*
3.11.7 Number of female educators who have completed more than 50 hours of continuing education/professional development which included ICT integration	10 *2009-01-15*
3.11.8 Number of male educators who have completed more than 50 hours of continuing education/professional development that included ICT integration	5 *2009-01-15*
3.11.9 Percentage of female educators who have completed 1 to 50 hours of continuing education/professional development which included ICT integration	70.00 % (14 / 20) *2009-01-15*
3.11.10 Percentage of male educators who have completed 1 to	100.00 %

50 hours of continuing education/professional development which included ICT integration	(14 / 14) *2007-10-11*
3.11.11 Percentage of female educators who have completed more than 50 hours of continuing education/professional development which included ICT integration	50.00 % (10 / 20) *2009-01-15*
3.11.12 Percentage of male educators who have completed more than 50 hours of continuing education/professional development which included ICT integration	35.71 % (5 / 14) *2007-10-11*

APPENDIX B

Indicator 2.5.2

2.5.2 Description of the professional duties of the ICT advisor/technician

Indicator 4.7.1

4.7.1 Stated (by educators) factors that are challenges to ICT use by educators

Indicator 4.12.

4.12.2 Number of ICT in education-related research publications

4.12.1 ICT in education-related research publications

Indicator 4.10.

4.10.1 Competencies required for ICT use (by educators)

Indicator 4.6.1

4.6.1 Stated (by educators) factors that support ICT use by educators

Indicator 6.1.

6.1.1 Stated impact (by learners) of ICT on learning

6.1.2 Stated impact (by educators) of ICT on (learners) learning

Indicator 7.1.1

7.7.1 Stated impact (by managers) of ICT on continuing education/professional development programs (150 words)

Indicator 7.9.1

7.9.1 Barriers, as identified by managers, hindering the achievement of their institution's ICT-related goals for learners (600 words)

Indicator 7.2.1

7.2.1 Institution has a strategy in place to maintain and renew ICT equipment?

Indicator 7.2.2

7.2.2 Description of strategy in place to maintain and renew ICT equipment