

University of the Witwatersrand



The South African Digital Divide

**A thesis submitted in partial fulfilment of the requirements
for the degree of**

**BACHELOR OF COMMERCE
(HONOURS)**

By

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Declaration

I, Saul Andrew Leor-Lever, declare that this research was entirely my own work. It is being submitted as part of the requirements for the degree of Bachelor of Commerce with honours at the University of the Witwatersrand, Johannesburg. It has not been submitted for examination before for any degree at any other university.

Signed at _____ on this ____ day of _____, 2002

Saul Andrew Leor-Lever

Abstract

Through this paper, various definitions are put forward with regards to the digital divide. The causes and effects of the digital divide are viewed with both global and local viewpoints. The various methods used in developing countries to advance their ICT literacy ~~level's~~levels are discussed. In organisational ICT developments, the benefits to both the organisation and their employees are presented. South African developments in the digital divide arena are discussed, with regards to the educational system and national ICT developments, primarily focusing on rural ICT developments. An exploratory study consisting of 104 participants was conducted on the commercial and tertiary educational sector within Gauteng. It was found that gender, age, being previously disadvantaged, English being a persons first language, living in a rural areas and educational level were related to ICT access. It was shown that a person's view, regarding the utility of ICT, could be linked to their motivation to utilise and learn about ICT devices. It was further found that there is a relationship between the amount a person utilises telecommunication devices and their access to ICT devices. The underlying elements of technophobia were investigated in order to create an effective technophobia scale. Results revealed that elements of the digital divide are still evident within the sample universe i.e. Gauteng commercial sector and the tertiary educational sector.

Key words: **Digital Divide, ICT, Internet Access**

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Table of contents

Abstract.....	ii
Table of contents.....	iv
Chapter 1: A broad overview.....	1
1.1 Introduction.....	1
1.2 Chapter Outline.....	2
Chapter 2: The Digital Divide.....	4
2.1 Defining the Digital Divide.....	4
2.2 Causes of the digital divide.....	7
2.2.1 Initial system developers.....	7
2.2.2 Tertiary education.....	7
2.2.3 Access to ICT devices.....	8
2.2.4 Motivation.....	8
2.2.5 Lack of corporate interest.....	9
2.2.6 Segregation of women.....	9
2.2.7 Inadequately trained teachers.....	9
2.2.8 Inadequate resources.....	10
2.2.9 Inadequate telecommunication networks.....	10
2.2.10 Technophobia.....	11
2.2.11 Generation gap.....	12
2.2.12 Affects of the apartheid era.....	12
2.2.13 Inadequate schooling facilities.....	12
2.2.14 Poverty.....	13
2.2.15 Lack of interest from Macro Economic parties.....	13
2.2.16 Corruption.....	1413
2.3 Methods and Advantages of bridging the digital divide.....	16
2.3.1 Expanding markets.....	16
2.3.2 Computerisation.....	17
2.3.3 Importance of ICT training.....	18
2.3.4 The benefits of ICT in administrative activities.....	18
2.3.5 Creation of a knowledge sharing culture.....	19
2.3.6 Increasing organisational productivity.....	20
2.3.7 Knowledge Management culture.....	2120
2.3.8 Increased Employee Training.....	2221
2.3.9 Increasing rural productivity.....	2322
2.3.10 Efficient communication networks.....	23
2.4 Global developments in bridging the digital divide.....	24
2.4.1 Rural pay phones in Bangladesh.....	24
2.4.2 Public-Private partnerships in Argentina.....	2524
2.4.3 ICT usage by non-technical managers.....	25
2.4.4 Computers as paper weights.....	2625
2.4.5 Developments amongst the African American community.....	26
2.4.6 Children in the USA.....	2726
2.4.7 Low cost ICT devices.....	27
2.4.7.1 Gram-phone.....	27
2.4.7.2 The 5KPC.....	2928
2.4.8 Schools teaching parents.....	30
2.4.9 Microsoft's user friendly software.....	31
2.4.10 Wireless communication networks in Nigeria.....	32
2.4.11 The responsibility for training.....	33
2.4.12 Bridging the gender digital divide.....	34

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2.4.13	Small enterprises utilising ICT	34
2.5	Developments in South Africa with regards to the Digital Divide	35
2.5.1	Tripartite alliances assisting ICT developments	35
2.5.2	Private sector assistance	36
2.5.3	ICT laboratory implementations	36
2.5.4	ICT laboratory requirements	37
2.5.5	Educational environment assisted by ICT	38
2.5.6	Generating funds for a self sustained ICT centre	40
2.5.7	Expanding the national communication networks	41
2.5.7.1	A second phone service provider	41
2.5.7.2	Power sources for communication mediums	42
2.6	South Africa's comparative ICT progress	42
2.7	Conclusion of Chapter 2	44
Chapter 3	Methodology	44
3.1	Introduction	44
3.2	Research Problem	44
3.3	Hypotheses	44
3.4	Survey Design	45
3.5	Method of Data Collection	46
3.5.1	The Survey Instrument	46
3.6	Assumptions made in this Study	48
3.6.1	Procedure	48
3.6.2	The Pilot Study	49
3.6.3	Results of the Pilot Study	49
3.6.4	The Finalised Questionnaire	50
3.7	The Survey Sample	50
3.7.1	The population	50
3.7.2	Selecting a Sampling Method	51
3.7.3	Determining the Sample Size	51
3.8	Effectiveness of the Questionnaire as a Measuring Instrument	52
3.8.1	Validity	52
3.8.1.2	Internal Validity	52
3.8.1.3	Construct Validity	52
3.8.1.4	External Validity	52
3.8.1.5	Face Validity	53
3.8.1.6	Criterion Validity	53
3.8.1.7	Statistical Validity	54
3.8.1.8	Interorder reliability	54
3.8.2	Stability	54
3.9	Response Types	54
3.10	Data Analysis	55
3.11	Use of Statistics	55
3.11.1	Type of Tests Used	55
3.11.2	Level of Significance	55
3.11.3	Analytical Procedures	55
3.11.3.1	Descriptive Statistics	56
3.11.3.2	Hypothesis Testing	56
3.11.3.3	Statistical Software Package	56
Chapter 4:	Results and Discussion	56
4.1	Descriptive statistics	57
4.1.1	Results	57

Field Code Changed

Field Code Changed

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4.1.2	Discussion	59
4.2	Research Question 1	61
4.2.1	Results	61
	Hypothesis 1A	61
	Hypothesis 1B	62
	Hypothesis 1C	62
	Hypothesis 1D	62
	Hypothesis 1E	63
	Hypothesis 1F	63
	Hypothesis 1G	63
4.2.2	Discussion	64
4.3	Hypothesis 2	66
4.3.1	Results	66
4.3.2	Discussion	67
4.4	Hypothesis 3	68
4.4.1	Results	68
4.4.2	Discussion	68
4.5	Understanding technophobia	69
Chapter 5:	Conclusion	70
5.1	Limitations of the Research	71
5.2	Implications	72
5.3	Contributions to Past research	72
5.4	Recommendations for Future Research	72
Chapter 6:	Appendices	73
6.1	Appendix 1: The Questionnaire	73
6.2	Appendix 2: Summary table of Participants Current Situation & Race	79
6.3	Appendix 3: Summary table of Participants Race and Internet access	80
6.4	Appendix 4: Summary table of Participants Gender & Internet Access	81
6.5	Appendix 5 Summary table of Participants Age and Internet Access	184
6.6	Appendix 6 Summary table of Participants Gender & Internet Access	82
6.7	Appendix 7: Age controlled summary table of gender & Internet access	82
6.8	Appendix 8: Summary table of Participants first language & Internet	83
6.9	Appendix 9: Summary table of Participants area status and Internet	83
6.10	Appendix 10: Summary table of Participants marital status & Internet	84
6.11	Appendix 11: Summary table of Participants Education and Internet	184
6.12	Appendix 12: Summary table of Participants Income and Internet access	85
6.13	Appendix 13 Contingency Table Gender by Internet Access	86
6.14	Appendix 14 Contingency Table Internet Access by Age	86
6.15	Appendix 15 Contingency Table Internet Access by PDI	87
6.16	Appendix 16 Contingency Table Internet Access by English language	87
6.17	Appendix 17 Contingency Table Internet Access by Area Status	88
6.18	Appendix 18 Contingency Table Matric education level by Internet access	88
6.19	Appendix 19 Contingency Table Income bracket by Internet Access	89
6.20	Appendix 20 Hypothesis 2 test for Normality	89
6.21	Appendix 21 Hypothesis2 T-test	90
6.22	Appendix 22 Hypothesis3 T-test	90
6.23	Appendix 23 (Question 14) Principle components	92
6.24	Appendix 24 Factor analysis	95
Chapter 7:	References	96

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Chapter 1: A broad overview

1.1 Introduction

Arguments involving when the digital revolution began, can be traced back to the development of the micro transistor. Alternatively another argument could be with the first Personal Computer (PC), the graphic user interfaces of Microsoft's Windows and maybe even with the explosion of the World Wide Web (Internet). One thing is certain the digital revolution has begun. It can be argued that this revolution is of global proportion. The advanced incremental developments made by the digital revolution have resulted in the splitting of society. According to Tapscott (~~1998~~1998), society has split into "Information have and have-nots doers and do-nots..." (Tapscott, 1998, p.255). Generated from this idea is the concept of what exists today in countries around the world: a divide, a digital divide.

Through this paper, the literature review ~~explores~~ exploring the various definitions of what the digital divide consists of, are brought forward. The access to Information Communication Devices (ICT) is the primary definition of the digital divide, predominantly utilised throughout this paper. An ICT device could range from an ordinary pay phone to an Internet enabled portable computer. The various causes of the digital divide are ~~explored~~ explored; it is revealed that the causes of the divide have an effect on all the spectrums of society: young and old, rich or poor, male female etc. The causes vary from economic hardships to political turmoil, education upbringing to psychological motivational factors, social stigmas to corporate disinterest.

The various causes that contribute to the digital divide have been overcome in many countries. The paper explores several methods utilised to bridge the digital divide and also the motivating advantages used to encourage these initiatives. The various initiatives undertaken globally range from first world developed countries such as the United States of America to third world developing countries such as India and Nigeria. Through out this paper the words, 'access to ICT devices', 'the Digital Divide' and 'access to the Internet' are utilised although

they all primary focus on primary aspect of people's access to technological advancements.

South Africa's unique dividing factors are explored i.e. apartheid and the various national ventures being undertaken to conquer the digital divide. South Africa's national ICT developments are investigated primarily in impoverished rural areas.

The literature review provides a comprehensive analysis of the extent of the digital divide and some of the infringing elements causing the divide. Drawing from the literature review, the empirical study research aims to analyse the extent of the digital divide in South Africa and factors that contribute to the South African digital divide. This study aims to evaluate the relationship between an individual's view of whether ICT is productive for them and their computer literacy level. The study further intended to evaluate the level of communication devises that South Africans have access to and the amount they utilise the various means of communication in relation to their access to ICT devices. The empirical study established core factors that could be linked to an individual's technophobia level.

1.2 Chapter Outline

1. Defining the Digital Divide.

This chapter provides various definitions from contrasting authors about what the digital divide encompasses. The chapter summarises the those affected by the digital divide, into two groups, those people that can utilise ICT devices and those that can not for the reasons that are discussed in the chapter.

2. Causes of the Digital Divide.

Through the ~~chapter~~chapter, the various causes of the digital divide are explored. The primary focus of the chapter is on causes that are affecting developing ~~country's~~countries. The chapter reflects that there are various contributing factors to the digital divide, ranging from rural to urban, wealthy to poor with the realisation that with correctly allocated resources most of these factors can be bridged. In ~~addition~~addition, the chapter highlights that these causes are not specific to any particular group.

3. Methods and Advantages of bridging the digital divide.

The chapter provides an insight into the various benefits of bridging the digital divide as well as ~~methods which~~methods that can be utilised to assist in bridging the digital divide.

4. Global Developments in bridging the digital divide.

This chapter establishes various initiatives undertaken globally ranging from first world developed countries such as the United States of America to third world developing countries such as India and Nigeria in their attempts to bridge the divide.

5. Developments in South Africa with regards to the digital divide

This chapter describes South Africa's unique dividing factors and explores the various national ventures being undertaken to conquer the digital divide. The focus of this chapter is on rural ICT developments.

6. South Africa's comparative ICT progress

This chapter provides an overview of the 2003 Digital Access Index (DAI) and points out what South Africa's comparative ICT standing is.

7. Methodology

This chapter describes the experimental design utilised to assess the research problem and how the data was analysed empirically.

8. Results and discussions

This chapter explores the statistical tests that were utilised and the results obtained from these tests. The results are then discussed in light of the research problem.

9. Conclusion

This chapter summarises the findings, describes how the research has expanded the understanding of the topic, and provides ideas for future research

Chapter 2: The Digital Divide

2.1 Defining the Digital Divide

The definition of what the digital divide encompasses, in most cases disregards a crucial aspect. It is not the availability of commercial electronics that is the problem. If it were then the wealthy individuals would have the latest hi-tech gadgets while the poor will have to make do with what is available. According to Ken Jarboe¹(2001), there is far too much focus on certain aspects of technology while the important point of overall inclusion is forgotten. In an interview with John Surmacz, (2001), he says:

“ When I think of the digital divide, I think of this broader issue of people who can utilise and participate in all the things that are going on in the information revolution and those that are locked out.”. (K.Jarboe cited in Surmacz, J. 2001.p.12)

According to Jarboe (2001), people who do have the facilities to access the vast resources of information can not, due to their computer literacy level. Computer literacy is a further dividing factor. There is a group of individuals who understand the technological concepts i.e. these are the computer literate. On the other ~~hand~~hand, there is a group who ~~are~~is alienated from modern technological developments because of their computer literacy level. The literacy level of an individual may have an affect on the way the person utilises various appliances at home.

According to Gripsrud (1999), an investigation into most homes will reflect the usage of an array of technological developments: microwave, radio, Television (TV) and even the smallest example, a digital watch. These developments are an advancement of modern technology. When examining the advancement made through TV, it is still a passive form of entertainment. TV can be viewed as a means of dispensing knowledge. The question is then raised; to what extent can the active viewers' knowledge grow through the use of TV.

¹ Ken Jarboe, president of the Athena Alliance, a Washington D.C. based think tank focusing on the social and economic implications of the internet.

Modern reservoirs of information require an active user. The word 'active', means a two-way interaction between the user and the communication medium. Two-way interaction is achieved by the user being literate in using the communication medium whilst having a need for the information the medium can provide. Although the usage of TV spread very rapidly, comparable growth in the Information Communication Technology (ICT) field cannot be expected to do the same. This is due to the modern media user being capable of being active instead of passive when using the communication medium. The abilities of an active ICT user are needed in various business sectors.

Smith (1997) referenced a study that was conducted in the micro retail and hotel catering markets. It revealed that half of the enterprises were not utilising computer systems in their business operations. Of the companies that were utilising ICT, very few had any relevant and applicable strategy for further IT integration into their organisational operations. The study further revealed that these specific business sectors expected new recruits to have a basic degree of computer literacy. The organisations in these markets had no internal ICT developmental plan for their current employees although they required new personnel to have a basic level of computer literacy. ~~?????~~ Simultaneously implementing an employee skills development barrier and ~~aan~~ employment deterrent to potential employees who may have had skills to contribute to the organisation. ~~?????~~ The influences of the digital divide can be seen in the surrounding social environment.

Disadvantaged children who have a lack of access to ICT are hindered by their surrounding environmental disadvantages: low educational levels, high crime, hunger and unemployment. In these ~~circumstances~~ circumstances, it would be unreasonable to expect a child to try and grasp a concept involving such a high degree of active personal focus. The cycle of human poverty has a visible affect of impoverishing the individual further.

According to Tapscott "Poverty causes digital impoverishment, which in turn contributes to continued povertisation" (Tapscott, 1998, p.257). According to

Cochran (2001), the cycle of poverty, historically and up till now has continued hindering humankind's development. According to Herrin (1987), in the Dark Ages when the availability of books was mainly limited to the church and other elite areas of society, reading material could only be utilised by those who had the ability to read. Through the development of the printing press primarily by Johannes Gutenberg in 1434, a world of unlimited knowledge opened up. According to Sherry (1995), the only barrier to a person's knowledge was now their inability to read. This inability was limited due the inadequate education that the person had received. According to ~~Tapsoett~~Tapscott (1998), through the forces of free markets, certain wealthy areas of society have developed their literacy levels. If these same forces are relied upon for the acceptance and usage of modern technologies, the limiting factor of poverty will still persist. Sherry (1995) reported that if and when these aspects of modernisation reach these impoverished generations they would no longer be in their prime age of knowledge acceptance. They would have been denied their chance to assimilate the tools of modern daily life and be forced to adapt to the reality of modern technology. While they are still learning how to open the door of technology, the next generation will be benefiting from ICT. According to Smith (1997), consideration should be taken into account with regards to the availability of employment opportunities, in a knowledge based economy. ICT illiterate employees could 'hit' a glass ceiling, resulting in their potential earning power being limited. ~~Overall~~Overall, their capacity for fulfilling their optimal life style will be impeded, by their inability to assimilate into modern society. The impact of the digital divide can be seen on a national level as well as on an individual level.

According to Clarke (2001), local enterprises in developing countries, which are partly owned by a foreign ~~interest~~interest, are twice as likely to have access to the Internet. In ~~contrast~~contrast, enterprises which are solely employee owned are less likely to have Internet access. Clarke (2001) reported that the rapid growth seen in the USA in the mid to late 1990's was a result of the growing use of organisations starting to use information more efficiently and the spread of the ~~world-wide-web~~World Wide Web. Clarke (2001) highlighted the point that a reverse effect could possibly be seen in developing countries, whose growth in

ICT was low to non-existent. According to Friebohn (1999), third world countries are disadvantaged by not having the benefits of increased productivity and economic growth, which are seen in developed countries.

~~Consequently~~Consequently, through this observation the divide was highlighted, with regards to third world countries not having access to developmental tools resulting in a downward social and economic spiral. According to Clarke (2001), this led to a greater divide in the global digital arena.

The digital divide can be summarised into two groups, those people that can utilise ICT devices and those that can not due to various causes mentioned in the following chapter.

2.2 Causes of the digital divide

This chapter aims to provide an understating into the contrasting cause's of the digital ~~divide which~~divide, which span over most social and demographic borders. A primary dividing factor of the digital divide originates in the initial technological evolution era.

2.2.1 Initial system developers

According to Filipczak and Smith (1994), a fundamental cause of the digital divide can be traced to the initial developers of computerised information systems. According to Burden (~~2002~~2002), computer systems were originally designed by computer engineering experts, for fellow avid and highly learned computer engineers. Burden (2002) reported that primarily software development had an ingrained flaw: the lack of end-user usability. This flaw caused potential everyday users to be placed on the sidelines of the information revolution, because it had created applications they could not use. According to Filipczak and Smith (1994), the difficulty of using computers can be attributed to the initial focus of ICT training.

2.2.2 Tertiary education

Filipczak and Smith (1994) reported that early tertiary education regarding the utilisation of ICT was targeted mainly at electrical engineering students. These students were educated about ICT developments and how to utilise its benefits,

whilst helping in the development of other ICT mediums. According to Filipczak and Smith (1994), even if the utilisation of ICT drifted into other areas of expertise besides electronics it always remained within the educated elite arena. It can be argued, however that vast amounts of creative potential went unutilised. This was due to the ICT training base not expanding to involve those that were not part of the educated elite. According to Pridmore (1986), ICT unleashes the unique capabilities of individuals thereby, enabling them to contribute in society. It can however, only be utilised when people have access to the tools that are necessary.

2.2.3 Access to ICT devices

Access to instruments that could be used to develop one's ability to take part in the global digital arena, were and are a contributing factor to the digital divide. According to Oliver (1993), without access to ~~technology~~technology, there is no foreseeable means of growth. This may lead to a downward spiral of social events, enforcing the digital divide. Disadvantaged people are stranded in a bracket where they were originally i.e. being computer illiterate. Therefore according to Oliver (1993), not only are they not able to uplift themselves socially, through the use of ICT, they are also constantly held back economically by the fact that they do not know how to access the requirements of the digital economy. An essential requirement of learning how to use ICT devices is personal motivation.

2.2.4 Motivation

When previously disadvantaged people are given access to ICT facilities, there is a need for them to motivate themselves to overcome the learning curve posed by ICT concepts. According to Sullivan (~~2002~~2002), an obstacle limiting the variety of ICT users is that potential users are not being educated as to what information is available through ICT devices. This results in potential user not being motivated enough to investigate the utilities of ICT for themselves. Once a user overcomes this ~~hurdle~~hurdle, they have difficulty in determining the quality, credibility and accuracy of the information. According to Sullivan (2002), a divide

that can be created even though the potential user have overcome many other possible divides, is the crucial element of a lack of training. Searching for information is almost impossible without the correct methodologies. Thus resulting in the potential user being discouraged from further learning in the digital environment. This lack of training may have been due to low corporate interest at that time, in ICT development.

2.2.5 Lack of corporate interest

According to Bundy "If information literacy is viewed as a product, then there is virtually an unlimited markets for it." (Bundy, 1999, p.242). ~~Therefore~~ Therefore, a further limiting factor in the digital divide has been the lack of corporate interest. This lack was due to companies foreseeing no financial returns from bridging the divide. It can be disputed that this was due to companies not being adequately informed about the opportunities that ICT could afford their organisations. According to Bundy (1999), this could have a ripple effect on the organisations surrounding environment. The causes of the divide are evident in the corporate and more especially, in the social environment.

2.2.6 Segregation of women

The opposing parts of the digital divide, are those that are entrenched in many but not all societies. The segregation of women, minority groups, the aged and the poor are all seen in areas affected by the digital divide. According to Bessie (1994), a strong traditional culture in rural South African areas, many handed down cultural viewpoints have been put forward. These contain for example the place of women in society and the level of education that children with disabilities should be given. According to Bessie (1994), entrenched in these traditional understandings, a child with a learning disability is seen, as not being able to develop their mind, therefore there is no advantage in educating them. The ability to educate learners in the ICT field requires that the teachers themselves have an adequate ICT literacy level.

2.2.7 Inadequately trained teachers

Teaching staff at previously disadvantaged schools are expected to hand over their knowledge of ICT devices. According to Van Niekerk (1999), teachers at

these schools were disadvantaged themselves in the education and opportunities, which they were afforded. Teachers could be considered crucial links in bridging the digital divide and therefore, ~~ought should to~~ be soundly educated in ICT before any further bridging can be attempted. According to Van Niekerk (1999), in many disadvantaged areas this link is not suitably in place to facilitate the bridging of the digital divide. This results in learners being obstructed in their ICT development. In order for ICT teachers to be ~~effective effective~~, the required resources need to be made available to them.

2.2.8 Inadequate resources

Effective implementation of ICT requires the utilisation of a vast amount of resources. Electricity is needed to operate the computers, networks and communication devices. Training facilities are required by ICT educators to effectively pass on their knowledge to ICT students. ~~These are B~~basic schooling facilities, mainly in the form of solid classrooms, effectively providing shelter from the rain and other natural elements. A crucial resource that is a restriction in social development world wide, is finance. The combined utilisation of all the above resources are required to effectively build an ICT education facility. If one wants to implement ICT on a national scale, many resources are needed. According to Chandra (2003), basic ICT devices require fewer resources. This can be attributed to the developments in the micro transistor field. Chandra (2003) concluded that a contributing factor in the digital revolution was the advancement in the micro transistor. A critical requirement of the transistor even in its initial developmental stage was the need for electricity. There are areas in which power is not available resulting in a further divide in the digital environment.

2.2.9 Inadequate telecommunication networks

Combined with the scarcity of power is the lack of adequate communication mediums such as telephone lines. According to Bryce-Pease (2000), formerly communication ~~was conducted~~took place through a copper wire medium. The high cost of installing and replacing these phone lines resulted in them being predominately installed close to urban areas with a few long distance country

lines. Rural areas situated away from city centres had either a single pay phone kilometres away from most people's homes or no telephones at all.

According to Clarke (2001), even if one put the other causes of the digital divide aside, this would still leave the obstacle of inadequate telecommunication networks. He concludes that the efficiency level of the communication network within the country has a negative correlation to the likelihood that an enterprise in that country would have access to the Internet. Currently this correlation is correct, as affordable access to the Internet is not available without a land based communication network. According to Bryce-Pease (2000), even though most enterprises can utilise land based communication mediums, these mediums are not developed enough to accommodate large file size transfers. Bryce-Pease (2000) reported that, broadband communication is still in its infancy in South Africa. According to Bryce-Pease (2000), broadband communication could handle large file size transfers across the World Wide Web. ~~Therefore~~ This would, unleashing the full potential of the Internet to accommodate multi media files. Through multi media, information could be presented in a way that is more understandable for illiterate users (Bryce-Pease 2000) for example graphics could be used instead of text to convey a point. Research by Clarke (2001) suggests that until an efficient means of satellite communication is available, the limitations of the current networks will affect developments in bridging the digital divide. On a national level the concern with the digital divide is primarily structural, while on the individual level it is psychological.

2.2.10 Technophobia

Filipczak & Smith (1994) revealed that more than half of all Americans were technophobic. They found that these people had, to some degree, developed a resistance to the use of devices, which had any element of modern technology. From their survey sample twenty five per cent of those surveyed had never attempted such relatively simple tasks as using a computer, setting the timer on their video machine or programming their favourite stations into their car radios. According to Mullan (2001), similar results are evident today all around South Africa, both in rural and urban areas. Many people seem to develop mental blocks to anything they presume as being to technologically advanced for their

understanding. Filipczak & Smith (1994) used an example in the banking sector, where it is still common for people to write out cheques instead of making cash withdrawals from an ATM. A psychological factor involved in the divide is the age group of the individual.

2.2.11 Generation gap

Sherry (1995) believes that the age gap between the ICT literate generation and previous generations has widened. She goes on to say that the so-called 'hippie' generation, known for their leading societal change, are no longer so active. Some are now corporate executives and move in influential areas of society. Surprisingly, this age group according to Sherry (1995) is reluctant to learn to use ICT devices, hence affecting their own productivity and managerial decisions regarding technology. According to Sherry (1995), middle aged Japanese and Chinese executives are proud to show their latest computer on their desks although without the cleaning staff, dust would have covered the keyboards. This shows the digital divide is of global proportion. Sherry (1995) noted that some executives had formed an interest in their computers potential utilisation. This was from their observations of their staff and younger executives utilising ICT mediums. South Africans affected by apartheid can attribute some of their ICT disabilities to the country's history.

2.2.12 Affects of the apartheid era

The UN Integrated Regional Information Network (IRIN) (2003) reported that the greatest cause of the digital divide in South Africa is located in the country's past. The apartheid government created a concept called Bantu education. Non-white children were educated by a system that was developed to create the perfect compliant workforce. According to Hlatshwayo (2000), the Bantu education system was designed as a finite system and was not designed to enable learners to further their studies. The basic education that the learners were given was rudimentary and of a low standard. Presently many rural communities still suffer from these poor standards.

2.2.13 Inadequate schooling facilities

In rural farming areas there have been cases where the "classroom" is simply an area under a tree because no facilities have been made available to the

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community. According to Alagiah (1998) there are disadvantaged schools where the power lines stop right outside the school. Due to natural elements of rain and sun students who are trying to absorb as much knowledge as they can are often distracted from their studies. These factors hinder learning aspects of daily life and are difficult enough within themselves, without having to grasp ICT concepts, that may be unfamiliar to rural children in their circumstances. Hence, there is a need for tripartite involvement in ICT developments.

2.2.14 Poverty

From the above argument, it can be seen why funding ICT in rural areas was not seen as a priority or even a necessity. The lack of financial resources that poor people have access to is one of the fundamental causes of the digital divide. Many underprivileged people don't have accessibility to loans, due to their low-income status or inability to even find employment. According to Gill (1998) many loans are only available at a high interest rate of up to 30%, resulting in people not being able to repay the loans. This indicates that a great number of the population cannot economically uplift themselves. When funding can be found a high level of apprehension holds back donor funding, due to concerns with national corruption.

2.2.15 Lack of interest from Macro Economic parties

At the beginning of the digital revolution, the corporate world, government and other related parties were not concerned with its development and could not see any motivation for taking part in it. On a national level, the digital revolution was not seen as having the potential to assist the man in the street. This view was obvious in relation to former developments in the digital revolution. Many of the applications were primarily designed around an educated user. Hammond (2001) stated that arguments have been made to support the idea that new technological developments have the potential for human development. In an article by Hammond (2001) Bill Gates, the worlds wealthiest knowledge worker, put forward an argument that people who live in absolute poverty need the basics just to keep on living. He further states that these people also need adequate amounts of healthy food, available clean drinking water sources and basic health care, far more than they would ever need personal computers.

2.2.16 Corruption

Some members of government saw the funding of ICT development projects as an opportunity for personal upliftment. According to the 2003 annual survey by the Berlin-based organization Transparency International, the world's least corrupt country is Finland and its most corrupt is Bangladesh. The index defined corruption as the abuse of public office for private gain, and measures the degree to which corruption is perceived to exist among a country's public officials and politicians. The index is compiled from seventeen surveys from thirteen independent institutions, which gathered the opinions of business people and country analysts. The scores range from ten, which indicates a "squeaky-clean" country to zero, which indicates a highly corrupt country. A score of five is the number Transparency International considers the borderline figure distinguishing countries that do and do not have a serious corruption problem. From the index it can be seen that the highest rates of corruption in the world can be found in Africa. The index gave South Africa a rating of four point four, which reflects that there is a corruption problem in the country. The effects of this corruption could have contributed to many poor people being without access to ICT facilities. In several rural schools funding was granted for ICT laboratories. The transformation process from the granting of the funds to the materialisation of the facilities was often not apparent, due to high levels of corruption. According to Lyman (2000), a possible cause of such a high level of corruption can be traced back to historical events in the past. In the liberation struggle underground markets were developed and various covert operations conducted. For example, officially the books of apartheid parastatal companies would reflect one thing while the reality was that funds were being channelled elsewhere (Lyman 2000). Other common causes of corruption are a lack of monitoring and control of funds. From this it can be seen that high levels of state and urban corruption impact severely on the growth of the digital divide. Corruption is also prevalent in rural communities.

Rural corruption can be seen from an example in a rural development project in the Limpopo region of South Africa. A tarred road was planned to link the rural village to the city centre. All the formalities had been finalised and the project

could go ahead. Development plans that would have utilised the unemployed local workforce had also been finalised. The only hindrance to the project was its non-acceptance by the local chief. This was solely due to the fact that he had not been offered payment for his approval of the project, hence the road was not built. Consequently the rural village could not be connected to the city and local people could not benefit from employment resulting in the whole situation remaining as it was.

The above examples concerning corruption are not isolated instances. A major concern with these forms of dishonesty is that while they may not affect the balance sheet of Multi National Corporations (MNC's), it most certainly does affect the people on the street. These are the people who would benefit significantly from ICT improvements. Through better financial management many of these examples in the divide within the digital revolution could be resolved. However, financial control measures cannot entirely reduce theft.

The Gauteng Department of Education initiated a public schools program, called 'GautengOnline'. The aim of the project was to install twenty-five computers in every public school in the province. A major concern with the project was the physical security of the computers at the schools. Many of the schools which needed ICT laboratories were situated in areas with a high crime rate. Crime is another element that is not an actual cause of the digital divide but it is a major hindrance to its bridging. Nadan (2003), a technical director of the GautengOnline project, said that local crime in the form of theft had already detrimentally influenced eleven of the twenty-five pilot projects in the province. Various measures to secure the computer laboratories at the schools had been implemented.

Nadan (2003) reported that in an attempt to minimise the risk of theft a local security expert was sent to England to view new developments abroad in security. On returning he used this knowledge to design a security door for the ICT laboratory in a school in Gauteng. The door was designed in a special way so that access to the laboratory could only be gained through using a specific

key. The expert underestimated the capacity of local criminals – they simply broke through the solid brick wall on the opposite side of the security door, and stole all the thin client² terminals in the computer laboratory.

Although there are various contributing factors to the digital divide, ranging from rural to urban, wealthy to poor, they can all be bridged. In addition these causes are not specific to any particular group.

2.3 *Methods and Advantages of bridging the digital divide*

The various causes of the digital divide are mostly complemented with specific methods which could resolve them. The primary aspect of resolving the digital divide is the motivational factor, through increasing the advantages of bridging the digital divide the various parties required to assist in the bridging process will hopefully be motivated to implement the various methods of bridging the digital divide. The various advantages of bridging the digital divide such as expanding retail markets, corporate knowledge sharing cultures, increased organisational productivity coupled with ICT development initiatives revolving around ICT training and ICT accessibility, the overall goal of bridging of the digital divide is possible.

2.3.1 Expanding markets

According to Surmacz (2001) one of the motivations for the corporate world to care about the extent of the digital divide, is the potential for them to expand their current markets exponentially. Jarboe (2001), however feels that the advantages are not about selling a few books over the Internet, they are more about ICT developments and new ways of conducting business. The changes incorporated in the digital revolution can be compared to the US transcontinental railroad. It was initiated by the business leaders of the 1860's who foresaw the opportunities associated with an efficient link between the east and west coasts of the USA. Therefore, just as the expanding markets of the 1860's brought wealth and business opportunities to American corporates, investments into the ICT future expanding markets could return similar profitable results to corporate companies who invest in it.

² A thin client terminal is a computer that is dependant on another computer, mainly found in networks.

If the corporate world saw the potential of including all people in the information age they may be able to expand their markets. This is supported by Metcalfe's law, which states that the value of a network increases exponentially in relation to the number of users. Moreover, more individuals involved in a trading environment should result in an increased amount of trading activity. This translates into both higher turnover and increased profit for all parties concerned. If community members in general are excluded from the benefits of ICT, they stand to lose as well as the corporate world.

There is further motivation for software developers to assist in bridging the digital divide (Gleicher 1998: 78). The business potential that can be realised from having a larger computer literate society is the opportunity of having a larger potential market for ICT products. Having an expanded clientele may increase the potential for niche market products. The opportunities that ICT provide can be seen from both a corporate and an individual perspective.

2.3.2 Computerisation

A study was conducted in 1993 on the various requirements and developments made in most modern organisations by Olsten Corp. It found a majority of information system executives placed a considerable amount of importance on computerisation (Computerisation is defined as the efficient use and ability regarding ICT usage i.e. computer literacy). The executives, however, were not willing to invest in training employees to use computers. The study also found that seventy-five per cent of the organisations interviewed agreed that computerisation improves their employees productivity, their accuracy when carrying out their daily tasks and their responsiveness to the organisations customer needs. Notably only twenty-two per cent of the above interviewed organisations rated their employees computer literacy as acceptable. The remainder of the organisations should have seen the need to train their employees

Derived from the above study, an organisation would have been expected to see potential returns from increasing their employee's computer literacy levels. Resulting in organisations investigating further methods of developing these

required skills. A contradictory result from the Olsten Corp study reflected that the general trend at the time of the study was a tendency for organisations to cut back on computer development projects. Therefore by organisations decreasing their investment that they make in their employees, they are inevitably decreasing their organisations overall flexibility.

2.3.3 Importance of ICT training

Although the Olsten Corp study was conducted in 1994 and today many of the organisations that were interviewed in the study have developed. A critical point that was made in the study was the importance of giving employees ICT training. The benefits of training to the company are evident through increased productivity, accuracy and responsiveness to customer's needs, which in turn may result in increased returns and larger markets. An example is given below about the benefits of ICT, with reference to school administrators

2.3.4 The benefits of ICT in administrative activities.

According to Oliver (1993), once the various learning obstacles are overcome and the basics of computer literacy are mastered, an administrators abilities can be enhanced. For example by learning how to use a word processor the various letters, reports, course catalogues and teacher evaluations which the education administrators needed to produce in their every day activities can now be prepared efficiently through utilising their ICT skills.

According to Oliver (1993), with the aid of databases the administrators could easily cross-reference and manipulate data to produce higher levels of information, compiled by the combining of the various data sources. Therefore, an overall view of operations would now be available, resulting in a more manageable administrative system. According to Silverberg³ (1998), employees within an organisation without regards to their status in the organisation, can benefit from developing a knowledge of ICT. The capability of the average PC has the ability to automate every day repetitive tasks thus freeing the employee

³ Microsoft's Systems Division vice president

to focus on more specialised areas of their work. These capabilities can be seen by the potential advancements predicted for the accounting field.

Pridmore (1986) made the statement of computerisation being inevitable within the next few years. Not only did the cash management computerisation function take place, it also transformed the corporate working environment and methodologies of financial management systems. These developments were evident in frequent accounting tasks (i.e. the general ledger.)

A compilation of a general ledger by hand would take days to compile for a medium sized organisation, with the implementation of a computer package the above task is condensed into a two hour task. This illustrates the time saving element of using ICT devices. The advantages according to Pridmore (1986) of implementing an automated financial system is the ability to access recent and current data and the automation of time-consuming financial calculations. By limiting the time and effort needed for an audit, the responsibility entrusted on the staff conducting the audit can now be given to a smaller group of employees, therefore, decreasing the chance of fraud involved in the audit. At the same time by having smaller work groups, people within these groups could have higher workloads, therefore, requiring a higher level of ICT literacy on the managerial side to efficiently manage these work groups activities.

2.3.5 Creation of a knowledge sharing culture

According to Pridmore (1986), managers that have overcome the digital divide will be able to expand their knowledge of various ICT areas and thus find new applications for them in their workings within the organisation. By giving them a broader view over the organisation, they will be capable of more precise forecasting of the organisations interacting environment. With ICT devices, administrative tasks involved in their daily tasks could be decreased, therefore, allowing the managers to become involved in various other areas of the organisation and have more time to focus their skills in areas where they are needed more. Therefore, ~~instead of~~ the human resources manger ~~having to~~ would not be tied down with the various administrative activities, with which the human resource department is renowned for. The human resource managers will now

have time to focus their attention on the individual employees and their work space development, organisational designing and increasing communication within the organisation. Through employees having more time available they can help generate a knowledge sharing culture in the organisation.

2.3.6 Increasing organisational productivity

According to Sullivan (2002), it can be seen that employees who are computer literate, possess the ability to share their opinions and help develop group ideas using shared knowledge. Many organisations overlook the potential to share knowledge, which is achieved by connecting workers internally and externally, within different corporate environments. The ICT literate workforce of the organisation now has the potential of networking their abilities and gaining alternate perspectives of problems they are working on, therefore, having the potential to increase overall organisational productivity.

According to an article by Esber (1989), the initial benefit of bridging the digital divide was through the adoption of the PC, which had the ability to increase productivity. ~~The increase in P~~productivity was increased ~~was~~ through the user being given access to new tools. According to Esber (1989), in the primary ICT implementation phase there was a decrease in employee productivity, caused by an abundance of collective data. Due to the increased amount of PC's the analysing mainframe was overloaded with data. ~~Therefore, This resulting resulted~~ in the system having a slower processing capability. The computer industry then went into a second phase of development. The second phase of development according to Esber (1989), involved the unification of all the PC's into a network. The computer literate workforce now had access to corporate data that resided on different databases and even on various-different computer platforms. Through networking, corporate data ~~can-could~~ be utilised by employees around the organisation. Therefore, networking would enable a more efficient knowledge management system throughout the organisation.

2.3.7 Knowledge Management culture

Abel and Oxbrow (2001), suggest that the implementation of ICT devices in an organisation can facilitate in developing a knowledge management culture.

Through a knowledge management culture, employees can enhance their personal abilities and job performance. Therefore, employees will develop an ability to initiate tasks themselves, resulting in an ability to make independent decisions. Through knowledge management, an overall culture of collaboration amongst employees develops (Abel and Oxbrow, 2001), The combined problem solving capabilities reflects the advantage of networking the employees' capabilities. Through knowledge management, employees can identify where they can contribute and utilise each other abilities. According to Rooney and Mandeville (1998, p.456), Therefore, as a result, the organisation can expand as well as its trading partners, through the benefits of knowledge management.

An example of the knowledge management cycle is illustrated by a building construction project. An architect had to design a building situated in a location with which they were not familiar ~~with~~. Through the means of a forum on the World Wide Web all parties concerned with the project could communicate. The architect ~~can~~ could obtain information about the location, while the client could monitor the projects progress and voice their opinions. The client could also view previous developments with which the architect was involved. The architect could search though recent developments in building material and structural design. With access to professional forums on the World Wide Web, the architect could track developments and concerns with other architects' world wide. Through professional networking, professionals could share their knowledge and help each other in solving problems. Retailers and manufactures of building material could market their goods directly to niche markets. The retailers could build up a catalogue of materials from around the world, which could be of benefit to specific customer needs. Professionals could form alliances whereby they have the ability to foresee changing global trends. ~~Therefore~~ Thus, increasing their ability to be flexible in their dynamic environments.

2.3.8 Increased Employee Training

According to Berman (1987), organisations that increase the training of their employees, with regards to the broader operating functions of their PC's, ~~could~~ resulted in the employees having an increased ability to efficiently utilise their ICT devices. A filing clerk in an organisation is used to illustrate the efficiencies of further training employees. In this illustration, a filing clerk has been trained ~~how~~ to turn on the computer, reset the computer when it shows something he is not familiar with and scan a barcode from a parcel. The productivity of the filing clerk ~~may have~~ has been increased with the implementation of an ICT device. The organisation no longer needs the filing clerk to manually enter the received goods in a journal. A list containing all the received mail can be reviewed when any queries regarding mail might arise. Further training the mailing clerk into fully utilising ~~their~~ the PC could result in the clerk being able to increase their overall productivity. The operational flexibility of the clerk ~~could~~ would be increased by training the clerk how to solve problems in the mail capturing process, therefore, saving time by not having to reset the computer so often. The clerk would be able to expand their knowledge by accessing resources, which were previously not accessible to them. The organisation may benefit by having additional employees who can contribute their particular capabilities. These contributions may not be fundamental, but they can add a perspective by which management can develop the organisations. Specific developments ~~with regards to~~ concerning the company's productivity are now examined.

According to Maglitta (1991), organisations can self-sustain themselves by their employees knowing the broader operating capabilities of their PC's. ~~Hence This would give them;~~ the capabilities to enhance their utilisation of their PC's. ~~Thus by~~ not relying on PC maintenance personal to assist them in finding information or operating the software. The organisation as a whole, also has independence from other organisations. For example using their own staff, organisations can review their own respective market trends, without having to depend on external research agents. The organisation can sell direct to the public using their e-commerce capabilities and source new materials direct from the manufactures by not having to rely on the middleman. Therefore, the company will have a saving

on external ~~consultants~~consultants' costs and have the ability to utilise current business information efficiently. These efficiencies can be seen in both first and third world countries.

2.3.9 Increasing rural productivity

According to Hammond (2001), first world countries would be able to free the productivity restraints imposed on poorer countries. For example, rural farmers who rely on old traditions for forecasting the weather could turn to an alternate means of forecasting. Modern methods of forecasting are at times ~~are~~, more accurate in providing essential weather reports. The rural farmer through ICT devices could seek planting advice and information on obtaining insect resistant crops, for their specific threat of insects. They could access ~~up-to-da~~up-to-date prices of crops, which would assist the farmers in deciding which crops to plant and in what quantities. All these advantages to third world farmers could yield larger and more sustainable crops, translating into larger profits and the ability to further develop themselves. The national benefits of ICT devices according to Hammond (2001), are resolving crop failures and growing efficient crop sizes to sustain growing populations. Therefore, by bridging the digital divide with the deployment of ICT systems, third world countries could reverse their deadly food shortages. A fundamental problem causing these shortages is corruption.

??explain???

ICT can be beneficial on both a social and corporate level. A long-term ICT advantage is the increased level of efficiency attained when utilising ICT methodologies. A critical necessity needed for any improvement in the utilisation of ICT is the degree of motivation supporting the change, as discussed above.

??discussed where above??

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2.3.10 Efficient communication networks

According to Hammond (2001) an efficient communication network may alleviate corruption causing the digital divide. Through ICT, effective law enforcement

measures can be put in place to monitor suspicious dealings. Non governmental organisations and other groups involved with social activities could independently monitor the government. According to Hammond (2001), efficient communication between the various agencies involved with development projects i.e. food and health aid, could narrow the margins for opportunism. Between the various agencies, they could co-ordinate an effective method of deploying the much-needed aid. Further progress of aid deployment could begin, due to the concern of corruption having been addressed. The agencies could monitor the actual developments in the deployment of the aid packages at all the deployment stages.

The causes that have been discussed above reflect the global nature of the digital divide. Some of the causes affect both first and third world countries, for example literacy. ICT can be advantageous to both the employee and the organisation. Through all these causes and benefits various developments have been made around the world to bridge the digital divide.

2.4 *Global developments in bridging the digital divide.*

Gradual developments have been made in bridging the digital divide. The digital divide is comprised of diverse divides each requiring various unique solutions. Several causes are associated with each divide these include: financial, physiological, racial, demographic or technological. In each of these areas there have been developments of different magnitudes. Larger scales of ICT development are required in rural areas due to the demographic and economic dividing factors associated with these areas.

2.4.1 Rural pay phones in Bangladesh

In low-income villages in Bangladesh, Hammond (2001) reported that through the simple implementation of cellular pay phones an entire village had been able to economically develop. Through the use of a communication device, small pockets of entrepreneurship developed, directly from the implementation of the phones in the village. People in the village paid for phone calls, hence

contributing to the rise of the income level of the family involved in the business. People in the village also benefited by not having to make so many journeys into the city, hence saving time and money. By these savings they could invest these resources in their personal development and the general well being of the rural village.

2.4.2 Public-Private partnerships in Argentina

The benefits brought about by ICT, can be seen in developments in South America. Argentina is another example of a country that is affected by the digital divide. According to Hammond (2001) in the formation of a public-private business partnership with the goal to supply affordable Internet access and educational services. The project was aimed at allowing the countries ten million students to access the World Wide Web through ICT devices. A critical benefit would be the ability for the countries economy to enter the global virtual economy. In this virtual economy students trained in ICT would be able to initiate the countries e-commerce marketplace, therefore, allowing for global exports which result in the development of the local economy.

2.4.3 ICT usage by non-technical managers

Through local economic development, many senior managers are seeing the need to utilise ICT devices. According to Maglitta (1991) in higher management levels of organisations an increased amount of non-technical managers are utilising their PC's during their working week. The empirical results from his study showed that fifty-six per cent of the surveyed executives regularly use computers. The result was an increase of twelve per cent in contrast to the same study of organisational executives, conducted in 1989. When looking at specific executive positions, the study revealed the many organisations Chief Financial Officers (CFO) were the heaviest users, with fifty-nine per cent of the CFO's reflecting that they use computers regularly in their daily activities. The study reflected that forty-eight per cent of chief executives of organisations revealed that they utilise ICT devices. Senior top executives who use computers reported that they could see the potential use for more senior staff to be involved in ICT developments. A conclusion from the Maglitta (1991) study, revealed that the majority of executives who do not use computers tend to be unfamiliar with or afraid of the

technology. Managers that do not know how to use ICT devices have blamed this inability on a lack of time to learn.

2.4.4 Computers as paper weights

According to Maglitta (1991) corporate executives who had a low or non-existent level of computer literacy, used the excuse that they did not have time to learn. An ICT device on an executive's desk in some cases did not reflect that the executive was computer literate. The tasks that these executives may be using their computers for may be simple tasks. For example they would use their computer for finding stock quotes where the efficient usage of the technology would be to use ICT devices to assist in managerial decisions. The overall conclusion from the study by Maglitta (1991) was that executives who had bridged the digital divide, reported that ICT developments have the potential to pay itself off through greater employee productivity and overall knowledge growth throughout the organisation.

2.4.5 Developments amongst the African American community

Within disadvantaged communities, for instance African Americans, knowledge growth can be a key developmental factor for the overall community. In a survey conducted by 'Black Enterprise' (1996 v27 n5: 39(1)) the level of ICT development amongst the readers was investigated. The magazine's readership is predominately African American, which is a minority group effected by the digital divide. The survey revealed that the magazine's readers have a comprehensive knowledge of ICT devices. This result was concluded by the reader's own understanding, of what they had considered an acceptable knowledge of ICT devices. The survey further revealed the eighty eight per cent of the readers have computers in their homes. By having a computer in their homes they could share this resource with their family. According to the above article through access to ICT devices their family would then be able to have access to resources found using ICT devices. Therefore, through organisation giving their employees computers to take home they are not only assisting in bridging their employee's digital divide but the digital divide in their community. However the survey was limited in that it was conducted predominately amongst

high-income members within the African American community. The magazine is also aimed at business people and their interests. A factor affecting the survey is that most of the responses came via the Internet. Therefore, people who were not able to use the Internet were excluded.

2.4.6 Children in the USA

A similar study to the one above, was conducted on children in the USA. The American Corporation for public broadcasting, in a study conducted in 2003 reported that American children of all ethnic groups and income brackets are rapidly increasing their use of the Internet. The increased usage of the Internet was achieved through the various places where these children could access the Internet i.e. schools, libraries, community centre or their homes. Therefore, through this usage, according to Gerst (2003) the digital divide amongst rich and poor children in America is narrowing. The children surveyed were seventeen years old and younger. They spent an equal amount of time on their personal computers at home as they did watching television. According to Gerst (2003), in the United States, many wealthy homes have a high speed home Internet connection resulting in more information being downloaded through the Internet. Therefore resulting in wealthy American children spending larger amounts of time on the Internet in contrast to children without high-speed connections. Two-thirds of low-income homes have a PC compared to ninety-eight percent of high-income homes. According to Gerst (2000), through the enjoyment of using the Internet, more children in America are being motivated to utilise ICT devices, resulting in the children being able to develop their own knowledge and creating a self-learning environment. These benefits seen above are mostly seen in countries that have a good communication infrastructure thus allowing further ICT developments. In countries that have inadequate communication infrastructures, ICT developments are primarily focused at creating affordable access to basic communication devices.

2.4.7 Low cost ICT devices

2.4.7.1 Gram-phone

According to Clarke (2001) third world countries, which are in the primary stages of ICT development, have to focus on their communication infrastructure. In a report about ICT developments written by Chnadra (2003), regarding advancements in bridging the rural digital divide, the article described the installation of low cost ICT devices that had taken place in a remote rural village in New Delhi called Andhra Pradesh. The development came with the introduction of a communication device called the "gram-phone". According to Chnadra (2003), with this phone, the world is now within talking distance for almost two hundred families in the village. The aim of the project was to enable a cost-affective means of communication for rural people. This was achieved by each household only having to contribute Rs 12.50 for the phone, enabling them to make thirty outgoing calls and receive an unlimited number of incoming calls each month. The overall aim of the project was to bridge the digital divide between urban and rural areas. A Non-Governmental Organisation (NGO) called 'the Rural Telecom Foundation (RTF)' orchestrated this project and many similar ICT projects. According to Chandra (2003), the initial project had to be adapted because many people could still not afford to communicate by telephone.

There was a distribution of one phone line per hundred people in the province, before the development of the "gram-phone". Chandra (2003) reported that twenty-five thousand local phone exchanges within New Delhi were under-utilised. The article reflected the views of many people living in these rural areas who said that the subsidised telephone rentals and tariff structures were still beyond their reach. Through a project with the local telephone company BSNL and the RTF, a subsidy of Rs 900 was given towards the costs of the telephone's registration and installation. Even through this subsidy the costs could still have been high for individual rural homes, therefore, the concept of "party lines" was initiated in rural villages. According to Chnadra (2003), a "party line" is essentially a telephone connection where two or more parties share a common line to the local telephone exchange.

Through the above projects a vital platform needed to initiate the bridging of the digital divide between rural and urban areas was created i.e. a communication

medium. Once this platform is in place further affordable ICT devices can be utilised i.e. affordable PC's

2.4.7.2 The 5KPC

According to an article by Phadnis (2003), a marketing strategy was compiled to launch a personal computer that will cost a little over Rs 5,000. The device is being launched by Via Technologies and NetCore. Phadnis (2003) reported that these companies are working in partnership for this project, with the goal of bringing down prices of hardware and software for ICT devices. The article quoted the chairman of NetCore as saying that the development of the 5KPC would revolutionise the usage of computers. The inability of people in disadvantaged areas to buy computers is mainly due to the high prices of PCs. The 5KPC will be predominately targeted at the mass market comprising mainly of disadvantaged users. A note that was made about the 5KPC was that it was not a replacement for the desktop.

According to Phadnis (2003) the 5KPC is a thin client (thus needing to be connected to a server), comprising of a motherboard and processor but no hard disk or floppy drives. It will be sold with a full operating system called "Netcore's Emergic Freedom", which will offer: e-mail, an Internet browser, office suite (a word processor, spread sheet, database manager), instant messenger and it will support Microsoft's Windows applications through add-on software. Phadnis (2003) reported that several hundred 5KPCs had already been sold in India. A crucial element in the hardware and software prices being brought down was that it was manufactured in Taiwan. Taiwan according to Phadnis (2003) is renowned for its ability to produce low cost, high volume ICT components. This is due to the efficient manufacturing capabilities that it has developed. Profit margins for the retailers of the 5KPC were kept deliberately low. According to Phadnis (2003) retailers of the 5KPC could make a profit through the high volumes they should be able to sell, due to the affordability of the PC. Through the profits from the 5KPC project, the manufacturers are going to develop further affordable ICT devices. The key elements attributed to the 5KPC's market acceptability, is the

affordability and usability of it, with regards to the mass market. These benefits of the 5KPC come at the cost of it being dependant on a network.

Explained in Phadnis (2003) the 5KPC works in a way similar to a cell phone or a television as it is only functional through a network. The users of the 5KPC will be able to simply log onto a network and start working. A server on the network will provide the 5KPC with the required software applications. A practical example of where the 5KPC network may be implemented is in a rural ICT facility. All that is needed is a single desktop, which can operate as a server on the network servicing the thin clients. A requirement of these systems according to Phadnis (2003) is that the user of the 5KPC will always need to be connected to a network. The developments in wireless networking will enable greater utilisation of the 5KPC. Network cables will not have to be run to every terminal point thus increasing the flexibility and accessibility of the overall network. The advantages of the 5KPC networks are that the total cost of ownership is reduced significantly. The ownership costs involved in the maintenance of the entire system are therefore brought down. An example of the low costs can be seen by the affordability of upgrading the software on the network. In order to upgrade the entire networks software, only the server needs to be upgraded not each PC. The hardware components of the 5KPC are stable due to there being no moving parts e.g. hard-drive or disk-drive, therefore, requiring minimal repairs. Through the development of this affordable computer, the broader goal of the project will hopefully be accomplished, to enable people to buy an ICT devices. Once the step of affordability is overcome, there is a need to educate the ICT users to effectively utilise the ICT devices.

2.4.8 Schools teaching parents

Illiterate people may be able to afford a PC through the above project, but a critical element in bridging the digital divide is educating new ICT users. According to Lagar (2003), a school in Brunei had initiated a series of free computer literacy courses that were given by the computer department staff at the school. The courses were attended by parents, teaching staff and members of the surrounding community. The outline of the course was to cover the usage of e-mail, Internet search engines and basic Internet Relay Chat (IRC). A further

part of the course was to address the concerns that parents had, regarding their children's safety while browsing the Internet.

The idea for the course developed from an idea that two ICT laboratory assistants had at the school for an end of year ICT project. The aim of the school project was to give back to the community. People who attended the course reported that it was helpful because it was aimed at their level of education and understanding of ICT. Lagar (2003) wrote that an advantage of the course was that the learners were able to gain a hands on understanding of the PC, by using the computers while they learned. A teacher of the course was reported to have said, that through educating the parents about the available technology the parents would see the emphasis on passing it down to their children (Lagar 2003).

Taken from the above discussion is the importance of involving already established educational institutes, who have ICT facilities, in bridging the digital divide. An advantage of incorporating the parents was that it created an initiator for motivating adults to see the advantages for themselves in the corporate world and for their children in their future working environment. The training of new ICT users could be made easier by user friendly software.

2.4.9 Microsoft's user friendly software

According to Microsoft's systems division vice president Brad Silverberg (1992), Microsoft is enabling easier utilisation of ICT devices through the company's developments in Graphical User Interfaces (GUI). Silverberg (1992) said that employees at all levels could benefit from an understanding of how microcomputers operate and an ability to fully utilise available software applications. Microsoft's operating system "Windows" encourages computer usage amongst even the most basic of literacy levels, this is achieved by providing a simple user interface. According to Silverberg (1992) the ongoing improvements in all of Microsoft's software packages are aimed at increasing the efficiency and usability for all its software users. By Microsoft continuing to improve its software, organisations would be able to utilise ICT devices more in their business activities (Silverberg 1992). A claim made by Silverberg (1992)

was that through these developments, Microsoft had facilitated in bridging the digital divide by increasing computer literacy.

It can be argued that levels of computer literacy could be improved through Microsoft's developments, but a core aspect of computer literacy, is the usability of the software. Usability of the computers operating system could be measured by the ease that a non ICT expert, could navigate around the system. Microsoft's Windows operating system, through its GUI enables the users to see where they are in the system and where they can go. There is no need to enter complex text commands in order to navigate the system, all that is needed is the click of the mouse on a picture on the screen. By increasing the usability this will increase the ease of becoming computer literate thus more people will be able to harness the full potential of their PC's and utilise them as a tool in their personal and organisations productivity. The ease of usability is only as powerful as the ease of accessibility to ICT devices and other communication networks.

2.4.10 Wireless communication networks in Nigeria

According to Awoniran (2003), Nigeria as a country, through ICT developments around the world, is seeing the need for it to develop an effective national ICT infrastructure. Awoniran (2003) reported that the only feasible way to implement such a plan, in an undeveloped country, would be through a wireless communication system. Dr. Emmanuel Ekwuem, the Vice Chairman of the Nigeria Internet Group highlighted the need for Nigerians to build their digital literacy (Awoniran 2003), According to Dr. Ekwuem the government should provide full Internet access to all of its citizens to harness the benefits of technology. Through access to the Internet the countries citizens would be empowered to access most of the reservoirs of knowledge, data and information stored throughout the world. Through this access Dr. Ekwuem believed the country would become more productive and have the ability to market its self globally.

Access to the Internet can be achieved through various routes, such as via dialup Internet service providers or broad band wireless access. According to Awoniran (2003) these connections could be established through the use of the well

developed cellular network operating within the Nigeria. The article reported that wireless radio communication, is flexible and is relatively easy to install and could be redirected throughout the country. This is considerably important for Nigeria which has a large geographic area. Dr. Ekwuem stated that due to Nigeria's late start in the digital revolution there is currently a poor level of available public telecommunication infrastructure. Therefore, through installing a relatively affordable Wireless communication medium a Third world country can have access to First world information. This access to information will provide valuable information for all professional fields. For example accountants would be able to contact other accountants around the world and thus have access to recent developments in the accounting profession. These benefits can only be achieved through training, the argument is then who the responsibility for the training vests in.

2.4.11 The responsibility for training

Changes within the Accounting industry with regards to the need for computer literacy have drawn the attention of the accounting association to focus on the training of up and coming accountants. These accountants have to be able to fully utilise ICT devices. According to English (1990) the accounting association agreed that training is needed but to whom the responsibility of training lies is the focus of the article. The issue of which sector is responsible for the training of the accountancy students is being waged between the Universities who educate accountants and the private sector for which the accountants will work. A major resource that is lacking in the university system is that of finances. In order to train new ICT users, the required ICT laboratories required for accounting software training would be unaffordable for the universities. This is due to the high hardware requirements of up-to-date accounting software such as Pastel accounting. Hence, universities claimed that they do not have the required funds to provide these facilities (English 1990). The universities also stated according to English (1990) that of the universities lecturing staff, there is often no one to provide the initial training to the lectures, regarding the workings of the accounting software packages. English (1990) further reported that auditing firms reflected that the training costs may be high but they could recover these expenses. The recovery of the training costs could be obtained through the

increased levels of productivity and accuracy brought about by the enhanced computer literacy of their employees.

Currently the situation at the university of the Witwatersrand is that students in the commerce faculty have the option of doing an ICT orientation and basic usability course. The school of accounting at the university was given an immense sponsorship from the accounting industry. English (1990) concluded that the universities he had studied would make changes to their courses. These changes would enable accounting students to adequately utilise accounting packages thus enabling them to cope in the accounting field. The improvements that can be seen in the professional arena could be duplicated, with the aid of corporate investment, in the social arena. The emphasis in the social arena is particularly focused on empowering woman to utilise ICT devices.

2.4.12 Bridging the gender digital divide

An organisation called the Digital Diaspora Initiative (DDI) has been focusing on bridging the gender digital divide (The monitor 2003). The aim of the DDI has been to draw the worlds attention to the need to improve the lives of African women through the use of ICT. The DDI created a women's ICT program in nine pilot countries: Cameroon, Ethiopia, Ghana, Kenya, Rwanda, Somalia, Tanzania, Zimbabwe, and Uganda. Reported in the article was that the Executive Director of the United Nations Development Fund for Women (UNIFEM) Noeleen Heyzer, who called on African governments, the private sector, NGO's, the UN and its donors, to be accountable and firmly committed to gender development. Empowering women to socially uplift them selves could deal with the gender element involved in the digital divide. This social upliftment could be attained through woman starting small enterprises that would have corporate sponsorship. This sponsorship could come in the form of business coaching, ICT devices and training.

2.4.13 Small enterprises utilising ICT

According to Walker (2003) at the turn of the millennium HP executives, visited East Palo Alto and promised to assist in closing the digital divide in the area. HP initiated a project in 2000 called *Digital Village* and the company also gave a grant of five million US dollars to start the project. The main aim of the project

was to enable small enterprises to utilise ICT devices to expand their operations. An ICT development project was discussed by Walker (2003), the project involved a lady by the name of Afungia and her husband, Saia, who operated the Island Market and Restaurant in East Palo Alto. The enterprise was a small neighbourhood place where shoppers could pick their weekly groceries and diners could sit down to island style food. Through HP's developments the small enterprise was given a computer system. The computer was utilised by Afungia in her enterprise to print fliers and connect to suppliers. This small island market was one of seventy small enterprises that were handed a computer system comprising of a printer and other ICT devices. A point made by HP according to Walter (2003) was that through the ICT implementation, the enterprises would have the ability to give their home-style business the final touch needed to give a professional appearance. The computers given to East Palo Alto's were just one component of the project. The project also brought ICT to schools, homes and churches in the community.

The ICT developments that have been discussed above are primarily regarding improvements in the accessibility to ICT devices. These achievements have been achieved through the developments of affordable ICT devices and effective means of communication. Through NGO and corporate support, small enterprises have been able to develop, therefore, allowing disadvantaged people to earn an income and enabling them to afford ICT devices. The discussion now focuses on the ICT developments within South Africa, primarily focusing on rural ICT advancements.

2.5 *Developments in South Africa with regards to the Digital Divide*

2.5.1 Tripartite alliances assisting ICT developments

The results from the 2003 South African census reveal that over half of all households in the country have TV. In contrast less than ten percent of them have a computer. South Africa has begun bridging the digital divide, through a tripartite alliance, involving government, NGO's and private companies. Various advancements can be seen throughout the country for example, the supplying of

electricity to rural areas and the incorporation of ICT into the educational system. The government has allocated in its budgets on both a national and provincial level, funds for developing the countries overall ICT standing. In the private sector, many local and foreign companies have initiated development projects both with regards to their own employees and various disadvantaged communities.

2.5.2 Private sector assistance

MTN⁴ is an example of a private sector company, which is involved in the countries ICT developments. According to IRIN (2003) MTN created a development foundation specifically for social development with South Africa. Education is one of the MTN Foundations four areas of focus, the others being arts, culture and heritage(science and technology) and HIV/AIDS. In Limpopo, a rural South African town, the MTN Foundation was responsible for initiating a project, which would connect schools in the area to the Internet. The goal of the project was to equip eleven targeted schools with complete multi-media centres. In the article the overall aim of the project was to improve the quality of education available and to increase the accessibility to ICT devices in disadvantaged areas. The project had the joint support of both the local community members and the provincial department of education.

2.5.3 ICT laboratory implementations

In the IRIN (2003) article the ICT laboratories in each school comprised of ten computers, a network server, printer, copier, scanner, fax machine, a TV, video recorder and a General Packet Radio Service (GPRS) Modem. According Kari (1998), GPRS is a technology that utilises existing communication networks, it transmits data at a quicker rate than other transmissions mediums. The GPRS modem is a crucial ICT device in the a rural ICT laboratory, the device will utilise the cellular network in the rural area due to the lack of copper based phone lines in rural areas. An advantage of utilising the GPRS modem is that the Internet connection speed is faster than normal phone lines and the communication costs can be subsidies by the sponsor, which provides cellular services(IRIN 2003).

⁴ a national cellular service provider in South Africa

The MTN Foundation has already enabled access to ICT facilities in schools located in the Eastern Cape, KwaZulu Natal and Mpumalanga and is currently scouting the requirements for schools in the Free State (IRIN 2003). The IRIN (2003) article stated that MTN was not the only sponsor of the project: Microsoft South Africa supplied the software and provided training to the teachers, while Johnnic⁵ provided the text books which contained the overall ICT curriculum. According to IRIN (2003) Microsoft South Africa has also given a pledge to give free software to all the schools in South Africa, in order to help bridge the digital divide. Through these tripartite alliances, communities that were previously neglected by the government are now starting to advance.

The IRIN (2003: 3) article quoted the principle of Molabosane as saying,

"In the past the government neglected our [black] schools, it is really only now that they are starting to do something, and the private sector has come in and together we can make a big difference that goes a long way", Mr Lebepe.

The above statement was said at the opening ceremony of an ICT facility Molabosane High. The school is situated in the village of Rita, about 30 km outside the small town of Tzaneen. According to IRIN (2003) the school was built mostly through the donations from the embassies of the United States and Australia. Local support for the schools development was given through the private sector by Anglo-American, who paid for the building of the administration block and several classrooms. The IRIN (2003) article reported that Mr Lebepe acts as both the schools principal and chief fundraiser, hence showing the personal commitment that is needed from community members for these projects to be initiated. Through these rural developments it is hoped the learners would be able to develop the province.

2.5.4 ICT laboratory requirements

The IRIN (2003) article reported that Mrs Mashamba, a MEC for education, said that by learning mathematics, science and technology, the students at the school would have the ability to grow and develop their province and create employment

⁵ a South African, black empowerment company

opportunities in the province. According to IRIN (2003) the currently disadvantaged children in the province, through these ICT developments, could be on an educational level equal to their counterparts in urban areas. The learners at these ICT facilities could be able to develop their unique abilities and access information available in first world countries. For a successful ICT implementation in the area the community has to actively participate in the ICT development project.

"MTN has given these communities the tools and it is now up to them to take ownership of the programme, use it to empower themselves and make a success of it."(Mrs Mashamba cited in IRIN, (2003: 7). A primary element of the ICT laboratory will be teachers who are capable of instructing the learners about ICT devices.

2.5.5 Educational environment assisted by ICT

According to the IRIN (2003) article, each school involved in the MTN Foundation project will send two teachers for ICT training. These teachers will be trained to perform first-level maintenance⁶ themselves. A further five teachers from each school will be provided with professional development support. Through the training these teachers should be able to efficiently utilise ICT devices. They can use the ICT devices to assist them in teaching the learners subjects that are not related to ICT (e.g. Biology). Therefore, through the utilisation of the ICT facility the overall educational level at the school can be enhanced.

Dr Khosa, the general manager of the MTN foundation was quoted in the IRIN (2003) article as saying, "Schools Connectivity supports the use of technology and skills transfer, to improve the overall teaching and learning environment, while enhancing the management and administration capacity of schools. The project will therefore create new possibilities for learners, educators and the surrounding communities as well."(Dr M. Khosa, the MTN Foundation's General Manager. cited in IRIN, (2003: 8). Through effective ICT training of educators and implementations of ICT facilities, the educational environment can be enhanced.

⁶ Computer Hardware support

The utilisation of the ICT facility will only be possible as long as there are funds to maintain the facility.

2.5.6 Generating funds for a self sustained ICT centre.

The success of the ICT project can only be measured on the long-term capability of the school to maintain the ICT laboratory for future learners. Hence, to ensure that the schools can sustain the multi-media centres, according to IRIN (2003), the MTN Foundation has installed Telecentres at three of the eleven schools in the Limpopo Province. Depending on the success of these Telecentres further centres may be installed, to support further disadvantaged schools.

According to IRIN (2003), the overall idea of the Telecenter will be to provide funding for the disadvantages schools while providing the surrounding community with pay phones. The Telecenter will be equipped with six pay cellular phones and two MTN card phones. Sixty percent of the profits generated by the Telecentres will be given to the school and the remaining forty percent used to cover the operating costs of the shop. The Telecentres will also be able to sell MTN pre-paid vouchers, electricity cards and snacks, and operate satellite post offices. The shops will have another element of rural community development within them. Although minor they will create employment for members of the community who will be appointed to manage the running of the Telecenter.

The IRIN (2003) quoted Dr Muthien as saying,

"Schools Connectivity, which also facilitates Internet access for learners, gives substance to MTN's commitment to bridge the digital divide and it is relevant in terms of this years world telecommunication day theme, which is helping all of the world's people to communicate"(Dr Yvonne Muthien, MTN's Group Executive for Corporate Affairs. cited in IRIN, (May 19, 2003).

A critical aspect of this development project is that not only will the schools be given an opportunity to access the digital revolution, but the schools will also be able to sustain themselves through the use of a revenue-earning shop, which will come with the ICT Laboratory. A further advancement is that of training the teachers, in not only how to teach the computer curriculum but also of how they

themselves will be able to utilise the ICT devices in preparing lessons. Therefore, resulting in an independent school, with the potential to effect the entire community around it. The IRIN (2003) reported that Lebepe high school is not the only school in the area that is in need of an ICT facility. There are schools in the area, which still require electricity. Hence, these schools have sent requests to use the Lebepe ICT facilities, when the schools students are not using the laboratories. Through developments in ICT devices, with special emphasis placed on the developments of communication devices, further areas of South Africa could benefit from ICT.

2.5.7 Expanding the national communication networks

A further development in the goal to overcome the digital divide in South Africa is to increase the size of the communication network within the country. A solution to the communication problem was mentioned in the discussion of the 5KPC, which could use a wireless communication medium. According to Chalmers (2003) if the government wanted to spread the benefits of ICT, they would need the combined resources of Telkom, SABC, and cellular companies. Through the drafting of a new communication policy by the government, the current restrictions in the telecommunications act could be removed (Chalmers, 2003). Hence, by way of a new legislation, in 2005 the country's telecommunication market will be open for new service providers. These new service providers would utilise the latest ICT devices, therefore, upgrading the country's telecommunications infrastructure (Chalmers, 2003).

Chalmers (2003) quoted Andile Ngcaba (Communications department director-general) as saying

" We hope to speed up the process of bridging the digital divide and empowering our people with access to technology at affordable prices that can expedite the realisation of a better life for all".

A crucial link for this bridging process to be realised is the licensing of the country's second phone service provider.

2.5.7.1 A second phone service provider.

With the imminent arrival of a second phone service operator, the licensing agreement for this operator will contain the point of providing telecommunications services in rural areas where Telkom does not have a presence. The key to the deployment of telecommunications in these areas will be through wireless communication facilitated by cellular technology. According to Chalmers (2003) Telkom's fixed-line phone network was once the dominant means of telephony in SA. Chalmers (2003) reported that, through the introduction of cellular technology in South Africa there are over fourteen million cell phone users in the country. This can be compared to five million Telkom users, reflecting that cellular technology is the dominant means of communication in the country. The 2003 census reveals that twenty five percent of black headed households use cellular technology as opposed to only twelve percent utilising land lines. This indicates that cellular technology can be considered the dominant means of telephony in South Africa today.

2.5.7.2 Power sources for communication mediums.

According to the Communications Minister Ivy Matsepe-Casaburri, cellular communication in rural areas is more cost efficient than land based phone lines (Chalmers, 2003). The high costs of running kilometres of copper cable all over the country, and then the compounded costs of maintaining these lines could reflect that cellular communication is cost effective in the long run. Chalmers (2003) reported that cellular technology is similar to copper phone lines in that it also requires electricity to function. According to Chalmers (2003) through developments in alternative fuel sources, the concern of providing electricity to rural areas is being addressed. Chalmers (2003) stated that the agricultural department has addressed this concern in rural farming areas with the installation of solar panels. The article also stated that developments have been made in the automotive field with regards to storing power for longer in batteries. Therefore, with a combined departmental effort of the agricultural department and communication and technology departments the criteria of power should be addressed.

The developments that have been discussed above, with regards to the education system and the communication infrastructure, reflect that South Africa is progressing in bridging the digital divide.

2.6 South Africa's comparative ICT progress

According to Vecchiatto (2003), South Africa received a medium rating from the Digital Access Index (DAI), which measures an economy's access to ICT. The DAI covers 178 economies and classifies countries into one of four digital access categories: high, upper, medium and low. Those in the upper category include mainly nations from Central and Eastern Europe, the Caribbean, Gulf States and emerging Latin American nations. When comparing the DAI to other ICT measures it distinguishes itself by including a number of new variables, such as education and affordability. The DAI combines eight variables, covering five areas, to provide an overall score for a country. The areas are the availability of infrastructure, affordability of access, educational level, quality of ICT services and Internet usage. In examining the results from the DAI a country should be able to see potential ICT stumbling blocks regarding their ICT. Although South Africa was rated in the medium category most southern African countries were fell into the low access category. Vecchiatto (2003) stated that English is no longer a decisive factor in quick technology adoption, especially as more content is made available in other languages. Limited infrastructure was often regarded as the main barrier to bridging the digital divide, although the DAI suggested that affordability and education are equally important factors of the digital divide. A further result from the DAI was that access to the Internet is closely linked to education. Vecchiatto (2003) concluded that , in China, over half of all Internet users are university educated, therefore, highlighting the educational factor of the digital divide.

2.7 Conclusion of Chapter 2

In conclusion, the digital divide has been shown to incorporate both social and economic dividing factors. The arguments that have been put forward reflect the developments that have been made in the digital divide. Many advancements have been made regarding accessibility to ICT devices, in certain areas. Accessibility has been made available through developments in ICT devices

such as the 5KPC. Influential software companies have enabled easier system navigation through GUI. Small enterprises now have an ability to uplift their professional image and efficiency. Schools with ICT facilities are encouraging adults in the community to learn how to utilise modern technology. Corporate sponsorships has enabled universities to give graduates ICT skills to adequately enter the work place. Through bridging the gender digital divide, the overall economy of a country can be positively affected by including women in the economic marketplace. In areas where copper phone lines are not available, developments in wireless communication have increased the accessibility to ICT devices, hence, resulting in social upliftment.

Through affording a larger number of people access to ICT devices, the potential advancements made in society could be advantageous to mankind as a whole. Because ICT is not just a tool to increase employee productivity - it has an inherent capacity to unleash the unique capabilities that each individual possesses. Therefore, according to Morgan (1997), ICT devices could help in transforming a worker, from the idea of being a production line machine, into a dynamic human 'organism' with independent and more productive capabilities.

Hammond (2001: 63) wrote, "Bridging the digital divide provides us [with] hope of creating a world that is not just richer but genuinely better", which inculcates an overall progress and benefit from bridging the digital divide.

Chapter 3 Methodology

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3.1 Introduction

This section sights the purpose and objectives of the research and provides an in depth analysis of the research methodology used. It exemplifies the design of the study, the confines and boundaries associated with the method used.

3.2 Research Problem

The literature review provides a comprehensive analysis of the extent of the digital divide and some of the infringing elements causing the divide. Drawing from the literature review, the empirical study aims to analyse the extent of the digital divide in South Africa and factors that contribute to the South African digital divide. This study aims to evaluate the relationship between an individual's view of whether ICT is productive for them and their computer literacy level. The study further intends to evaluate the level of communication devices that South Africans have access to and the amount they utilise the various means of communication in relation to their access to ICT devices. The final research was aimed at ascertaining which opinions were related to participants who could be classed as technophobic.

The methodology adopted was to assess the past research on the topic through a wide-ranging literature review and then to develop research questions and hypotheses that could then be qualified through an empirical study.

3.3 Hypotheses

Through the factors highlighted in the literature review, around elements of the digital divide and developments in ICT, the following ~~Hypotheses~~ hypotheses were identified as the basis for research in South African surroundings. They are summarised as follows:

Hypothesis 1/ Research question 1

The following factors have an affect on the digital divide:

- A) The gender of a person is related to their ICT access.

- ~~A)B)~~ The age of the person is related to their ICT access.
- C) Being classified as a Previously Disadvantaged Individual (P.D.I) is related to a person's access to ICT.
- D) English being a person's first language does have a relationship with their access to ICT.
- ~~D)E)~~ There is a difference in the extent of the digital divide between people living in rural areas and people living in urban areas.
- ~~D)F)~~ The educational level that a person has attained is related to their ICT access.
- ~~D)G)~~ The income level of the person is related to their ICT access.

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Hypothesis 2

There is a positive relationship between an individual's perception on whether ICT is productive for them and their computer literacy level.

Hypothesis 3

There is a positive relationship between a person's access to telecommunication devices and their access to ICT devices.

Universe

The universe was defined as people working in the Gauteng commercial sector and the tertiary educational sector.

SAMPLE

Commercial sector

The survey was handed out to 100 employees in three companies: a printing company (OneStop Print), a heating element manufacturer (Glowide International) and a textile company (Selborn Carpets). 42 surveys were completed out of the 100 that were distributed to the commercial sector.

Tertiary sector

The survey was handed out to 70 students and staff at the Wits Business School and the commerce faculty of the University of the Witwatersrand. The students at the Wits Business School were predominantly completing their MBA's and the students at WITS were in their 2nd and 3rd year of study of a BCOM degree. 62 surveys were completed out of the 70 that were distributed to the tertiary sector.

3.4 Survey Design

The primary objective of the survey was to investigate the causes of the digital divide in South Africa. It therefore is essentially a descriptive study

3.5 Method of Data Collection

The method of data collection utilised was a structured questionnaire. Although emailed questionnaires were attempted they did not prove to be successful, as the response rate was low. The questionnaires were distributed by hand. Each participant was given a printed version of the questionnaire to complete in their own time.

3.5.1 The Survey Instrument

The survey was modelled around the literature review and used measures adapted from a market research questionnaire such as AMPS. The survey consisted of twenty two questions (see Appendix 1) that could be grouped into the following sections:

- Section 1: This was a multiple-choice question with the intention of being simple and impersonal, therefore, starting the questionnaire off easily and ensuring that the participant would complete the whole questionnaire whilst not feeling intimidated upfront by any initial personal questions. The only question ~~that was~~ asked in this section was the participant's first language i.e. their mother tongue. This section comprised of Question 1.
- Section 2: A multiple-choice question was used, with the intention that the participant could select more than one option that was applicable to them. The objective of the question in this section was to assess ~~what~~ the participant's current employment/ study situation ~~was~~. This section comprised of Question 2.
- Section 3: A list of household appliances ~~were was~~ listed and the participant could select which appliance they have in their home. The list was created ~~so~~ as to cater for the basic appliances such as a radio and a stove and then increased up to a technically advanced level of a DVD player and Digital organisers. The intention of this section was to ascertain the level of technological appliances that an individual had in ~~their-his~~ home. This section comprised of Question 3
- Question 4 was used to instruct the participants ~~as to~~ which questions were applicable to them. The primary purpose of this question was to

ascertain the level of ICT access ~~that of~~ the participants ~~had~~, such as access to computers or a computer with the Internet.

- Section 4: The objective of this section was to create a count that could be used to see how often the participants used a computer in various environments. The section was measured by a single question that utilised a frequency scale in relation to the various environments. This section comprised of Question 5.
- Section 5: A multiple-choice question was used, with the intention of ascertaining what the participant used computers for. The participant could select all the options that were applicable to the question. This section comprised of Question 6.
- Section 6: A straight forward dichotomous yes/ no question was asked here to ascertain if the participant felt that computers assisted them in their daily work/study. This section comprised of Question 7.
- Section 7: This section was designed to assess the participants ICT literacy level. It was split into the following areas: their ability to perform certain software tasks, the frequency that they used certain software applications. These measures were done by both a multiple choice question (Question 8) and a frequency scale (Question 9). The frequency scale was weighted as follows: ~~5~~ a score of five to a frequently used application, two to an occasionally used application and zero to an application that was not utilised. This section comprised of Questions 8 to 9 inclusive.
- Section 8: The underlying component of this section was to ascertain whether the participant had attended a computer course. The section was divided into questions asking whether they had attended a computer course of any kind, what type of computer course they had attended and whether their place of work/ study offered a computer course. These aspects were measured by multiple choice questions. This section comprised of Questions 10,13a and 13b inclusive.
- Section 9: This section investigated the access that the participant had to communication mediums and how frequently they utilised the various mediums. The frequency measure used in Question 12 was weighted to

reflect the true cumulative count of a participant that utilised a communication medium frequently. The weighting was as follows: a frequent usage would receive a weighting of five, an occasional usage would receive a weighting of two and no usage would receive a weighting of zero. This section incorporated Questions 11 and 12 inclusive.

- Section 10: This section was aimed at establishing the perceived level of technophobia the participant possessed. It consisted of 5-point likert type scales which brought forward various opinions about technology and the participants were asked to show whether they agreed or disagreed with the opinions. There were opinions that did not go with the technophobic trend; this was to ensure that the participants marked the scale correctly. This section comprised of Question 14 and all its sub questions.
- Section 11: The demographics that could have been considered personal were left to the end of the questionnaire. ~~The demographic data was ascertained by participants answering various multiple choice questions incorporating the needed demographic details~~ Participants answering various multiple choice questions incorporating the needed demographic details ascertained the demographic data. This section comprised of Questions 15 to 22 inclusive.

3.6 Assumptions made in this Study

The research was based upon the following assumptions:

- Participants ~~understood the~~ understood the terminology in the questionnaire.
- Participants listed only those aspects relevant to themselves.
- Participants, translated 'home' as the primary place of living.
- The term 'general computer course' was understood to mean a basic computer literacy course.

3.6.1 Procedure

The procedure used to collect data was ~~all~~ entirely performed by a paper based questionnaire distributed in urban areas. The cover note on the front page of the questionnaire gave a brief explanation of the questionnaire's purpose and an

assurance of the confidentiality of information given by the participants. An initial pilot study was conducted at the Wits Business School, sourcing participants from various areas, ranging from the security guards to MBA students and lecturers.

3.6.2 The Pilot Study

A pilot study allows the identification of errors in the design whilst facilitating the control of extraneous and environmental conditions. The pilot study allows the refinement of the instrument before it is used for the final test. Through this ~~process~~ process, factors that affect the reliability and validity of the study can be assessed and factors that weren't initially identified can be incorporated (Cooper & Schindler, 1998).

To assess the comprehensibility of the questionnaire and ascertain whether the participants were interpreting the options correctly, ten pilot questionnaires were distributed.

The pilot study was conducted on a small sample of participants and was primarily utilised to identify any problems in the survey instrument. ~~while~~ Reactions of the participants regarding the questionnaire were additionally evaluated. Clarity of questions as well as face validity ~~was-were~~ evaluated. It was also important to test the opinions in the technophobia scale against people that were considered technophobic to ascertain if the opinions would return the correct measures.

3.6.3 Results of the Pilot Study

The initial pilot interview indicated that the layout of the survey had to be ~~adapted~~ modified. The wording in a few questions had to be reworded in order to clarify ~~the~~ issues in certain questions. The final responses to the pilot survey indicated that there were no major problems with the questions and that the instrument effectively covered the research questions. These results indicated that the instrument and the measures had face validity.

3.6.4 The Finalised Questionnaire.

This was conducted on both working and studying participants. Companies that participated in the study were first contacted by a telephone call, where they were asked if they would allow their employees to participate. The questionnaires were then delivered to the company's secretary who would distribute the questionnaires to the staff. Questionnaires handed out at universities were distributed to participants individually.

Table 1
Summary of Responses

Questionnaires handed out	170	Responses
Companies	100	42
Individual	70	62
Company response Rate	42%	
Individual response rate	86%	
Overall Response Rate	61%	

The response rate reflected in Table 1 could be considered normal for an individually distributed questionnaire. The response rate is brought down by the dual approach used to distribute the questionnaire. The individually distributed questionnaires had a 86% response rate while the company drop-off questionnaires had a 42% response rate. This lack of a response rate could be attributed to the lack of motivation on the employee's side. While the high response rate on the individual side, could have been attributed to the personal factor of being delivered the questionnaire by the researcher.

3.7 The Survey Sample

3.7.1 The population

The study was aimed at providing information about the extent of the digital divide in South Africa. Due to the methodology ~~used~~used, the population was

confined to participants that could read English. It was also limited to participant's who were situated in the Gauteng province.

3.7.2 Selecting a Sampling Method

The main sampling method was convenience sampling. Participants were selected on their willingness to complete the questionnaire. According to Werbeloff (2003), convenience sampling is utilised by researchers in exploratory research with the main benefit being it is inexpensive and utilises minimal resources. When the resources available to researcher were considered namely: financial and time resources, this sampling method was the optimal option available.

3.7.3 Determining the Sample Size

The sample obtained was limited by two factors:

- Resource limitations: The time frame and costs of this study was a large determinant of the sample size;
- Participation: Participation was voluntary which limited the size of the sample.

Within these constraints, a sample of 104 was obtained. The following table reflects the distribution of the sample taken, according to the participants current situations.

Occupation	Count	Percentage
Working Full Time	39	37.5 %
Studying Full Time	57	55 %
Working Full Time & studying part time	1	1 %
Studying Full Time & working part time	7	7 %
Total	104	100 %

3.8 Effectiveness of the Questionnaire as a Measuring Instrument

In order to obtain accurate results, the questionnaire needs to be accurate and measure what it intends to measure (validity) and it must consistently be able to measure the results accurately (reliability) (McBurney, 1998).

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3.8.1 Validity

According to McBurney (1998), validity is the extent to which a measure is free from systematic and random errors.

3.8.1.2-1 Internal Validity

The relationship between the independent and dependent variables is the primary concern of internal validity. The research is therefore internally valid if there are logical reasons to believe that there is a cause and effect relationship between the independent and dependent variables (McBurney, 1998).

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The following aspects could have affected the internal validity of the study:

- Selection bias: The area that the questionnaire was distributed in was urban therefore the participants would have predominantly been from urban areas.
- Experimenter Bias: The experimenter can affect the study by his personal biases during measurement (Cascio, 1997). This was avoided by using a questionnaire as a means of collecting the data.
- Experimental mortality: Refers to the threat to validity caused when individuals choose not to participate (Cascio, 1991).

3.8.1.3-2 Construct Validity

This type of validity concerns the question of whether the results support the theory. According to McBurneyr (1998) it is almost impossible to measure construct validity and can only be controlled through the careful planning of the empirical study in relation to the available literature on the topic. Scales and measures taken from similar ICT questionnaires were used to maximise construct validity.

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3.8.1.4-3 External Validity

The question here is whether the results can be generalised to another situation. External validity can be increased by insuring the random or selected sample is

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representative of the population. According to McBurney (1998), through utilising sufficient independent samples and by replicating the study a sufficient amount of external validity is achievable (McBurney, 1998). Due to resource limitations the external validity was largely dependent on the sample obtained are likely to be low.

A number of other factors could affect the external validity of the research.

- The Hawthorne effect: respondents behave differently due to their knowledge of being tested. This was minimised by allowing the respondents to choose whether to participate and were allowed to complete the questionnaire in their own time (Zikmund, 1997).
- The experimenter effect: unintentional errors through observation, data collection and computation can affect validity. This was minimised by limiting human errors by having a single person inputting the data and investigating outlying data points, thereby limiting unintentional human errors. (Zikmund, 1997).

3.8.1.5-4 Face Validity

Face validity is the degree to which the instrument adequately covers the topic. It is based on the subjective analysis of the instrument. Face validity can be minimised by ensuring an effective survey instrument design (Zikmund, 1997). The instrument was designed with all possible care in order to eliminate threats to face validity. In an attempt to measure the face validity of the questionnaire, the pilot study participants were asked after they participated, whether the questionnaire had covered the topic mentioned on the cover page. From the responses obtained from the participants who partook in the pilot study it was concluded that the questionnaire had face validity.

3.8.1.6-5 Criterion Validity

Criterion validity refers to the ability of some measured variable to predict a future value associated with that the variable (Zikmund, 1997). As this study was largely exploratory in nature, the criterion validity could not be established from comparing the results of the study with known facts from past research.

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Although, most factors of digital divide were acknowledged by the literature review.

3.8.1.7-6 Statistical Validity

Statistical validity occurs when the relationship between the independent and dependent variables is a true cause and effect relationship. Low statistical validity is largely due to incorrect statistical procedures being used or because of the insufficient sample size (McBurney, 1998). Although every attempt was made to use the appropriate statistical procedures, the size of sample was restricted by resource constraints.

3.8.1.7-7 Interorder reliability

This refers to the ability of different individuals using the same survey instrument under similar conditions coming to the same conclusion (Zikmund, 1997). The primary limit of interorder reliability in the research would be size of the sample.

3.8.2 Stability

Stability refers to the consistency of the measure when the sample is measured at different time intervals (Zikmund, 1997). This was a cross sectional once off study, therefore, reliability and stability could not be assessed.

3.9 *Response Types*

The design of the survey resulted in the following response types being measured:

- Dichotomous yes/no variables; ~~and~~
- Multiple choice questions requiring respondents to select an appropriate option;
- In the questionnaire a five point Likert-type scale was utilised where the participant could select the extent they agreed with an opinion. The scale had the following options: Strongly disagree, Disagree, Neither/ neutral, Agree or Strongly agree.

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- Frequency scales were utilised to assess the extent certain aspects were utilised, such as communication medium usage. The scales were broken down into three levels: Never, Occasionally and Frequently.

3.10 Data Analysis

Using statistical methods the collected data was analysed to ascertain:

- Which factors have an affect on the extent of the digital divide?
- If there is a relation between an individual's computer literacy level and their view on how productive ICT is for them?
- How strong is the correlation between access to telecommunication devices and access to ICT devices

3.11 Use of Statistics

Due to the nature of the empirical data ~~collected~~collected, various statistical procedures were used to analyse the data. This section identifies the statistical procedures used in the analysis.

3.11.1 Type of Tests Used

Responses were measured using primarily Likert-type scales and yes/no responses, therefore the data collected was categorical in nature. Some of the Likert-type scales were then compounded into continuous variables by combining several variables. These variables were tested for reliability and validity using correlations. However, statistical procedures that evaluate combinations of metric and categorical data were then used.

3.11.2 Level of Significance

Significance levels are used to indicate the maximum risks that one is willing to accept in rejecting the null hypothesis. The lower the significance level the less risk one is willing to take (McBurney, 1998). A significance level of 5% (0.05) was chosen for all statistical procedures.

3.11.3 Analytical Procedures

The analytical procedures that were selected were used in the following ways:

- Descriptive statistics were used to analyse the demographics of the sample.
- Hypothesis testing was conducted using contingency tables supported by Chi-Square tests.

3.11.3.1 Descriptive Statistics

Descriptive statistics was primarily used to evaluate the dispersion of the sample within the population. These statistics were done using percentage based frequency tables.

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3.11.3.2 Hypothesis Testing

Hypothesis testing was performed using the following procedures:

- Chi-square tests were utilised to assess if certain aspects were significant in assessing the extent of the digital divide.
- T-tests were utilised to assess the relationships between certain variables. The predictors consisted of Likert-type scales along with metric variables and dichotomous yes/no variables.
- Correlation matrixes were utilised to assess the strength of the relationships between aspects of technophobia
- Factor analysis was used to investigate possible underlying dimensions of technophobia.
- Factor rotations were utilised to compound the factors utilised.

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3.11.3.3 Statistical Software Package

All statistical procedures were computed using JMP version 5.01 and version 1.3 of SAS Enterprise Guide.

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Chapter 4: Results and Discussion

This chapter provides a detailed analysis of the statistics done. After each set of findings there is a discussion of the statistical results in relation to the aspects of the digital divide brought out in the literature review.

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4.1 Descriptive statistics

4.1.1 Results

The initial test conducted was a summary table to determine the race break down of the sample. This was performed utilising a summary table indicating the distribution in percentages. The first summary table shows the distribution of the sample between race and the participants current situations (see Appendix 2). The race distribution obtained by the exercise was as follows: The majority of the sample were black 52%, while whites made up 29%, coloureds 7% and Asians 13%. The majority of the ~~sample were~~samples were people who defined their current situation as studying full time, 52%, while people who were working full time accounted for 40% of the sample, people who were working full time and studying part time, 1% and studying full time and working part time accounted for 7%. The largest proportion of the sample came from black participants who were working full time, 27%.

The second summary table (see Appendix 3) shows the distribution of the sample between race and access to the Internet. The race distribution according to people who had Internet access reflected that black people were the largest race group that did not have access to the Internet, 82%, coloureds, 13%, whites, 3% and Asians 3%. The majority of the sample was made up of people who had Internet access, 62.50%, of those who had access to the Internet, whites made up the majority. 45%, blacks, 34%, Asians, 18% and coloureds, 3%.

The third summary table (see Appendix 4) showed the distribution of the sample between gender and access to the Internet. Women accounted for 47% of the sample while men accounted for 53% of the sample. According to the summary table, female participants have more Internet access, 55%, while the majority of male participants do not have Internet access, 67%.

The age distribution was divided into two categories. The first category was 16 to 34, the second category 35 onwards. The fourth summary table (see Appendix 5) showed the distribution of the sample between the age variable and access to

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the Internet. Participants who fell into the 16 to 34 age group accounted for 65% of the sample while the 35 years and onwards category accounted for 35% of the sample. The 16- 24 age group had the highest amount of participants who had Internet access, 60.58% of the sample. Of the participants who fell into the 35 years and onwards category 87.18% of them did not have Internet access.

The fifth summary table (see Appendix 6) showed the distribution of the sample between Gender and Internet access for participants who accounted for the first age group (16-34). The largest group in this table were females who had Internet access, 51.47%. In the sixth summary table (see Appendix 7), the distribution of the sample between gender and Internet access for participants who accounted for the second age group (35 +) is displayed. From this table we can see that males in the 35+ age category accounted for the majority of the sample who did not have Internet access.

The participants whose first language was English accounted for 49% of the sample while the other official South African languages when combined accounted for 51% of the sample. This was reflected in the seventh summary table (see Appendix 8). The majority of the participants whose first language is English had access to the Internet, 96%. While 69% of non-English participants did not have Internet access. The largest grouping of participants were English participants who had Internet access, 47%.

The tenth summary table (see Appendix 9) showed the distribution of the sample between rural and urban areas compared to Internet access. Urban participants accounted for 69% of the sample, while rural participants accounted for 31% of the sample. The summary table indicated that more urban participants had Internet access than rural participants. The majority of the participants from the sample were from urban areas and had Internet access, 56%.

In the eleventh table (see Appendix 10), the distribution of the sample between married participants and single participants are shown. The sample is made up of

63% single participants and 38% married participants. The majority of the participants who have Internet access are single, 91%.

The distribution of the sample between education levels and Internet access is shown on table twelve. The majority of the participants in the sample had completed their Matric, 52%. While 16% had only completed primary school, 8% had completed primary school, 5% had some high school education, 2% had a Technikon diploma, 11% had completed a university degree and 7% had a post graduate degree. The majority of the participants in the sample had Internet access, 63%.

The total personal monthly income of the participants was divided into three groups: less the R400 up until R1399; R1400 up until R 10 999; R11 000 to R30 000+

(see Appendix 12). The distribution of the sample between participant's income levels and their Internet access is shown in table thirteen. The participants that make up the sample predominantly fall into the > R400- R1399 income bracket, 66%. While the participants who fall into the R1400 – R10 999 bracket constitute 29% of the sample, and the R11 000 – R30 000+, income bracket constitutes 5% of the sample. The table reflects that 38% of the participants that have access to the Internet, fall into the >R400- R1399 income bracket.

4.1.2 Discussion

Descriptive statistics was initially conducted on the sample. It was primarily to see how the sample was distributed between rural and urban areas. It shows that the sample is largely made up of urban participants, 62.50% of the sample, this could be a direct result of the methodology utilised in the research. The questionnaire that was utilised in the research was a paper based questionnaire, due to resource restrictions it was only distributed in urban areas; therefore, the questionnaire ultimately favours participants from urban areas. The race distribution of the sample predominantly made up of black (51.92%) and white (28.85%) participants. These results could be once again due to the sampling method utilised, although the proportion of Asian participants were considerably high (12.5%) in comparison to the South African population. This could be as a

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result of the university courses which were sampled having a high Asian student presence. The proportion of white participants compared to non white participants utilised in the sample is adequate due to the comparative South African population proportion.

The sample's income brackets were predominantly, participants who were grouped into the below R400 up to R1399, income bracket. They accounted for 66.02% of the sample; this could be attributed to the sampling method which was dominated by participants who were full time students. The participants who were grouped into the middle income bracket (R1400- R10 999) constituted 29.13% of the sample which could be interpreted as a comparatively adequate to the population. The high income bracket was not sufficiently covered and this could affect the results, primarily when making a distinction between low and high income brackets in contrast to their Internet access.

The sample reflected a fairly normal gender distribution, with males constituting 53% of the sample and females 47% of the sample. The gender distribution was divided into two groups, basically young (16-34) and mature (35+) participants. The young participants had a fairly normal sample distribution, with females dominating this group by constituting 56% of the group. The relatively equal genders distribution could be attributed to the sampling areas, the majority of the young age group were from the universities commerce faculties, which are fairly gender balanced. In the mature age group, the distribution was largely skewed towards the males, who constituted 69% of the group. This imbalance could be attributed to the male dominated workplaces that were sampled.

The language distribution of the sample was equally distributed, with participants whose first language was not English accounting for 51% of the sample. The participants who completed the questionnaire had to understand English, although the study did not test their proficiency in understanding the English language. The primary concern of the study regarding language was whether non- English speakers were affected in their Internet access. The large proportion of participants whose first language is English could be attributed to

the sampling being carried out in urban South African areas, where English is one of the dominant languages used to communicate in the workplace and university.

The sample was dominated by participants who had obtained a minimum Matric education level, 70% of the sample. This relatively high education level obtained from the sample could be attributed to the sampling areas utilised. The workplaces that were surveyed were relatively medium skilled and the minimum education requirement required by most University's is a Matric certificate.

4.2 Research Question 1

Which of the following demographic factors are related to ICT access? The following contingency table tests were utilised, the Pearson's chi-square tests were utilised although where the expected value of each cell was less than 5, Fisher's Exact test was used. Below are the Alternate Hypotheses which were used to answer the research question:

- A) The gender of a person is related to their ICT access.
- B) The age of the person is related to their ICT access.
- C) Being classified as a Previously Disadvantaged Individual (P.D.I) is related to a person's access to ICT.
- D) English being a person's first language does have a relationship with their access to ICT
- ~~D)E)~~ There is a difference in the extent of the digital divide between people living in rural areas and people living in urban areas
- ~~D)F)~~ The educational level that a person has attained is related to their ICT access.
- ~~D)G)~~ The income level of the person is related to their ICT access.

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4.2.1 Results

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Hypothesis 1A

H₀: The gender of a person is not related to their ICT access.

H_a: The gender of a person is related to their ICT access.

From the results of the chi-square test (See appendix 13), the null hypothesis is rejected at the 5% significance level due to the Pearson chi-square p-value being 0.0292. The Fisher's Exact Test was utilised, due to the expected values being less than 5 in each element of the sample. From the Fisher Test it was concluded that Internet access is greater for woman than for men, due to the probability

level of 0.0235, therefore we would reject our null hypothesis at the 5% significance level.

Hypothesis 1B

Ho: The age of the person not is related to their ICT access.
Ha: The age of the person is related to their ICT access.

From the results of the chi-square test (See appendix 14), the null hypothesis is rejected at the 5% significance level, due to the Pearson chi-square p-value being $<.0001$ From this we could conclude that the age of a person is related to their ICT access.

Hypothesis 1C

Ho: Being classified as a Previously Disadvantaged Individual (P.D.I) is not related to a person's access to ICT.
Ha: Being classified as a Previously Disadvantaged Individual (P.D.I) is related to a person's access to ICT.

The Pearson value ($P<.0001$) for the chi-square test could not be effectively utilised due to one of the sample expected elements values, being less than 5 (Non PDI's who do not have Internet access). From the Fisher Test it was concluded that Internet access is greater for Non PDI's than for PDI, due to the probability level of $<.0001$. We reject that overall Ho, therefore, we can say being classified as a PDI is related to a person's access to ICT..

Hypothesis 1D

Ho: English being a person's first language does not have a relationship with their access to ICT.
Ha: English being a person's first language does have a relationship with their access to ICT.

The Pearson value ($P<.0001$) for the chi-square test could not be effectively utilised due to one of the samples expected values being less than 5 (Participants with no Internet access and whose first language is English). The Fisher Exact Test was utilised (See appendix 16), the null hypothesis is rejected at the 5% significance level, due to the two tailed result having a p-value of $<.0001$ From this we could conclude that English being a person's first language

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is related to a person's ICT access. The test also revealed that people whose first language is English have a greater chance at having Internet access.

Hypothesis 1E

Ho: There is **no** difference in the extent of the digital divide between people living in rural areas and people living in urban areas

Ha: There is a difference in the extent of the digital divide between people living in rural areas and people living in urban areas

From the results of the chi-squares test (See appendix 17), the null hypothesis is rejected at the 5% significance level, due to the Fisher Exact test value being $<.0001$. From this we could conclude that there is a difference in the extent of the digital divide between people living in rural areas and people living in urban areas

Hypothesis 1F

Ho: The educational level that a person has attained is not related to their ICT access.

Ha: The educational level that a person has attained is related to their ICT access.

The expected values in the sample were only adequate enough to use the Fisher Exact Test. From the results of the test (See appendix 18), the null hypothesis is rejected at the 5% significance level, due to P-value being $<.0001$. From this we could conclude that the educational level that a person has attained is related to their ICT access.

Hypothesis 1G

Ho: The income level of the person is not related to their ICT access

Ha: The income level of the person is related to their ICT access

From the results of the chi-squares test (See appendix 19), the null hypothesis is **not** rejected at the 5% significance level, due to the Pearson chi-square p-value being 0.137. From this we could conclude that income level is **not** a factor of the digital divide. Although caution must be drawn to the fact that one of the elements in this test did not have any data (participants who were classified as high income bracket and did not have Internet access).

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4.2.2 Discussion

Contingency tables were utilised and justified by chi-square tests I.E. Pearson and Fishers Exact Test. Due to the sample being investigated having small expected values the Fisher Exact Test was utilised. From the various sub Hypotheses above (Hypothesis 1A – Hypothesis1 G), all the above demographic factors except for the participants income bracket have a significant relationship to their Internet access. Hypothesis 1A concluded that a participant's gender does have an effect on their Internet access. Although when utilising the Fisher exact test result, for the probability that Internet access is greater for females than males, this does not correlate with Bessie (1994) who discussed the issue of women being segregated thus resulting in females being on the negative side of the digital divide. A probable reason for the result obtained by the above test, is that the sample was taken in urban areas and that people who predominantly resided in urban areas were the majority of the sample, the argument that Bessie (1994) brought forward was referring to woman mainly in rural areas. The results from this hypothesis could reflect that progress is being made in breaking the gender digital divide in the workplace and urban areas.

The results obtained by Hypothesis 1B correlate with the argument that Sherry (1995) brought forward. According to Sherry (1995) the age gap is growing between people who have access to ICT and people that don't. This can clearly be seen by the contingency table in Appendix 14, which shows that all the participants in the oldest age group do not have access to the Internet. And the inverse is seen in the youngest age group, where the vast majority of participants have Internet access. Therefore the results support Sherry (1995), in reflecting that access to ICT is different across the various age groups.

According to the results of Hypothesis 1C, PDI's were less likely to have Internet access. This correlates with the UN Integrated Regional Information Network (2003) report which stated that the greatest cause of the digital divide in South Africa is located in the country's past. Therefore, the results obtained by the test support the article, and reflect that participants who were disadvantaged by the country's past are less likely to have Internet access.

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The issue of whether English being a person's first language could have an affect on a participants Internet access, was addressed by Hypothesis 1D. According to the Digital Access Index (DAI) 2003, English being a person's first language no longer is a determining factor of the digital divide. This issue was supported by the fact that the majority of software applications that are available today are also available in most languages. The results of the Hypothesis 1D reflected that English being a person's first language is a significant factor in determining whether a person will have Internet access. The results may differ from the DAI 2003, due to the majority of the sampling population having the ability to speak and understand English.

The results obtained by Hypothesis 1E reflect that participants who live in urban areas are more likely to have Internet access. The results obtained support Bryce-Pease (2000), who reported that telecommunication infrastructures in rural areas are underdeveloped in South Africa, therefore, resulting in people living in rural areas not have access to ICT devices. Rural areas are the hardest hit by factors of the digital divide e.g. poverty and corruption, therefore, living in a rural area you are more likely not to have access to the Internet, therefore supporting the results obtained by Hypothesis 1E.

According to Filipczak and Smith (1994), ICT training was initially targeted at specific university courses. Although ICT training has developed and spread to incorporate more of the educational fields, people that did not finish their secondary education would probably not have access to ICT. The results of Hypothesis 1F reflected that the probability of people who have Internet access is greater for people who have passed Matric than those that have not. From these results it can be concluded that a persons educational level has an affect on their Internet access, and therefore the ability to effectively utilise ICT devices. When reviewing the contingency table in Appendix 18, all the participants who did not have a Matric did not have Internet access, therefore, supporting educational level as a factor of the digital divide.

The final Hypothesis in this section, Hypothesis 1G, reflected that a participants income level does not have an affect on their Internet access. According to Gill (1998), a persons income level would indicate their ICT access, although the results of the test do not correspond. A reason for this could be that the sample of low income participants mainly came from students who have Internet access provided to them by the university. When reviewing the developments that are being made to combat the digital divide, many of them are aiming at lowering the price of ICT devices, therefore making them more affordable.

The discussion above reflects that most aspects of the digital divide were evident in the sample. Caution should be drawn to the small sample size that was obtained, therefore resulting in many of these tests not being totally effective in obtaining an accurate result. Although the income dividing factor was not evident in the sample the other factors were still evident, therefore, it could be ascertained that develop still needs to be made in creating access to ICT devices in South Africa.

4.3 Hypothesis 2

4.3.1 Results

The following Hypothesis was used to assess whether a person's view regarding the utility of ICT was related to their ICT capability i.e. ICT literacy.

Ho: An individual's perception on whether ICT is productive is not related to their ICT literacy level.

H1: An individual's perception on whether ICT is productive is related to their ICT literacy level.

Before the T-test could be ~~conducted~~conducted, the data needed to be tested to ascertain the parametric assumptions of normality and homogeneity of variance which were needed to run a parametric independent sample T-test. From the Bar graph on Appendix 20, it can be seen that the data is sufficiently symmetrical to meet the normal distribution assumption i.e. the distribution of the sample is normal. The Levene's test for homogeneity of variance was utilised (see table below) to assess the variance in the sample.

Levene's test hypothesis.

Ho: The variances are equal

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H1: The variances are not equal

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.0806	1	68	0.7774
Brown-Forsythe	0.9573	1	68	0.3313
Levene	0.5103	1	68	0.4775
Bartlett	0.0637	1	.	0.8007

From the above it can be seen that we would fail to reject H_0 , at $\alpha = 0.05$

therefore, we can assume homogeneity of variance. Therefore it appears that we have sufficiently met the assumptions to conduct a parametric independent samples T-test. The power of the test was 0.9241, therefore the T-test had a very strong ability to detect deviations from the null hypothesis, with a sample size of 70 and a 5% significance level. From the results obtained by the T-test (see appendix 21) where the p value for the equal variance T-Test was 0.001, we reject H_0 . When comparing the means of people who view computers as assisting and not assisting, compared to their ICT literacy: People that said computers assist them in their daily work had a ICT literacy mean score of 33.15 with a standard deviation of 9.4 compared to people that said computers do not assist them in their daily work, who had an ICT literacy mean score of 18.2 with a standard deviation of 8.52. Therefore, a person's view regarding the utility of ICT has an effect on their ICT capability.

4.3.2 Discussion

Drawn from the above Hypothesis (2), a person's view, regarding the utility of ICT, could be linked to their motivation to utilise and learn about ICT devices. The mean ICT literacy score of people, who viewed computers as assisting, were significantly higher than those who viewed computers not assisting. According to Sullivan (2002), motivation is a factor of the digital divide, and people's perception about ICT devices could influence their ICT abilities. The Sullivan (2002) article discussed the need for PDI's to be informed about the uses of ICT devices. By being informed the individuals would see the various uses of ICT devices, therefore, creating the motivating factor to learn about ICT devices, resulting in PDI's increasing their ICT capabilities overall. From the results of the above hypothesis, it can be seen that in order to enable people to utilise ICT devices, individuals need to be motivated to invest their time in learning about

ICT devices, in order to be motivated they need to see ICT devices as being productive for them.

4.4 Hypothesis 3

The following Hypothesis was used to assess whether a person's access to ICT is related to their telecommunication usage.

4.4.1 Results

Ho: There is **no** relationship between a person's telecommunication usage and their access to ICT devices.

Ha: There is a relationship between a person's telecommunication usage and their access to ICT devices.

The power of the test was 1.00, therefore the T-test had a very strong ability to detect deviations from the null hypothesis, with a sample size of 107 and a 5% significance level. From the results obtained by the T-test (see appendix 22), we reject Ho, due to the t-tests p-value being $<.0001$. When comparing the means of people who have Internet access and those that don't compared to their communication utilisation: People that had Internet access had a communication usage mean score of 9.57 with a standard deviation of 3.45, compared to those people who did not have Internet access, who had a communication usage mean score of 3.72 with a standard deviation of 2.86. Therefore, a person's Internet access is related to the communication usage.

4.4.2 Discussion

The amount a person utilises a device could reflect the availability of that device, therefore, from the test above it is seen that there is a relationship between the amount a person utilises telecommunication devices and their access to ICT devices. Although caution should be drawn to the reality that cell phones are not commonly utilised as data communication devices I.E. Internet access devices, therefore, the relationship may not be entirely correct. The results obtained by the tests above concur with Clarke (2001), who discussed how inadequate telecommunication networks were hindering ICT development. Therefore, in

order for South Africa to create an adequately utilised telecommunication network, people would have to be informed about cell phone modems and more land lines would have to be placed in areas affected by the digital divide.

4.5 Understanding technophobia

Question 14, of the questionnaire that was distributed to participants, contained eleven opinions regarding technology. Participants were asked to indicate the extent they agreed or disagreed with the opinions. The objective of the question was to ascertain which opinions were related to participants who could be classed as technophobic.

The initial correlation matrix showed which opinions in question 14 (the technophobia scale) were inverse to the general technophobia scale. They were reversed and the results of the reversed opinions are shown by the correlation matrix in Appendix 23. An initial glance at the matrix reflects that there is a strong correlation between all the statements with the exception of opinion D (People depend on computers too much nowadays) and opinion G (Further learning would enable me to use the computer more).

The principle component analysis confirmed the strong relationship between all the statements except opinion D and G immersed as separate components. The first principle component had 72% of the variance with high loading on all the opinions except opinion D and G. The second principle component had 9% of the variance with a high loading on opinion D, while the third principle component had 6% of the variance with a high loading on opinion G.

Factor analysis with a varimax rotation was used (see appendix 24) to further explore the relationship between the opinions contained in Question 14. Four and three factor solutions were examined although the four factor solution appeared to be most meaningful. Attained from the three factor solution which explained 87.51% of the variance were similar results to the above principle component analysis. There were high loadings on all statements except opinion D and G. Opinion G had a strong negative loading on the second factor while opinion D

had a strong positive loading on factor three. The primary reason for resorting to a four factor solution was due to factor three of the three factor solution also having significant loadings on opinions C (Computers are intimidating to use), E (Computers are fun) and K (Using computers restricts our ability to talk and communicate with each other), which are obviously conflicting opinions tending towards opposite ends of the technophobia scale.

The Four factor solution provided an explanation of 91% of the variance. The first factor had high negative loadings on all the opinions except opinions G, D and K. Due to the dominate negative loadings on this factor it could be defined as non technophobic individuals. The second factor had a high loading on opinion G and therefore could be classified as knowledge seeking individuals. The third opinion had a strong loading on opinion D, which could classify it as a anti technology dependency characteristic. The fourth factor has a dominate loading on opinion K which could characterise it as individuals who view technology as impersonal.

Concluding from this analysis, is that underlying this technophobia scale there are four dimensions. Namely the non-technophobic characteristic, knowledge seeking, an anti technology dependency and technology is impersonal. Through incorporating further specific technology opinions, this scale could be fine tuned to distinguish and classify the dimensions involved further.

Chapter 5: Conclusion

The initial emphasis of the study was to identify which demographic and social elements have a relationship with access to ICT i.e. The Digital Divide. The various elements that were examined all reflected a relationship except for the income level of the participants which did not reflect a relationship with Internet access. The study explored the relationship between an individuals motivation to utilise ICT devises and their current ICT literacy level, it was found that motivated individual have a relatively high ICT literacy level in comparison to non motivated individuals. Therefore, in order for a person to be motivated to utilise ICT devices they need to be informed about the benefits of ICT. The relationship between an individuals communication usage and their access to ICT devise was investigated. This investigation returned a positive relationship between the

amount an individual uses a communication medium and their access to ICT device. Thus in order to increase ICT developments within South Africa, ICT communication mediums need to be made easily available to the public. The literature review established that technophobia is a ICT dividing factor. Through the study a technophobia scale was compiled and underlying dimensions were established through the various correlation tests. The final test reflected that the scale could be effectively characterised by four underlying dimensions of technophobia. The overall result of the study was that elements of the digital divide are still evident within the sample universe i.e. Gauteng commercial sector and tertiary educational sector. However, the study was limited and needs to be expanded upon for accurate conclusions to be drawn.

5.1 Limitations of the Research

While all possible effort was made to reduce the limitations of the study, the following limitations were identified:

- The research was limited to individuals who were situated in urban areas.
- Although the study aimed to assess the extent of the digital divide in South Africa the literature that was utilised to draw up the Hypothesis were predominantly compiled in the United States and Europe. Therefore, conclusions drawn and the Hypothesis tested were predominantly based on European and United States research and might not be generally applicable to South Africa.
- The questionnaire utilised some common technology terminology and is largely dependent on whether the respondent understands the general meaning of these concepts.
- The areas that the questionnaire was distributed in were populated by either people who are employed or studying. Therefore, the research did not incorporate data from unemployed people.
- Due to the questionnaire being written in English this draws two further limitations:
 - The questionnaire draws on literate people only
 - The questionnaire is limited to English literate people

5.2 *Implications*

The implications of this study are that the factors of the digital divide are evident within South Africa. Although a large amount of ICT development has been made within South Africa and globally, to combat the digital divide, primary aspects such as ICT motivation and rural communication still need to be addressed. Through the technophobia scale character traits of technophobic individuals can be identified in order to address their ICT development.

5.3 *Contributions to Past research*

In the literature, technophobia was defined as a cause of the digital divide, the study contributed to this by establishes underlying dimensions of technophobia. Ultimately, this study was an exploratory study of the various relationships affecting ICT access in South Africa. It therefore needs to be developed significantly in order to generalise the conclusions through out the country.

5.4 *Recommendations for Future Research*

It is however recommended that future research focus on the specific extent of the digital divide in South Africa, utilising the relationships established in the study. The extent of the digital divide should be monitored in order to establish the overall ICT development and benchmark our development globally. Future research should also focus on the different ICT development methods and their positive affect on ICT access. The primary research area that needs attention is the extent of the digital divide in rural South African areas.

Chapter 6: Appendices

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6.1 Appendix 1: The Questionnaire

Thank you in advance for your time that you have given to completing this questionnaire. Whilst completing this questionnaire, please indicate your choice by placing a cross in the box or boxes (where applicable) e.g. ☒

(1) Please indicate what your first language is:

- | | |
|--|--------------------------------------|
| <input type="checkbox"/> Afrikaans | <input type="checkbox"/> Sesotho |
| <input type="checkbox"/> English | <input type="checkbox"/> Setswana |
| <input type="checkbox"/> IsiNdebele | <input type="checkbox"/> SiSwati |
| <input type="checkbox"/> IsiXhosa | <input type="checkbox"/> Tshivenda |
| <input type="checkbox"/> IsiZulu | <input type="checkbox"/> Xitsonga |
| <input type="checkbox"/> Northern Sotho (Sepedi) | <input type="checkbox"/> Other _____ |

(2) Which one of the following best describes your current situation?
(Select all that may describe you)

- ☐ Working full time
- ☐ Working part time
- ☐ Studying full time
- ☐ Studying part time
- ☐ Retired
- ☐ Unemployed
- ☐ Other: (please describe) _____

(3) Please indicate which of the following appliances you have in you household by placing a cross in the box next to the item:

- | | |
|--|---|
| <input type="checkbox"/> Electric stove | <input type="checkbox"/> TV games |
| <input type="checkbox"/> Fridge/freezer | <input type="checkbox"/> Hi-fi/ music centre |
| <input type="checkbox"/> Microwave oven | <input type="checkbox"/> DVD player |
| <input type="checkbox"/> Cordless phone | <input type="checkbox"/> M-Net/ DSTV subscription |
| <input type="checkbox"/> Digital camera | <input type="checkbox"/> Dishwasher |
| <input type="checkbox"/> VCR | <input type="checkbox"/> Sewing machine |
| <input type="checkbox"/> Vacuum cleaner/floor polisher | <input type="checkbox"/> TV set |
| <input type="checkbox"/> Alarm system | <input type="checkbox"/> Tumble dryer |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Washing machine |
| <input type="checkbox"/> Digital camera | |

(4) Please indicate which of the following you have or have had:

- ☐ Access to a computer (go to question 7)
- ☐ Access to a computer with the internet (go to next question)
- ☐ None of the above (go to question 11)

(5) If you have access to a computer with the Internet, please select how often you use the computer in the following environments:

	Frequently	Occasionally	Never
(a) At home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) A friends house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) University	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Library	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Internet café	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Other: please state: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(6) What do you use computers for? (you can tick more than one)

- ☐ Work
- ☐ Study
- ☐ Personal
- ☐ Other: _____

(7) Do you feel computers assist you in you daily work/ study?

- ☐ Yes
- ☐ No

8) Please select which of the following you can do:

- ☐ Reset/ Reboot a computer
- ☐ Send and receive email
- ☐ Cut and paste
- ☐ Save and open a computer document
- ☐ Install a program on your computer

(9) Please indicate how often you use each of the following, by placing a cross in the applicable box:

	Frequently	Occasionally	Never
(a) Communication – Email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Accessing the World Wide Web	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Word processing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Spreadsheets/Database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Graphics/Multi-Media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Research Information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Buy things over the Internet (Ecommerce)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Playing games (solitaire, etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) PowerPoint presentations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(j) Copy pictures from digital camera to computer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(k) Burn data/music to CD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(l) Use the computer as a fax machine	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(10) If you have been on a computer-training course, please select which of the following you have attended?

- ☐ A general computer course i.e. how to use the computer.
- ☐ A specific computer course i.e. on using a specific program.
- ☐ Other: _____

(11) Please select which of the following you have

- ☐ A cell phone
- ☐ Access to a pay phone
- ☐ A land line phone in your house
- ☐ None of the above

(12) If you do have a access to a phone (cell phone /land line), please select how often you make use the phone daily:

	Never	Occasionally	Frequently
(a) Home phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Pay phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Cell phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Internet phone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Other: please state:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(13a) Does your place of work or study have computer training courses?

- ☐ Yes
☐ No

(13b) If yes have you attended any of these courses?

- ☐ Yes
☐ No

(14) Please place a cross over the number that indicates your view, indicate whether you agree or disagree with the following statements,

Where **1** indicates strongly **disagree** and **5** indicates strongly **agree**

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
(a) The Internet is a mystery to me	1	2	3	4	5
(b) I'm not interested in new technologies	1	2	3	4	5
(c) Computers are intimidating to use	1	2	3	4	5
(d) People depend on computers too much nowadays	1	2	3	4	5
(e) Computers are fun to use	1	2	3	4	5
(f) Computers will make life harder	1	2	3	4	5
(g) Further learning would enable me to use the computer more.	1	2	3	4	5
(h) The Internet is not fun to use	1	2	3	4	5
(i) Computers make me more productive	1	2	3	4	5
(j) The Internet is very useful to me.	1	2	3	4	5
(k) Using computers restricts our ability to talk and communicate with each other	1	2	3	4	5

(15) Gender: ☐ Male ☐ Female

(16) Age at your last Birthday:

- ☐ 16 to 24
☐ 25 to 34
☐ 35 to 49
☐ 50+

(17) Please select which Race group you fall into (For statistical purposes only):

- ☐ Black
☐ White
☐ Coloured
☐ Asian
☐ Other _____

(18) What is the highest level of education you have personally have achieved?

- | | |
|---|---|
| <input type="checkbox"/> No schooling | <input type="checkbox"/> Artisans certificate obtained |
| <input type="checkbox"/> Some primary school | <input type="checkbox"/> Technikon diploma/degree completed |
| <input type="checkbox"/> Primary school completed | <input type="checkbox"/> University degree completed |
| <input type="checkbox"/> Some high school | <input type="checkbox"/> Post graduate degree completed |
| <input type="checkbox"/> Matric (Grade12) | <input type="checkbox"/> Other (please describe) |
- _____

(19) What is your current marital status?

- ☐ Married/ Engaged
☐ Living together
☐ Single
☐ Divorced
☐ Widowed

(20) Do you have electricity in your house?

- ☐ Yes
☐ No

(21) Please indicate which group below reflects your total personal monthly income, before tax and other deductions. (Please indicate the total of all your sources of income i.e. salaries, pensions, income from investments etc):

- | | |
|--|--|
| <input type="checkbox"/> Below R400 | <input type="checkbox"/> R5000 – R7999 |
| <input type="checkbox"/> R400 - R699 | <input type="checkbox"/> R8000 – R10 999 |
| <input type="checkbox"/> R700 – R999 | <input type="checkbox"/> R11 000 – R15 999 |
| <input type="checkbox"/> R1000 - R1399 | <input type="checkbox"/> R16 000 – R29 999 |
| <input type="checkbox"/> R1400 – R2499 | <input type="checkbox"/> R30 000 or more |
| <input type="checkbox"/> R2500 – R4999 | |

(22) The area you live in is considered:

- ☐ Rural
- ☐ Urban
- ☐ Semi-urban/ Other: (please describe)

Once again, thank you for your time in completing this questionnaire.

6.2 Appendix 2: Summary table of Participants Current Situation & Race.

Table1 of Race by CSIT

Race(Race)		CSIT(CSIT)		Current Situation	
Frequency!				1= working full time	
Percent				3= studying full time	
Row Pct				8= work full & study part	
Co! Pct				10= Study full & work part	
Race	1	28	26	0	0
	26.92	25.00	0.00	0.00	54
	51.85	48.15	0.00	0.00	51.92
	66.67	48.15	0.00	0.00	
2	7	17	1	5	30
	6.73	16.35	0.96	4.81	28.85
	23.33	56.67	3.33	16.67	
	16.67	31.48	100.00	71.43	
3	6	1	0	0	7
	5.77	0.96	0.00	0.00	6.73
	85.71	14.29	0.00	0.00	
	14.29	1.85	0.00	0.00	
4	1	10	0	2	13
	0.96	9.62	0.00	1.92	12.50
	7.69	76.92	0.00	15.38	
	2.38	18.52	0.00	28.57	
Total	42	54	1	7	104
	40.38	51.92	0.96	6.73	100.00

6.3 Appendix 3: Summary table of Participants Race and Internet access

Table2 of Race by Internet

Race(Race)		Internet access:	
Frequency!		0 = No Internet	
Percent		1= Internet	
Row	Pct		
Co!	Pct		
1	32	22	54
	30.77	21.15	51.92
	59.26	40.74	
	82.05	33.85	
2	1	29	30
	0.96	27.88	28.85
	3.33	96.67	
	2.56	44.62	
3	5	2	7
	4.81	1.92	6.73
	71.43	28.57	
	12.82	3.08	
4	1	12	13
	0.96	11.54	12.50
	7.69	92.31	
	2.56	18.46	
Total	39	65	104
	37.50	62.50	100.00

6.4 Appendix 4: Summary table of Participants Gender & Internet Access

Table3 of Internet by Gender

	Frequency Percent Row Pct Col Pct	Gender		Total
		1= Male	2= Female	
Internet access: 0 = No Internet 1 = Internet	0	26	13	39
		25.00	12.50	37.50
		66.67	33.33	
		47.27	26.53	
1	1	29	36	65
		27.88	34.62	62.50
		44.62	55.38	
		52.73	73.47	
Total		55	49	104
		52.88	47.12	100.00

6.5 Appendix 5 Summary table of Participants Age and Internet Access

Table4 of Age by Internet access

	Frequency Percent Row Pct Col Pct	Internet access:		Total
		0 = No Internet	1 = Internet	
Age: 1 = 16 - 34 2 = 35+	1	5	63	68
		4.81	60.58	65.38
		7.35	92.65	
		12.82	96.92	
2	2	34	2	36
		32.69	1.92	34.62
		94.44	5.56	
		87.18	3.08	
Total		39	65	104
		37.50	62.50	100.00

6.6 Appendix 6 Summary table of Participants Gender & Internet Access

Table5 of Internet by Gender

Controlling for Age= 16-34				
		Gender		
		1= Male 2= Female		
Frequency!	Percent!			
Row Pct	Col Pct			
		1	2	Total
Internet access: 0 = No Internet 1 = Internet	0	2	3	5
		2.94	4.41	7.35
		40.00	60.00	
	1	6.67	7.89	
		28	35	63
		41.18	51.47	92.65
		44.44	55.56	
		93.33	92.11	
Total		30	38	68
		44.12	55.88	100.00

6.7 Appendix 7: Age controlled summary table of gender & Internet access

Table6 of Internet by Gender

Controlling for Age=2				
		Gender		
		1= Male 2= Female		
Frequency!	Percent!			
Row Pct	Col Pct			
		1	2	Total
Internet access: 0 = No Internet 1 = Internet	0	24	10	34
		66.67	27.78	94.44
		70.59	29.41	
	1	1	1	2
		2.78	2.78	5.56
		50.00	50.00	
		4.00	9.09	
Total		25	11	36
		69.44	30.56	100.00

6.8 Appendix 8: Summary table of Participants first language & Internet

Table 7 of Internet by English

		English First Language		
		0 = No		
		1 = Yes		
Frequency!	Percent!	0!	1!	Total!
Row Pct	Co! Pct			
0		37	2	39
		35.58	1.92	37.50
		94.87	5.13	
		69.81	3.92	
1		16	49	65
		15.38	47.12	62.50
		24.62	75.38	
		30.19	96.08	
Total		53	51	104
		50.96	49.04	100.00

6.9 Appendix 9: Summary table of Participants area status and Internet

Table8 of Area Status by Internet

		Internet access:		
		0 = No Internet		
		1 = Internet		
Frequency!	Percent!	0!	1!	Total!
Row Pct	Co! Pct			
1		25	7	32
		24.04	6.73	30.77
		78.13	21.88	
		64.10	10.77	
2		14	58	72
		13.46	55.77	69.23
		19.44	80.56	
		35.90	89.23	
Total		39	65	104
		37.50	62.50	100.00

6.10 Appendix 10: Summary table of Participants marital status & Internet

Table9 of Internet by marital status

		Marriage status:	
		1= married	
		3= single	
Frequency	Percent	1	3
Row Co	Pct		
0	33	6	39
	31.73	5.77	37.50
	84.62	15.38	
	84.62	9.23	
1	6	59	65
	5.77	56.73	62.50
	9.23	90.77	
	15.38	90.77	
Total	39	65	104
	37.50	62.50	100.00

6.11 Appendix 11: Summary table of Participants Education and Internet

Table10 of Internet by Education

Table10 of Internet by Education

Highest level of education:

2= Some primary school

3= Primary school completed

4= Some high school

5= Matric

7= Technikon/Degree completed

8= University Degree completed

9= Post graduate Degree completed

Frequency Percent ROW Pct Co! Pct	2!	3!	4!	5!	7!	8!	9!	Total!
0	17	8	5	9	0	0	0	39
	16.35	7.69	4.81	8.65	0.00	0.00	0.00	37.50
	43.59	20.51	12.82	23.08	0.00	0.00	0.00	
	100.00	100.00	100.00	16.67	0.00	0.00	0.00	
1	0	0	0	45	2	11	7	65
	0.00	0.00	0.00	43.27	1.92	10.58	6.73	62.50
	0.00	0.00	0.00	69.23	3.08	16.92	10.77	
	0.00	0.00	0.00	83.33	100.00	100.00	100.00	
Total	17	8	5	54	2	11	7	104
	16.35	7.69	4.81	51.92	1.92	10.58	6.73	100.00

Internet access:

0= No Internet

1= Internet

6.12 Appendix 12: Summary table of Participants Income and Internet access

Table 11 of Income by Internet

		Frequency!		Percent		Row Pct		Co! Pct						
		1	2	3	4	5	6	7	8					
		29	39	68										
		28.16	37.86	66.02										
		42.65	57.35											
		74.36	60.94											
		10	20	30										
		9.71	19.42	29.13										
		33.33	66.67											
		25.64	31.25											
		0	5	5										
		0.00	4.85	4.85										
		0.00	100.00											
		0.00	7.81											
Total		39	64	103										
		37.86	62.14	100.00										

Internet access:	
0= No Internet	
1= Internet	

Income bracket:	
1= >R400 – R1399	
2= R1400 – R10 999	
3= R11000 – R30000	

Income bracket:

- 1= >R400 – R1399
- 2= R1400 – R10 999
- 3= R11000 – R30000

Internet access:

- 0= No Internet
- 1= Internet

6.13 Appendix 13 Contingency Table Gender by Internet Access

Count Total % Col % Row %	No Internet	Internet	
Male	26 25.00 66.67 47.27	29 27.88 44.62 52.73	55 52.88
Female	13 12.50 33.33 26.53	36 34.62 55.38 73.47	49 47.12
	39 37.50	65 62.50	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	1	2.413169	0.0351
Error	102	66.389407	
C. Total	103	68.802577	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	4.826	0.0280
Pearson	4.757	0.0292
Fisher's Exact Test	Prob Alternative Hypothesis	
Left	0.9918	Prob(Internet=1) is greater for Male than Female
Right	0.0235	Prob(Internet=1) is greater for Female than Male
2-Tail	0.0421	Prob(Internet=1) is different across Gender

6.14 Appendix 14 Contingency Table Internet Access by Age

Count Total % Col % Row %	1	2	3	4	
0	4 3.85 6.67 10.26	1 0.96 12.50 2.56	15 14.42 88.24 38.46	19 18.27 100.00 48.72	39 37.50
1	56 53.85 93.33 86.15	7 6.73 87.50 10.77	2 1.92 11.76 3.08	0 0.00 0.00 0.00	65 62.50
	60 57.69	8 7.69	17 16.35	19 18.27	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	3	44.93503	0.3853
Error	98	71.67645	
C. Total	101	116.61148	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	89.870	<.0001
Pearson	76.808	<.0001

6.15 Appendix 15 Contingency Table Internet Access by PDI

Contingency Table

PDI By Internet

Count Total % Col % Row %	No Internet Access	Internet Access	
Non PDI	1 0.96 2.56 3.33	29 27.88 44.62 96.67	30 28.85
PDI	38 36.54 97.44 51.35	36 34.62 55.38 48.65	74 71.15
	39 37.50	65 62.50	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	1	13.152373	0.1912
Error	102	55.650203	
C. Total	103	68.802577	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	26.305	<.0001
Pearson	21.000	<.0001
Fisher's Exact Test	Prob Alternative Hypothesis	
Left	<.0001 Prob(Internet=1) is greater for PDI=0 than 1	
Right	1.0000 Prob(Internet=1) is greater for PDI=1 than 0	
2-Tail	<.0001 Prob(Internet=1) is different across PDI	
Kappa	Std Err	
-0.44086	0.062687	

Kappa measures the degree of agreement.

6.16 Appendix 16 Contingency Table Internet Access by English language

Count Total % Col % Row %	No Internet Access	Internet Access	
English Not First Language	37 35.58 94.87 69.81	16 15.38 24.62 30.19	53 50.96
English First Language	2 1.92 5.13 3.92	49 47.12 75.38 96.08	51 49.04
	39 37.50	65 62.50	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	1	27.904869	0.4056
Error	102	40.897707	
C. Total	103	68.802577	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	55.810	<.0001
Pearson	48.143	<.0001
Fisher's Exact Test	Prob Alternative Hypothesis	
Left	1.0000 Prob(Internet=1) is greater for English=0 than 1	
Right	<.0001 Prob(Internet=1) is greater for English=1 than 0	
2-Tail	<.0001 Prob(Internet=1) is different across English	

6.17 Appendix 17 Contingency Table Internet Access by Area Status

Count Total % Col % Row %	No Internet Access	Internet Access	
Rural	25 24.04 64.10 78.13	7 6.73 10.77 21.88	32 30.77
Urban	14 13.46 35.90 19.44	58 55.77 89.23 80.56	72 69.23
	39 37.50	65 62.50	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	1	16.524831	0.2402
Error	102	52.277746	
C. Total	103	68.802577	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	33.050	<.0001
Pearson	32.548	<.0001
Fisher's Exact Test	Prob Alternative Hypothesis	
Left	1.0000	Prob(Internet=1) is greater for AreaStat=1 than 2
Right	<.0001	Prob(Internet=1) is greater for AreaStat=2 than 1
2-Tail	<.0001	Prob(Internet=1) is different across AreaStat

6.18 Appendix 18 Contingency Table Matric education level by Internet access

Count Total % Col % Row %	No Internet access	Internet access	
No Matric	30 28.85 76.92 100.00	0 0.00 0.00 0.00	30 28.85
Matric	9 8.65 23.08 12.16	65 62.50 100.00 87.84	74 71.15
	39 37.50	65 62.50	104

Tests

Source	DF	-LogLike	RSquare (U)
Model	1	41.411954	0.6019
Error	102	27.390623	
C. Total	103	68.802577	
N	104		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	82.824	<.0001
Pearson	70.270	<.0001
Fisher's Exact Test	Prob Alternative Hypothesis	
Left	1.0000	Prob(Internet=1) is greater for NewEducation=0 than 1
Right	<.0001	Prob(Internet=1) is greater for NewEducation=1 than 0
2-Tail	<.0001	Prob(Internet=1) is different across NewEducation
Kappa	Std Err	
0.806452	0.060495	

Kappa measures the degree of agreement.

6.19 Appendix 19 Contingency Table Income bracket by Internet Access

Count Total % Col % Row %	No Internet Access	Internet Access	
Low Income	29 28.16 74.36 42.65	39 37.86 60.94 57.35	68 66.02
Medium Income	10 9.71 25.64 33.33	20 19.42 31.25 66.67	30 29.13
High Income	0 0.00 0.00 0.00	5 4.85 7.81 100.00	5 4.85
	39 37.86	64 62.14	103

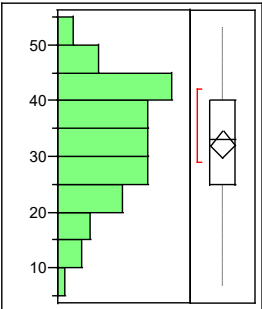
Tests

Source	DF	-LogLike	RSquare (U)
Model	2	2.838199	0.0415
Error	100	65.491466	
C. Total	102	68.329664	
N	103		

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	5.676	0.0585
Pearson	3.970	0.1374

Warning: 20% of cells have expected count less than 5, ChiSquare suspect

6.20 Appendix 20 Hypothesis 2 test for Normality.



6.21 Appendix 21 Hypothesis2 T-test

Summary of Fit

Rsquare	0.148413
Adj Rsquare	0.13589
Root Mean Square Error	9.35985
Mean of Response	32.08571
Observations (or Sum Wgts)	70

t Test

Assuming equal variances

	Difference	t Test	DF	Prob > t
Estimate	14.9538	3.443	68	0.0010
Std Error	4.3439			
Lower 95%	6.2858			
Upper 95%	23.6219			

UnEqual Variances

	Difference	t Test	DF	Prob > t
Estimate	14.9538	3.750	4.78193	0.0144
Std Error	3.9877			
Lower 95%	3.6327			
Upper 95%	26.2750			

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
Assist	65	33.1538	9.40949	1.1671	30.822	35.485
Not Assist	5	18.2000	8.52643	3.8131	7.613	28.787

Power

Alpha	Sigma	Delta	Number	Power
0.0500	9.35985	3.851204	70	0.9241

6.22 Appendix 22 Hypothesis3 T-test

Oneway Anova

Summary of Fit

Rsquare	0.438222
Adj Rsquare	0.432714
Root Mean Square Error	3.238609
Mean of Response	7.375
Observations (or Sum Wgts)	104

t Test

Assuming equal variances

	Difference	t Test	DF	Prob > t
Estimate	-5.8513	-8.920	102	<.0001
Std Error	0.6560			
Lower 95%	-7.1524			
Upper 95%	-4.5502			

UnEqual Variances

	Difference	t Test	DF	Prob > t
Estimate	-5.8513	-9.348	91.7977	<.0001
Std Error	0.6259			
Lower 95%	-7.1541			
Upper 95%	-4.5484			

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Internet	1	834.5391	834.539	79.5664	<.0001
Error	102	1069.8359	10.489		
C. Total	103	1904.3750			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
0	39	3.71795	0.51859	2.6893	4.747
1	65	9.56923	0.40170	8.7725	10.366

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean	Lower 95%	Upper 95%
0	39	3.71795	2.85573	0.45728	2.7922	4.644
1	65	9.56923	3.44587	0.42741	8.7154	10.423

Power Details

Test
Internet

Power

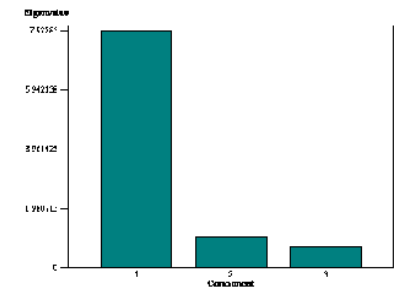
Alpha	Sigma	Delta	Number	Power
0.0500	3.238609	2.83274	104	1.0000

6.23 Appendix 23 (Question 14) Principle components

Technophobia scale Correlation Matrix

	A	B	C	D	E	F	G	H	I	J	K
A	1.0000	0.8928	0.8720	0.4933	0.8486	0.8850	0.1108	0.8153	0.8226	0.8667	0.6987
B	0.8928	1.0000	0.8850	0.4905	0.8471	0.8820	0.1390	0.8296	0.8481	0.8909	0.7081
C	0.8720	0.8850	1.0000	0.5520	0.8226	0.8411	0.0602	0.7674	0.7560	0.8106	0.6863
D	0.4933	0.4905	0.5520	1.0000	0.5655	0.5246	0.1271	0.4743	0.4836	0.5335	0.4967
E	0.8486	0.8471	0.8226	0.5655	1.0000	0.8537	0.1583	0.8682	0.8408	0.8954	0.6783
F	0.8850	0.8820	0.8411	0.5246	0.8537	1.0000	0.1572	0.8396	0.8555	0.8958	0.7056
G	0.1108	0.1390	0.0602	0.1271	0.1583	0.1572	1.0000	0.2207	0.2512	0.1932	0.0445
H	0.8153	0.8296	0.7674	0.4743	0.8682	0.8396	0.2207	1.0000	0.8327	0.9027	0.6691
I	0.8226	0.8481	0.7560	0.4836	0.8408	0.8555	0.2512	0.8327	1.0000	0.8764	0.6871
J	0.8667	0.8909	0.8106	0.5335	0.8954	0.8958	0.1932	0.9027	0.8764	1.0000	0.7036
K	0.6987	0.7081	0.6863	0.4967	0.6783	0.7056	0.0445	0.6691	0.6871	0.7036	1.0000

Scree Plot



Eigenvalues of the Correlation Matrix				
	Eigenvalue	Difference	Proportion	Cumulative
1	7.92285015	6.90387823	0.7203	0.7203
2	1.01897192	0.33412645	0.0926	0.8129
3	0.68484547		0.0623	0.8752

Eigenvectors				
		Prin1	Prin2	Prin3
TphobA	TphobA	0.330680	-.078774	-.127632
TphobB	TphobB	0.334223	-.047511	-.141495
TphobC	TphobC	0.320921	-.143963	0.014545
TphobD	TphobD	0.217431	0.008010	0.942370

Eigenvectors				
		Prin1	Prin2	Prin3
TphobF	TphobF	0.334321	-.017722	-.089196
TphobH	TphobH	0.323847	0.078746	-.151994
TphobK	TphobK	0.279788	-.157778	0.129235
NewTphobE	NewTphobE	0.331235	-.002130	-.011274
NewTphobel	NewTphobeI	0.324018	0.108898	-.133490
NewTphobJ	NewTphobJ	0.338408	0.034354	-.094676
NewTphobG	NewTphobG	0.067277	0.962443	0.027340

6.24 Appendix 24 Factor analysis.

4 Factor Rotation

Opinion A	-0.894221	0.000240	-0.185539	-0.228050
Opinion B	-0.902859	-0.033658	-0.172685	-0.242353
Opinion C	-0.844839	0.070697	-0.294443	-0.207654
Opinion D	-0.318887	-0.061376	-0.929851	-0.158248
Opinion G	0.094119	0.987503	0.046156	-0.003427
Opinion H	-0.876791	-0.156208	-0.152835	-0.211604
Opinion K	-0.526467	0.015485	-0.217995	-0.819965
Opinion E	-0.878799	-0.070952	-0.282418	-0.177291
Opinion I	-0.847495	-0.195200	-0.155028	-0.276493
Opinion J	-0.898342	-0.115707	-0.213311	-0.227911

Variance	Percent	Cum Percent
5.7826	57.826	57.826
1.0662	10.662	68.488
1.2379	12.379	80.867
1.0559	10.559	91.425

3 Factor Rotation

Opinion A	0.917819	0.011847	0.197177
Opinion B	0.930216	0.044064	0.187117
Opinion C	0.862613	-0.055940	0.301501
Opinion D	0.328687	0.071407	0.933120
Opinion G	-0.082903	-0.985471	-0.046697
Opinion H	0.896382	0.167811	0.163311
Opinion K	0.729576	-0.081230	0.350338
Opinion E	0.886222	0.089136	0.283705
Opinion I	0.886131	0.198387	0.178625
Opinion J	0.920463	0.127640	0.224873

Variance	Percent	Cum Percent
7.1359	64.872	64.872
1.0834	9.849	74.722
1.4073	12.794	87.515

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