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Towards a Digital Inclusion Index for South Africa

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A research project submitted to the Gordon Institute of Business Science,

University of Pretoria, in partial fulfilment of the requirements for the degree of

Master of Business Administration.

9 November 2011

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ABSTRACT

Digital technologies have penetrated so many facets of people's lives that access to technology has become a dimension of social inclusion. It is widely assumed that access to digital technologies would result in higher standards of living and improved social welfare through interaction, commerce and learning in a global community and individuals without digital access will be excluded from this community. In order to leverage all the benefits and opportunities that the digital revolution promises, it is essential to include more citizens to the digital society. The Digital Inclusion Index is proposed as a tool to measure and examine the digital divide in South Africa.

Current digital divide measurements are limited and narrow in focus. The Digital Inclusion Index proposed in this study is based on digital access levels of individuals to various digital technologies. The bi-annual AMPS survey results, containing data of more than 20 000 personal interviews, was used as secondary data. Factor analysis was used to assign a scale to each respondent's level of digital access. Descriptive statistics and *Chi*-Square cross tabulations were used to profile the different levels of digital access.

The study aimed to understand the digital environment of South Africa by creating the Digital Inclusion Index which measures the digital divide. The index was then applied to profile various levels of digital access in term of individual attributes and geographical regions. A risk group was identified where individuals have limited digital access. The index was applied to 2009 data to determine whether the digital divide has been growing or narrowing between 2009 and 2010.

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DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

______________________ *9 November 2011*

Tinia Scholtz Date

Universiteit van Pretoria
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- My family for your patience and understanding during the past two years.

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ABBREVIATIONS

ABBREVIATION:	DEFINITION:
AMPS	All Media and Products Survey
ANOVA	Analysis of variance
CCA	Canonical correlation analysis
DDIX	Digital Divide Index
DIDIX	Digital Divide Index
DII	Digital Inclusion Index
DS-CAPI	Double screen computer assisted personal interviewing
GDP	Gross Domestic Product
GPS	Global Positioning System
ICI	Internet Connectedness Index
ICT	Information, Communication Technology
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
LSM	Living Standard Measurement
PC	Personal Computer
PCA	Principal Components Analysis
SAARF	South African Advertising Research Foundation
TDI	Technology Distribution Index
UK	United Kingdom

CHAPTER 1: INTRODUCTION TO RESEARCH PROBLEM

1.1 RESEARCH TITLE

Towards a Digital Inclusion Index for South Africa

1.2 INEQUITABLE ACCESS TO INFORMATION

The South African Honourable Minister of Communications, Mr Radhakrishna Lutchmana Padayachie delivered the following message in the Budget Vote of the Department of Communications on the 31st of May 2011; he said:

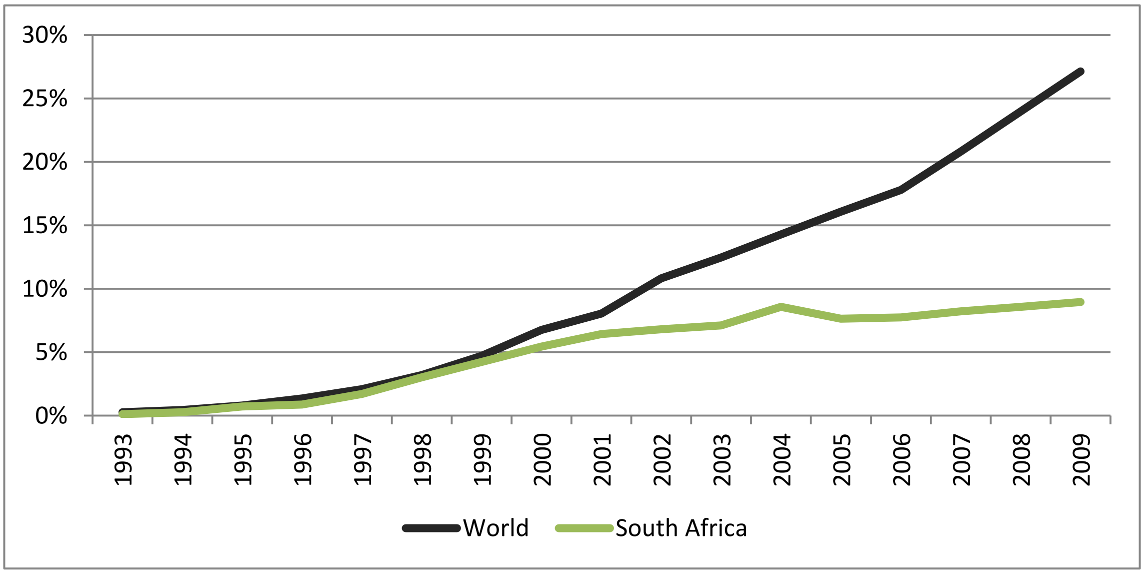
> *"In the future we will in time make it possible for every South African to access and use information and communications technologies as we shape our country towards an inclusive, people-centred information society. We are committed to working faster, harder and smarter in ensuring that we take technology to the people in service of the people"* (Padayachie, 2011, para. 8).

The excitement created by the extraordinary benefits of the information revolution is limitless. It promises to change the current landscape by facilitating economic growth, opportunity and democratic communication (Mariscal, 2005). However, these promises are only destined to those who have access to digital technologies (Mariscal, 2005). The United Nations Secretary General, Kofi Annan, has claimed that access to these technologies is a human right and that "the digital divide is a pressing humanitarian issue" (Fuchs & Horak, 2008, p.100). The digital divide might even be a type of social inequality which is exacerbated by the explosive growth of the Internet (Vehovar et al., 2006). Access to digital technologies acts as an integrator by serving as a platform for cross border flow of information, education, health, trade and services; however simultaneously acts as a divider due to inequitable access (Rao, 2005).

To conceptualise the gap between the haves and the have-nots of digital technologies, measurement tools are constructed to provide policymakers with instruments to justify the allocation of resources and to conduct benchmarking (Barzilai-Nahon, 2006). This study proposed an index to quantify the extent of the digital divide in South Africa as well as to analyse risk profile groups to be used by policymakers to allocate resources. There is no unanimity as to whether the digital divide is narrowing or widening in developing countries including those in sub-Saharan Africa (Mutula, 2008) and an index would enable this functionality. This is a topical issue because it identifies advantaged and disadvantaged individuals and groups within a community in terms of access to technology (Atkinson, Black & Curtis, 2008).

The United Nations (2010) stated that 23 per cent of the global population had access to the Internet at the end of 2008. Yet, this percentage remains much lower in the developing world, with South Africa lagging far behind when it comes to Internet access, with only nine per cent of South African citizens being Internet users (The World Bank, 2010).

Figure 1: Number of Internet User per 100 people



Source: Author’s analysis with data adapted from The World Bank (2010).

One of the Millennium Development targets is to ensure that the benefits obtained by Information and Communication Technologies (ICT) are made available to the entire populace of every country on the globe (United Nations, 2010). Even though digital technologies have become more accessible to a large group of the population, gaps still exist in the usage of these technologies (Mossberger, Tolbert, & Stansbury, 2003). There are many factors in a country that can impact the degree of the digital divide, but these factors are not the same for developing and industrialised nations (Bagchi, 2005).

“The digital divide refers to the separation between those who have access to digital information and communications technology and those who do not” (Dewan & Riggins, 2005, p.298). This study proposes a digital inclusion index to group people with similar digital access levels, to determine whether the digital divide is narrowing or widening and to identify risk groups in South Africa where digital access is low.

1.3 RESEARCH PROBLEM AND PURPOSE

This study proposed a comprehensive index to measure and quantify the extent of the digital divide. Currently, there is no common perspective on measuring the digital divide (Billon, Lera-Lopez, & Rocío Marco, 2010) and the measures that do exist are relatively imprecise (Vehovar, Sicherl, Hüsing, & Dolnicar, 2006). In order to conceptualise the gap between the “haves” and the “have-nots", measurements to which lay people can relate and which policy makers can use to justify allocation of resources and to conduct benchmarking need to be developed (Barzilai-Nahon, 2006). Because ICT has proven to have a remarkable impact on economic development, “the digital divide has become an issue of great interest for researchers and policy makers” (Billon et al., 2010, p.40).

For researchers DiMaggio and Hargittai (2001), it is important to “help society understand and anticipate the consequences of technological change as it is taking place” (p.17), because this kind of research is able to serve as an example to anticipate the effects and impact of future technological revolutions. Research regarding the socio-economic impact of having access to information is not new at all, the knowledge gap debate began in the 1970s with communication researchers (Husing & Selhofer, 2004).

It is currently unclear whether the digital divide is narrowing or widening, however, according to the knowledge gap theory it ‘should’ be widening (Husing & Selhofer, 2004). An index would play an integral role in such debates as it would quantify the extent of the digital divide. DiMaggio and Hargittai (2001) argued that access to a new technology, like the telephone, the television or the Internet is only accessible to a select few at first. As adoption of the new technology increases, the gap between the haves and the have-nots decreases (DiMaggio & Hargittai, 2001). The proposed index is designed to provide information regarding the trend of digital access.

Equal access to digital services by all individuals is a significant issue of social justice (Atkinson et al., 2008). It is therefore important to identify the individuals and geographical regions where digital access is lower than the norm in order to provide special attention to those groups and areas. This group of individuals is referred to as the risk group because these individuals have limited digital access. It is widely assumed that access to digital technologies would result in higher standards of living and improved social welfare through interaction, commerce and learning in a global community and individuals without digital access will be excluded from this community (Dewan & Riggins, 2005).

The purpose of the index was not only to explain the catalysts of the digital divide, but also to propose a meaningful metric with which to measure digital inclusion. The purpose of this study is twofold. The first contribution of the study was to propose an index which can serve as a measurement tool of the digital divide. The index group individuals with similar digital access levels to examine the similarities of their individual attributes and geographical regions. This enables the identification of the risk group where digital access is limited. The second purpose is to use the index as a benchmark to determine whether the digital divide is growing or shrinking.

1.4 Business Case

Multinational companies have struggled to obtain reliable information about consumption patterns to segment consumers in developing countries (Khanna, Palepu & Sinha, 2005). From a business perspective, digital advertising was expected to grow exponentially in 2011, as marketers initiated the appreciation of the strength of online media. However, it is difficult to find statistics on the entire digital market (Mokgata, 2011). The digital inclusion index proposed can be used as a market segmentation tool. The index grouped people with similar levels of digital access and profiled each digital market segment.

1.5 Research Motivation

"Access to the World Wide Web is still closed to the majority of the world's people"

(United Nations, 2010, p.72).

The wealth gap between the West and Third World is ever increasing and developing countries are systematically excluded from wealth and technological progress (Fuchs & Horak, 2008). It is therefore important to identify the driving forces to find appropriate policy programmes that are aimed at reducing these inequalities (Schleife, 2010). The proposed digital inclusion index provides information regarding the individuals and geographical regions where digital access is low, and provides information on whether the gap is narrowing or widening.

Whether the digital divide is a type of social inequality or not is unclear, but the explosive growth of the Internet exacerbates the existing inequalities as proved by other authors (Vehovar et al., 2006). While many South Africans suffer from different inequalities, digital inequality has been tied to economic development (Mutula, 2008). Mutula (2008) argued that countries with a high digital gap are less developed than countries with a low digital gap. The status of the digital divide is therefore not uniform across different societies and there is a need to determine the factors that contribute to the digital divide in various nations (Bagchi, 2005).

The potential existence of the digital divide is of interest to those conducting research in business management and one of the phenomena of interest is the adoption of digital technologies (Dewan & Riggins, 2005). Dewan and Riggins (2005) questioned what the individual characteristics and environmental factors that facilitate the adoption of online commerce at the individual level are. By developing a digital inclusion index, this study aims to answer that specific question.

The digital divide acts as an amplifier of economic and social divides that exist universally (Rao, 2005). South Africa’s Gini coefficient for inequality in income and wealth distribution has risen from 0.66 in 2007 to 0.679 in 2009 (European Commision, 2010). Digital access to information is transforming all sectors of everyday life (Selwyn, Gorard & Furlong, 2005) and assists in overcoming the inequalities of society. Digital access through the Internet facilitates access to education, jobs and better health (Dimaggio, Hargittai, Celeste, & Shafer, 2004), it also offers many other things such as platforms for political discussion and it provides citizens with direct access to government (Dimaggio et al., 2004). The digital divide creates a barrier to those that do not have access to digital technologies and it is important to identify the risk groups and geographical areas where people are being left out.

1.6 THE IMPORTANCE OF CREATING A DIGITAL INCLUSION INDEX

DiMaggio and Hargittai (2001) appealed that user behaviours should be analysed based on massive data sets. Van Dijk and Hacker (2003) confirmed that large surveys with sufficient representativeness or official statistics are needed to draw definite conclusions about the existence and development of digital divides. The proposed digital inclusion index is based on the All Media and Products Survey (AMPS) data which consists of more than 20,000 personal face to face interviews consisting of a battery of questions, including questions regarding access to digital technologies (SAARF, 2009).

James (2009) and Barzilai-Nahon (2006) argued that individuals rather than the countries should be used as the unit of observation. Barzilai-Nahon (2006) added that detailed data collection and analysis at the individual level are vitally important because most studies are done at international and national levels. The AMPS secondary data used to develop the index was gathered on an individual level and is therefore extremely powerful in determining individual digital user characteristics.

Many digital divide indices have been created on macro level, measuring the digital divide between countries (Billon et al., 2010; Chinn & Fairlie, 2007; Corrocher & Ordanini, 2002; Fuchs & Horak, 2008; Howard, K. Anderson, Busch, & Nafus, 2009; International Telecommunication Union, 2003, 2005; James, 2009b; Vicente Cuervo & Lopez Menendez, 2006; Vicente & López, 2011), but research on the individual level is limited. The focus of this study was on individual level and seeks to determine who and where individuals that do not have access to digital technologies are located.

1.7 Conclusion

Tony Blair said, “My point is this: this technology is revolutionising the way we work, the way we do business, the way we live our lives. Our job is to make sure it is not the preserve of an elite – but an Internet for the people” (Blair, 2000, para. 22).

Many governments in industrialised countries have initiated ICT based programmes over the last few years, aiming to ensure that their citizens are included in the formation of the information society and global information economy (Selwyn, 2002). This is not the same in developing countries. Most Africans do not have access to the basic ICT services needed for a simple telephone call, while many other regions are dominated by advanced digital telecommunication systems and the Internet (Buys, Dasgupta, Thomas, & Wheeler, 2009). This divide leads to social exclusion where large numbers of people do not have access to technology or the educational background or support to develop skills in using technology (Madon, Reinhard, Roode, & Walsham, 2009). It is therefore necessary for South Africa to focus attention on the digitally excluded and allocate funding accordingly.

A South African market segmentation tool based on digital inclusion will empower organisations to better understand their markets, which will facilitate marketing and advertising decision-making. According to a study done by Arnaldi, Boscolo, and Stamm (2010), new and enabling technologies are forecasted to play a key role in shaping the future society and virtual worlds will become increasingly important in all areas of life.

The study aimed to understand the digital environment of South Africa by creating a digital divide measurement which measures the digital divide. The index was then applied to profile various levels of digital access in term of individual attributes and geographical regions. A risk group was identified where individuals have limited digital access. And lastly was the index applied to 2009 data to determine whether the digital divide has been growing or narrowing between 2009 and 2010.

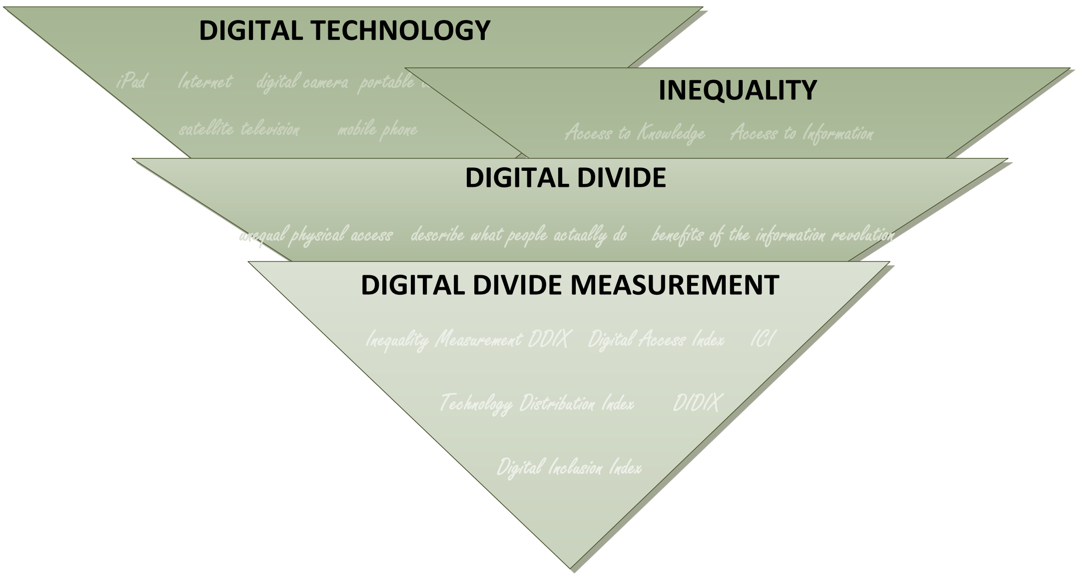
CHAPTER 2: THEORY AND LITERATURE REVIEW

2.1 INTRODUCTION

The impact of inequality in access to information is not a new field of enquiry. Theorising the digital divide originated from knowledge diffusion research of the 1970s (Husing & Selhofer, 2004). The knowledge gap hypothesis stated that: "segments of the population with higher socio-economic status tend to acquire information at a faster rate than the lower status segments so that the gap in knowledge between these segments tends to increase rather than decrease" (Tichenor, Donohue, & Olien, 1970, p.159). The focus of this study is to categorise similar digital access profiles in order to determine who has access to information through various digital platforms.

This chapter provides an extensive literature review that explores why digital access is important, defines the digital divide, provides a framework for the digital divide and looks at the current elements of the digital divide. The last section of the chapter looks at current ways of measuring the digital divide and how to construct an appropriate index. The figure below serves as a roadmap through the literature review.

Figure 2: Literature Review Roadmap



2.2 DIGITAL TECHNOLOGY DEFINITION

> *"Technology is not like anchovies, which some people can love and others hate, nor is it like the right to abortion, which some are for and others are against. Rather, it is an indelible feature of our cultural environment – one we must strive to understand in all its grey-shaded complexity"* (Shapiro, 1999, p.xvi).

Corrocher and Ordanini (2002) noted that the term *digitalisation* belongs to those concepts that are too wide to be represented and described well by a synthetic and precise definition. In pure technical terms, the term *digital* is defined by the online Oxford Dictionary as an adjective of signals or data. It is expressed as series of the digits 0 and 1, typically represented by values of a physical quantity such as voltage or magnetic polarization relating to, using, or storing data or information in the form of digital signals (Oxford University Press, 2011).

There are many definitions of *technology*. Technology is defined as a means to fulfil a human purpose (Arthur, 2007). The online Oxford Dictionary defines technology as the application of scientific knowledge for practical purposes (Oxford University Press, 2011). Technology can refer to something explicit like a motor vehicle or to something hazy like the Internet. Technology is also a "double-edge sword" (Hilbert, 2010, p.756). Technology is both the parent of technology because it is the creator of wealth and development, but also the child because technology stems from technology (Hilbert, 2010).

From the definitions above, when combing the term 'digital' and 'technology', digital technology refers to technology that uses digital signals or data as a platform. Digital technology can be defined as a means to fulfil a human purpose through utilising digital signals or data. Digital technology can refer to devices like mobile phones or services like the Internet. Information and Communication Technology (ICT) is encapsulated in digital technologies if they are based on a digital platform. Section 2.6.1 discusses the various digital technologies that form part of this study.

2.3 INEQUALITY

Inequality has many levels and impacts various aspects of life such as income, skills, education, opportunities, happiness, health, life expectancy, welfare, assets and social mobility (Heshmati, 2006); and now in the information and knowledge age, digital inequality has come into existence. The primary concern surrounding digital inequality is that it provides improved access to goods and services as well as the ability to enhance life chances through access to digital platforms that provide access to education, jobs, and higher incomes (DiMaggio & Hargittai, 2001). Digital technologies have already penetrated so many facets of our lives that access to technology has even become a dimension of social inclusion (Husing & Selhofer, 2004). According to Selwyn (2002) social exclusion is a far wider concept than poverty. Burchardt, Le Grand and Piachaud (1999) recognised an individual as socially excluded “if (a) he or she is geographically resident in a society and (b) he or she does not participate in the normal activities of citizens in that society” (p. 230).

There is a real concern that individuals without access to information technology may be disadvantaged (Dewan & Riggins, 2005; Jaeger, 2004; Wei, Teo, Chan & Tan, 2010) and of specific concern to governments is the lack of access by the youth, which can exacerbate social stratifications in the information era (Ching, 2005; Selwyn, 2004; Warschauer, 2003; Wei et al., 2010). Even after the implementation of policies to increase access to digital technology in the United Kingdom (UK) by providing public Internet access points, there is still evidence of social divisions in digital technology use and engagement in that country (Sinclair & Bramley, 2010).

Concerns around digital inequality were first recognised when researchers measured access to technology between countries and between developed and developing nations (Selwyn, 2002). In order to fully grasp the concept of digital inequality, the next section considers the effect of inequality in access to knowledge and also information.

2.3.1 Access to Knowledge

"A knowledge gap by definition implies a communication gap and a special challenge in resolving social problems" (Tichenor et al., 1970, p.170).

The digital divide is closely related to the larger issue of social inequality (Attewell & Gates, 2001; DiMaggio, Hargittai, Neuman, & Robinson, 2001; Vehovar et al., 2006 and Warschauer, 2003). Rao (2005) and Schleife (2010) elaborated that the digital divide is an amplifier of economic and social divides. To ensure a decrease in the current social inequalities, the digital divide needs to be turned into a digital dividend (Rao, 2005), by connecting individuals to a universe of knowledge and learning (Gunkel, 2003). Harrison, Waite and Hunter (2006) found that Internet usage makes consumers feel empowered and adds significant gains through access to information which leads to knowledge and understanding. The only way to expose individuals to this universe of knowledge is to grant them access to information through the Internet because knowledge forms part of the commons of society (Fuchs, 2010).

Jung, Qiu and Kim (2001) and Van Dijk (2006) questioned the difference of inequalities of access to and use of ICT as compared to other scarce resources. Jung et al. (2001) illustrated that there are two contradictory sides to inequality in access to the Internet: on one side, there are the people who believe that disparity is inevitable and will narrow as diffusion increases; on the opposing side are the people who believe that various inequalities will persist and may even increase in the process of diffusion.

Van Dijk (2006) answered the afore-mentioned question by saying that if it is believed that the current information society is fruitful and beneficial to humanity, attention should be focused on the effects of access to information as it may be a source of inequality.

Inequality in access to knowledge has not changed much over the last 40 years. Tichenor et al. (1970) completed a study on mass media flow and differential growth in knowledge. He tested a few events that were widely covered in the printed media and stated that mass media in 1970 were reinforcing or increasing existing inequalities. He continued to say that “other mass information delivery systems are required if lower-status segments of the population are to avoid falling further behind in relative familiarity with events and discoveries of the day” (p.170).

2.3.2 Access to Information

The impact of having access to, or using information is not at all new (Husing & Selhofer, 2004). Arrow (1962) said that “information is a commodity with peculiar attributes…and any information obtained, should, from a welfare point of view be available free of charge (excluding the transmission costs)” (p.616-617). Arrow (1962) further argued that by applying the basic supply and demand theory, the demand for information will not be optimal if the price of obtaining the information is above zero. The information age will provide economic opportunity and growth but it is only destined to those with access to these technologies (Mariscal, 2005).

The notion of access to digital technology is not one dimensional. DiMaggio and Hargittai (2001) redefined access to the Internet by saying that access is no longer about who can find a network connection at home, work or at the community centre, but rather what people are able to do when they access the Internet. Similarly, it is believed that equal Internet access does not guarantee equal Internet usage, and it is important to determine not only who is using the Internet but moreover how or in what way the Internet is used (Brandtzaeg, Heim & Karahasanovic, 2011).

The South African government perceives universal access as access to a telephone within 30 minutes travelling distance (Jensen, 2000; cited by Mutula, 2008). The universal term has been expanded and now includes Internet access facilities (PANOS, 2004; cited by Mutula, 2008). The Internet is not only a communication medium or a social networking platform, but is becoming more important because it serves as a market place. Greater levels of intimacy will emerge between individuals and business because business has more information about individuals (Orange, 2011). Not only will consumers be in more control than ever before, business will be forced to engage in "greater transparency and openness" (Orange, 2011, p.41).

2.4 Defining the Digital Divide

It is unclear who coined the term the "digital divide" but it has been widely discussed in literature since the mid-1990s. The digital divide can be defined as the difference between those who have access to ICT resources and those who do not (Atkinson et al., 2008; Gunkel, 2003). There is no consensus on the definition of the digital divide after years of debate by experts in public policy, communications, philosophy, social sciences, and economics (Dewan & Riggins, 2005).

Van Dijk (2006) stated that the term "digital divide" has perhaps caused more confusion than clarification. Warschauer (2003) further argued that the term "digital divide" is unclear and confusing because the word "divide" suggests a bipolar division, meaning that individuals are either connected or not. Vehovar et al. (2006) added that it is not a binary, yes or no answer and this study also assumes that each individual has a level of digital access and not a simple yes or no status.

There are two main differences in the available definitions of the digital divide. The first difference is the technologies that are included in the definition. Attewell and Gates (2001) defined the digital divide as the technology gap between individuals that have access to PC's and the Internet. The definition which Fuchs and Horak (2008) used focused on unequal access to only new technologies. Dewan and Riggins (2005) extended their definition to include all digital technologies. Dewan and Riggins (2005) defined the digital divide as the separation between those who have access to digital Information and Communications Technology (ICT) and those who do not. The second discrepancy in the definition of the digital divide is in inequity type. Rao (2005) defined the digital divide as the gap in opportunities, while Smith (2010) emphasized on the gap in benefits. Dewan and Riggins (2005) defined the digital divide as the gap between those who have access to digital technologies.

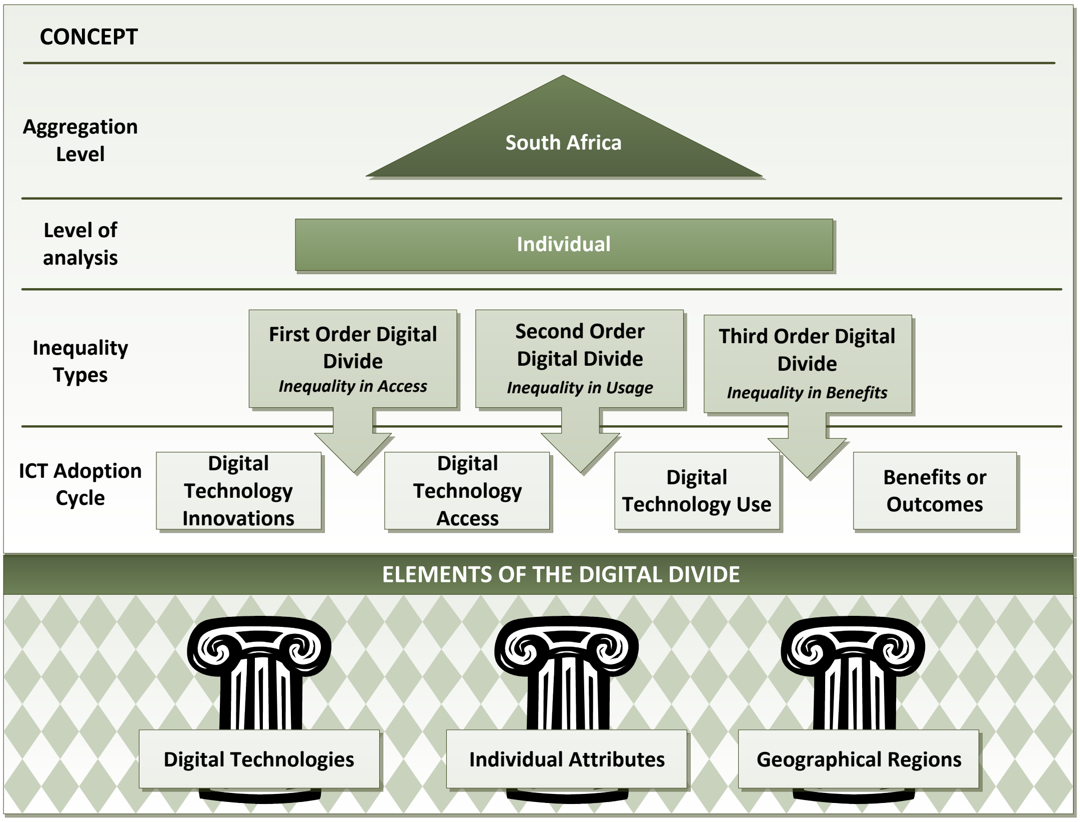
The definition for the purposes of this study is that the digital divide refers to the inequality in access to digital technologies. The focus on mere access to digital technology is discussed and is labelled as the first level digital divide. In the section below, a framework of the digital divide is provided and each concept is then discussed.

2.5 DIGITAL DIVIDE FRAMEWORK

The examination and interrogation of the digital divide from various perspectives is to accurately understand its multifaceted nature, which is essential in order to have a clear conceptual foundation on which to base the digital divide (Vehovar et al., 2006). The conceptual framework in the figure below has been adapted from Dewan and

Riggins (2005) by including the aggregation level (Vehovar et al., 2006) which can be seen as the highest level focus of the study. The conceptual framework was further adapted by the introduction of the third order digital divide as defined by Wei, Teo, Chan and Tan (2010) in addition to the first and second order digital divide.

Figure 3: Conceptual Framework of the Digital Divide



Source: Adapted from (Dewan & Riggins, 2005, p.6; Vehovar et al., 2006, p.286 and Wei et al., 2010, p.171).

The following section explains each component of the digital divide conceptual framework.

2.5.1 Aggregation Level

The aggregation level of the digital divide conceptual framework can be seen as the highest level focus of the study. Vehovar et al. (2006) provided examples of aggregation levels as regional, national, international and global. Heshmati (2006) used the same three levels of aggregation namely, global, international and intra-national in his income distribution analysis. In this study the aggregation level was selected as national. South Africa is therefore the high level focus of the digital divide measurement and no other countries was included in the study.

2.5.2 Level of Analysis

The lowest level of observation or the granularity of the data is referred to as the level of analysis. Examples of the level of analysis include individuals, households and companies (Vehovar et al., 2006). Dewan and Riggins (2005) added global levels as another level of analysis. Vehovar et al. (2006) said that although there is an obvious aggregation and hierarchy between these levels, there are “unique questions of interest at each level of analysis” (p.5). The level of analysis in this study is individuals. Many studies have been done on macro level, measuring the digital divide between countries (Billon et al., 2010; Chinn & Fairlie, 2007; Corrocher & Ordanini, 2002; Fuchs & Horak, 2008; Howard et al., 2009; James, 2009b; Vicente Cuervo & Lopez Menendez, 2006 and Vicente & Lopez, 2011), but research on an individual level is limited; hence the need for this study.

2.5.3 Inequality Types

“The digital divide is a phenomenon linked not only to the topic of access to the Internet, but also to the one of usage and usage benefit” (Fuchs & Horak, 2008, p.99). There are currently three levels of inequality types when looking at the digital divide. The first order digital divide refers to inequality in access to technology, the second order digital divide refers to inequality in the ability to use the technology (Dewan & Riggins, 2005) and the third order digital divide refers to inequality of outcomes or benefits from using the technology (Wei et al., 2010). The first order digital divide will eventually disappear when ICT becomes universally accessible (Vehovar et al., 2006). The second order digital divide will then become more important than the first order digital divide due to more people gaining the ability to use ICT, the benefits or outcomes derived from the technology will be most significant (Dewan & Riggins, 2005).

There is a hierarchy of needs towards digital technology as digital technology integrates more into society. It is important to understand that mere access to digital technology is only the first step towards a fruitful digital society. The next section explains each level in the hierarchy of digital needs.

2.5.3.1 Inequality in Access – The First Order Digital Divide

The first order digital divide refers to the unequal physical access to digital technologies or the differences among those who have access and those who do not and most of the current research focused on physical access (Van Dijk, 2006; Hargittai, 2002). Variation in the level of digital access occurs when new digital technologies become available in the market (Dewan & Riggins, 2005). This is because there is a difference in the rate in which individuals, organisations and countries adopt these technologies (Dewan & Riggins, 2005). The first step towards adoption of a new technology is to gain access.

Husing and Selhofer (2004) mentioned that because of the rapidly changing technological environment, access to information is now more prone to happen from a mobile device which is becoming a substitute for a home Personal Computer (PC). Present day digital technologies will soon be available to all because digital technology is “getting cheaper and easier to use by the day” (Van Dijk, 2006, p.232). But, access to digital technologies is never enough to ensure productive use (Dimaggio et al. 2004) and even motivation and skills do not guarantee actual use (Van Dijk, 2006). This leads to the next level in the hierarchy of digital needs and second order digital divide.

2.5.3.2 Inequality in Usage – The Second Order Digital Divide

The pressing issue is no longer access, but rather "what are people doing and what are they able to do, when they go online" (Dimaggio, Hargittai, Celeste, & Shafer, 2004, p.28). Measuring the usage or functionality rather than the technology will be a more suitable indicator. Van Dijk and Hacker (2003) stated that even in the Netherlands, one of the most digitised countries in world, more than a third of the population in 1998 had little or no digital skills. Even aspects such as the way in which individuals connect to the Internet has an influence (Dewan & Riggins, 2005). Davison and Cotten (2003) found a substantial difference in the Internet usage between users using broadband and dial-up Internet connections.

Atkinson et al. (2008) stated that even basic digital access will allow individuals to use electronic mail and the more advanced ICT services will increase that level of sophistication. This is echoed by Van Dijk (2006) who stated that an "active and creative use of the Internet, that is, contributions to the Internet by users themselves, is a minority phenomenon" (p.230). Most of the interaction on the Internet is passive and consuming whereas active contributions include "publishing a personal website, creating a weblog, posting a contribution on an online bulletin board, newsgroup or community and perhaps, in a broad definition, exchanging music and video files" (Van Dijk, 2006, p.230).

This level of the hierarchy of digital needs explains that the use which includes both passive and active use is the next level of ensuring a fruitful digital society. The second order digital divide considered that mere access to digital technologies do not guarantee actual use. The next level or third order digital divide goes even further by considering the benefits obtained from the use of digital technologies.

2.5.3.3 Inequality in Benefits or Outcomes – The Third Order Digital Divide

Gunkel (2003) argued that the Internet "is not an unqualified and unquestioned human good", but that it could be beneficial in some "highly-specific sociocultural situations" (p.508). Gunkel (2003) continued to say that "unlike clean water, nutritious food, and adequate shelter, the value of this technology has been determined by unique circumstances that are only applicable to a small fraction of the world's population" (p.508). Contradictory to Gunkel (2003), Mariscal (2005) argued that the benefits of the information revolution are boundless and that it "promises to provide economic opportunity, growth and democratic communication" to everyone (p.409). But whether digital technology is destined to everyone, users of technology have to actively engage to give meaning to digital technologies (Vehovar et al., 2006).

Dimaggio et al. (2001) found that information is a centrally important determinant of life chances. However, Anderson and Tracy (2001) stated that "applications and services delivered via the Internet are not changing the way people live their lives in a simple, straightforward manner, but are supporting and enhancing their existing lifestyles, whatever those lifestyles may be" (p.458). Mere access to new technologies will not be sufficient to prevent the widening of a digital knowledge gap but it is nevertheless a necessary prerequisite (Husing & Selhofer, 2004). The digital divide measurement created in this study is on the first order digital divide, because it forms the basis of and the prerequisite for the following levels. The next step will then be to measure the second and third order.

2.5.4 ICT Adoption Cycle

The adoption and dissemination of digital technologies is a phenomena of interest, because the diffusion of ICT innovation is at the heart of the digital divide and that the ICT adoption cycle represents that process (Dewan & Riggins, 2005). The ICT adoption cycle consists of ICT Innovations, ICT Access and ICT Use, and is discussed in terms of inequality (Dewan & Riggins, 2005). The ICT adoption cycle impacts levels of digitisation directly because as new technologies introduced to the market, the new technology needs to be adopted, used and benefits should be obtained through actual use.

The following section describes the elements of the digital divide and inputs to the digital divide measurement. These elements describe the inequality in access to digital technologies. It is also the final component of the digital divide conceptual framework.

2.6 Elements of the Digital Divide

DiMaggio and Hargittai (2001) stated that access to a new technology, like the telephone, the television or the Internet is only accessible to a select few at first. The element that describes digital access include access to digital devices, individual attributes and environmental factors. These elements are the catalysts and characteristics of the digital divide.

The digital divide has a multifaceted character (Billon, Marco, & Lera-Lopez, 2009). Due to the many elements that define the digital divide there is a large amount of literature surrounding almost every aspect of this topic. Variables include income, level of education, type of household, age, gender, race, language, ethnicity, labour-force participation, physical disabilities, skills, spatial issues, occupation, trust, Gross Domestic Product (GDP), autonomy of use, social support, number of young people and infrastructure (Atkinson et al., 2008; Bagchi, 2005; Dewan & Riggins, 2005; DiMaggio & Hargittai, 2001; Husing & Selhofer, 2004; Schleife, 2010 and Vehovar et al., 2006). DiMaggio and Hargittai (2001) divided the digital divide into five dimensions including equipment, autonomy of use, skill, social support, and the purpose of using digital technologies. However, Schleife (2010) differentiated only between two kinds of characteristics namely, individual characteristics and regional characteristics. Hence the characteristics of the digital divide for this study are broken into three categories. The first element is technology, the second element is individual characteristics and the third element is geographical regions.

The digital divide identifies advantaged and disadvantaged individuals and groups within a community in terms of access to digital technologies (Atkinson et al., 2008). In order to profile these groups of individual with similar levels of digital access, various individuals attributes and geographical regions were identified to sketch these groups. The elements below therefore also profiles the characteristics of individuals with similar levels of digital access according to the digital devices they use, their individual attributes and their geographical locations.

2.6.1 Digital Technologies: Digital Divide Element

*"There is no reason anyone would want a computer in their home."*Ken Olson, President, Chairman, and Founder Digital Equipment Corporation 1997. (Venkatesh & Brown, 2001, p.71)

Vehovar et al. (2006) argued that to fully understand the complex nature of the digital divide, all factors should be taken into account when it comes to technologies because researchers should look at all digital devices such as PCs, Internet and mobile technology. Billon et al. (2010) added that different technologies show different patterns of diffusion and that the analysis of a single technology does not provide much information about the level of digital development within a country. One of the reasons for the complexity of the digital divide is the multiple technologies that are available (Vehovar et al., 2006) and International Telecommunication Union (2003) stated that "no single indicator is sufficient to measure access to the information society" (p.20).

In the developing world, in countries like South Africa, older technologies such as electricity, the telephone and television have not yet been widely adopted (Fuchs & Horak, 2008), while in developed countries these technologies have already saturated the market (Vehovar et al. 2006). Popular personal digital devices that are currently available in the South African market are listed in the table below as well as the authors that have included the device in prior digital divide studies. In this study the digital inclusion measurement is based on various different digital devices or technologies, some of which have been used in prior studies and some not. But no study that uses a variety of technologies to create an index has been found.

Table 1: List of technologies included in the study

NO:	DIGITAL TECHNOLOGIES:	AUTHORS OF PRIOR DIGITAL DIVIDE STUDIES:
1	Television	(Vehovar et al., 2006) (Venkatesh & Brown, 2001) (Quibria, 2003)
2	Satellite television	(Corrocher & Ordanini, 2002)
3	DVD player	No reference
4	Mobile phone	(Venkatesh & Brown, 2001) (Quibria, 2003) (Corrocher & Ordanini, 2002) (Bagchi, 2005)
5	Personal computer	(Vehovar et al., 2006) (Dewan & Riggins, 2005) (Chinn & Fairlie, 2007) (Corrocher & Ordanini, 2002) (Bagchi, 2005) (Bagchi, 2005) (Venkatesh & Brown, 2001) (Quibria, 2003)
6	Digital camera	No reference
7	Portable music player	No reference
8	Video or portable gaming console	No reference
9	Global positioning system	No reference

	(GPS)	
10	e-book reader	No reference
11	Tablet computer	No reference
12	Electricity	(Rao, 2005)
13	Internet	(Vehovar et al., 2006) (Dewan & Riggins, 2005) (Chinn & Fairlie, 2007) (Corrocher & Ordanini, 2002) (Bagchi, 2005) (Venkatesh & Brown, 2001) (Quibria, 2003)

Even though electricity is not a digital device, access to digital devices are constrained by infrastructure parameters such as electricity (Rao, 2005). Access to electricity is therefore an important element in determining access to other digital devices. Similarly, access to the Internet through a digital device adds an additional dimension of benefits. Mere access to a personal computer or mobile phone does not guarantee Internet access and access to Internet is included to the list digital technologies. Video games, computer games and the Internet form part of children's everyday lives in the Western world whether they have access or not (Aarsand, 2007).

Hüsing and Selhofer (2004) explained that because of the rapidly changing technological environment, access to information is now more prone to occur from a mobile device which is becoming a substitute for a personal computer at home. Measuring access to a personal computer will soon become obsolete. This phenomenon is referred to as leapfrogging. Davison, Vogel, Harris and Jones (2000) define leapfrogging as "the implementation of a new and up-to-date technology in an application area in which at least the previous version of that technology has not been deployed" (p.2). New technologies should be incorporated into the indices continuously. Padayachie (2011) further highlighted that even though mobile communications have had unprecedented growth rates in recent years, Internet connectivity to the home remains low. Broadband penetration in South Africa stands at approximately 5per cent of the population (Padayachie, 2011, par. 13).

Because access to digital technology is the prerequisite in obtaining any use and benefits from the digital environment, access to various digital technologies is the foundation of the index. The level of digital access of an individuals will be directly proportional to the number of digital technologies an individual has access to. A wide range of digital technologies are included to ensure that the index is comprehensive.

Akhter (2003) found that when looking at the product adoption process two types of characteristics are commonly studied: personality traits and demographic characteristics. The following two sections titled individual attributes and environmental factors respectively, will help to explain and contextualise the digital access divide.

2.6.2 Individual Attributes: Digital Divide Element

Individual attributes refer to the attributes that describe the user. According to Atkinson et al. (2008), the digital divide identifies advantaged and disadvantaged individuals and groups within a community in terms of access to ICT services. Atkinson et al. (2008) continued by saying that the available literature has identified a range of socio-demographic characteristics of individuals with different levels of access and use of ICT. Van Dijk and Hacker (2003) found that income, education and employment are strongly associated with the digital divide. In addition, Schleife (2010) stated that an individual's age is also important. Husing and Selhofer (2004) elaborated and examined the digital divide by looking at four socio-economic variables including gender, age, income and education. Husing and Selhofer (2004) added that ethnicity, labour-force participation and spatial issues are crucial dimensions to consider but they did not have access to appropriate data. For a future wish-list they recommended also analysing attitudes towards IT, open-mindedness, frequency of usage and skills or experience (Husing & Selhofer, 2004).

The previous literature that has been highlighted, suggested that a number of attributes affect individuals' access and usage of digital technologies. This study analysed which individual attributes describe the users and which socio-demographic attributes of people influences access to digital technologies. This exercise highlights and profiles potential risk groups. The following individual attributes, shown in Table 2, are used in this study to describe different levels of digital access.

Table 2: Individual attribute characteristics

INDIVIDUAL ATTRIBUTE:	AUTHORS:
1. Age	(Hüsing & Selhofer, 2004) (Atkinson et al., 2008) (Schleife, 2010)
2. Education	(Bagchi, 2005) (Hüsing & Selhofer, 2004) (Atkinson et al., 2008) (Schleife, 2010) (Dewan & Riggins, 2005) (Chinn & Fairlie, 2007) (Bagchi, 2005)
3. Personal Income	(Schleife, 2010) (Atkinson et al., 2008) (Rao, 2005)
4. Household Income	No reference
5. Occupation	(Schleife, 2010)
6. Gender	(Atkinson et al., 2008) (Hüsing & Selhofer, 2004) (Rao, 2005)
7. SAARF LSM	No reference

The SAARF LSM is a living standards measure and has become a widely used segmenting tool in the South African market (SAARF, 2009). The attribute is included to illustration the influence of living standard on digital access levels.

2.6.3 Geographical Regions: Digital Divide Element

Bagchi (2005) used several indicators in the study of the digital divide phenomenon and found that the chosen indicators impacted the digital divide measurement in different ways across various nations and over time. These significant indicators included trust, GDP and infrastructure. Bagchi (2005) continued by saying that the indicators which impact the digital divide are not the same for developing and industrialised nations in a given year. In addition, Howard, Anderson, Busch and Nafus (2009) found additional factors such as telecommunication infrastructure, telephone access cost, the country's economic structure, and human capital, can best explain the digital divide. Rao (2005) added rural or urban and geographic location to the indicators. In this study, the measure is created on an individual level for citizens within South Africa; therefore these factors are not relevant.

Hindman (2000) conducted a study to determine adoption and use of information technologies among resident in metropolitan areas and nonmetropolitan areas. He found that other variables such as education, income and age had a more closely relationship with digital access levels. According to Schleife (2010) is geographical diffusion of the Internet twofold, it is firstly determined the decision of individuals to adopt the Internet and secondly determined by the decision business to supply Internet connectivity in a specific region.

Due to the vast differences in the economic and social structure within the provinces of South Africa, the measurement includes two geographical regions, province and metropolitan area. The community size is also provided for better understanding of the geographical region. The three variables in Table 3, below, are included in the measurement in this study. These variables enable the identification of risk areas or geographical regions where access to digital technologies is low.

Table 3: Geographical Regions

REGIONS:	OPTIONS:	AUTHORS:
1. Community Size	The community size definitions - based on all population groups - are: **Population:** 1. Metropolitan areas (250 000 or more) 2. Cities (100 000-249 999) 3. Large towns (40 000-99 999) 4. Small towns (8 000-39 999) 5. Large villages (4 000-7 999) 6. Small villages (500-3 999) 7. Settlements (Less than 500) 8. Non-urban	(Quibria, 2003)
2. Metropolitan Area	1. Cape Town 2. Cape Town Fringe Areas 3. Port Elizabeth / Uitenhage	(Chinn & Fairlie, 2007) (Bagchi, 2005) (Hindman, 2000)

	4. East London 5. Durban 6. Bloemfontein 7. Greater JHB (excl. Soweto) 8. Reef (Urban Gauteng excl. Jhb, Pta, Vaal) 9. Pretoria 10. Kimberley 11. Pietermaritzburg 12. Soweto 13. Vaal 14. Welkom 15. East Rand 16. West Rand	
3. Province	1. Western Cape 2. Northern Cape 3. Free State 4. Eastern Cape 5. Kwazulu-Natal 6. Mpumalanga 7. Limpopo 8. Gauteng 9. North West	No reference

These variables enable the identification of risk areas or geographical regions where access to digital technologies is low.

2.7 Digital Divide Measurement

"Count what is countable, measure what is measurable, and what is not measurable, make measurable" by Galileo Galilei (Kaydos Wilfred, 1999, p.20).

2.7.1 Introduction

Vehovar et al. (2006) said that the digital divide typically relates to socio-demographic differences in use of digital technologies, but current digital divide measurement is relatively imprecise and often only measures inequality in Internet access. Many different indices, tools and instruments have been developed to measure the digital divide over the last few years (Mutula, 2008; Vehovar et al., 2006) and all these indices are different in focus. A major difference in focus is the level on which the index was created.

Zandvakili (2008) stated that regardless of the motivation for an investigation into inequality, it is important to select an appropriate measure because some policy decisions are based on the result of these measures. The most common inequality index is the Gini coefficient. Heshmati (2006) stated that the Lorenz Curve is the standard approach used to analyse the inequality of income. According to Moyes (2007), the Gini coefficient and the Lorenz quasi-ordering are certainly the two tools used most often by economists for measuring inequality. In the case of the Gini coefficient, only one variable (income) is considered which would not be appropriate in this study. In order to develop a comprehensive, multidimensional, digital inequality measurement, various variables need to be considered and these standard inequality measures are not suitable.

The next section starts with a discussion on two indices which were developed on multinational level, the Digital Access Index (DAI) and the Technology Distribution Index (TDI). The section thereafter looks at indices developed on an individual level. Even though the study proposes an index on individual level, it is important to obtain an understanding of what is measured on a multinational level in order to understand the positioning of the index. Most studies found in literature were conducted on a multinational level where countries are compared between each other.

2.7.2 Measurements on Multinational Level

2.7.2.1 Digital Access Index (DAI)

International Telecommunication Union (2003) agreed that "no single indicator is sufficient to measure access to the information society" (p.20). The DAI took various indictors into account and are listed in Table 4, below. The ratio for each indicator is calculated against the target identified and then multiplied by 0.2, all the ratios are then added together to provide a number out of 1 (International Telecommunication Union, 2003).

Table 4: Indicators of the DAI

NO:	WEIGHT:	INDICATOR:	TARGET:
1	0.2	Fixed telephone subscribers per 100 inhabitants	60
		Mobile subscribers per 100 inhabitants	100
2	0.2	Adult literacy	100
		Overall school enrolment (primary, secondary and tertiary)	100
3	0.2	Internet access price (20 hours per month) as percent of per capita income	100
4	0.2	Broadband subscribers per 100 inhabitants	30
		International Internet bandwidth per capita	10000
5	0.2	Internet users per 100 inhabitants	85

Source: (International Telecommunication Union, 2003)

The result of this index is to list all the countries into four bands, high access (index between 0.7 – 1.0), upper access (0.5 – 0.69), medium access (0.3 – 0.49) and low access (0 – 0.29) (International Telecommunication Union, 2003). South Africa is listed in the middle band, with a score of 0.45 (International Telecommunication Union, 2003). But this score of 0.45 is not sufficient to make decisions regarding policies and allocation of resources. The DAI score is a mere indications of South Africa's position of digital inclusion compared to other countries.

2.7.2.2 Technology Distribution Index (TDI)

Howard et al. (2009) created the Technology Distribution Index (TDI). This index relates to the number of Internet and personal computer users in comparison with the GDP of each country. This determines if the country's supply of information technology is in balance with its share of global economic product. The index is created using a ratio of two other ratios (Howard et al., 2009). For each country, the proportion of PCs is determined and then divided by the proportion of GDP in relation to the world's GDP. The TDI is expressed as:

Equation 1: The Technology Distribution Index ratio

$$\text{Ratio of ratios}_{\mathrm{T}} = \frac{\dfrac{\mathrm{PC}_{\text{country}}}{\sum_{\text{world}} \mathrm{PC}}}{\dfrac{\mathrm{GDP}_{\text{country}}}{\sum_{\text{world}} \mathrm{GDP}}}$$

Source: (Howard et al., 2009)

Howard et al. (2009) found that some countries with low GDP levels have higher than expected digital technology users and also that some countries with high GDP levels have lower than expected digital technology users. This index still does not provide any information regarding the level of digital access within a country. The index rank countries according the achievement of the expected technology distribution.

2.7.2.3 Summary of Measurements on a Multinational Level

As seen from the discussion on the Digital Access Index and the Technology Distribution Index the output from indices on macro level only provides information regarding the ranking of a country in relation to other countries. The measurement expected from this study aims to provide information not only to identify the current level of digital access but also to identify the risk group where individuals have limited digital access. Over and above the two indices discussed above, there are more digital divide studies that have been conducted on a multinational level. Appendix A contains a summary of some of the key digital divide measurements on a multinational level.

2.7.3 Digital Divide Measurement on an Individual level

Not many studies have been conducted on an individual level. Three digital divide indices created on an individual level are discussed in the section below and illustrates both the advantages and limitations of current digital divide measurements on individual level.

2.7.3.1 The Internet Connectedness Index (ICI)

The Internet Connectedness Index (ICI) is a measure to monitor the long-term inequalities in the quality of Internet connections among users (Jung et al., 2001). Jung et al. (2001) focused mainly on Internet connectivity but also included PC ownership, type of tasks performed, where Internet is accessed from and benefits obtained. Income and education are used to determine socio-demographic differences. Jung et al. (2001) further stated that the purpose of the measurement is to gauge the post-adoption aspects of Internet diffusion.

The study found that individuals who have higher levels of education and income are more likely to be connected to the Internet, as well as individuals that are younger and male. Only one indicator, the Internet, is considered in this index which provide a narrow view. Findings based on socio-demographic differences provides interesting information regarding the individuals within the country.

2.7.3.2 Digital Divide Index (DDIX)

Selhofer and Hüsing (2002) created a digital divide index, named the DDIX, where four socio-economic factors (gender, age, income and education) are measured against four indicators. The four indicators are percentage of computer users, percentage of computer users at home, percentage of Internet users and percentage of Internet users at home. Selhofer and Hüsing (2002) further said that an arbitrary weighting was assigned to each indicator to calculate the compounded index. Table 5, below, lists the indictors used to develop the DDIX.

Table 5: Indicators of the DDIX

INDICATOR:	SURVEY QUESTION:	WEIGHT:
Percentage of computer users	Do you use a computer at [different locations given for selection]?	30%
Percentage of computer users at home	Do you use a computer at home?	20%
Percentage of Internet users	Do you use e-mail and/or the Internet at [different locations given for selection]?	30%
Percentage of Internet users at home	Do you use e- mail and/or the Internet at home?	20%

Source: (Selhofer & Husing, 2002)

Selhofer and Hüsing (2002) indicated that education levels may have the biggest impact on Internet usage and that the digital divide did not decrease between 1997 and 2000. Selhofer and Hüsing (2002) created another index, named the DIDIX, for measuring inequality in IT diffusion.

2.7.3.3 Digital Divide Index (DIDIX)

Hüsing and Selhofer (2004) created the DIDIX by using diffusion theory and by applying the S-curve diffusion models. Hüsing and Selhofer (2004) measured four socio-economic variables (gender, age, income and education). The index is created using the following indicators listed in Table 6, below.

Table 6: Indicators of the DIDIX

INDICATOR:	WEIGHT:
Computer users	50%
Internet users	30%
Internet users at home	20%

Source: (Husing & Selhofer, 2004)

Hüsing and Selhofer (2004) presented the divide index as the quotient of two axes, the diffusion disadvantage group and the diffusion population. If the derivative of the quotient in time is positive, it means that the digital divide is becoming narrower. Hüsing and Selhofer (2004) found that the diffusion of Internet users in the European Union population is still in the lower part of the S-curve for all of the dimensions, hence there is still a lot of growth opportunity.

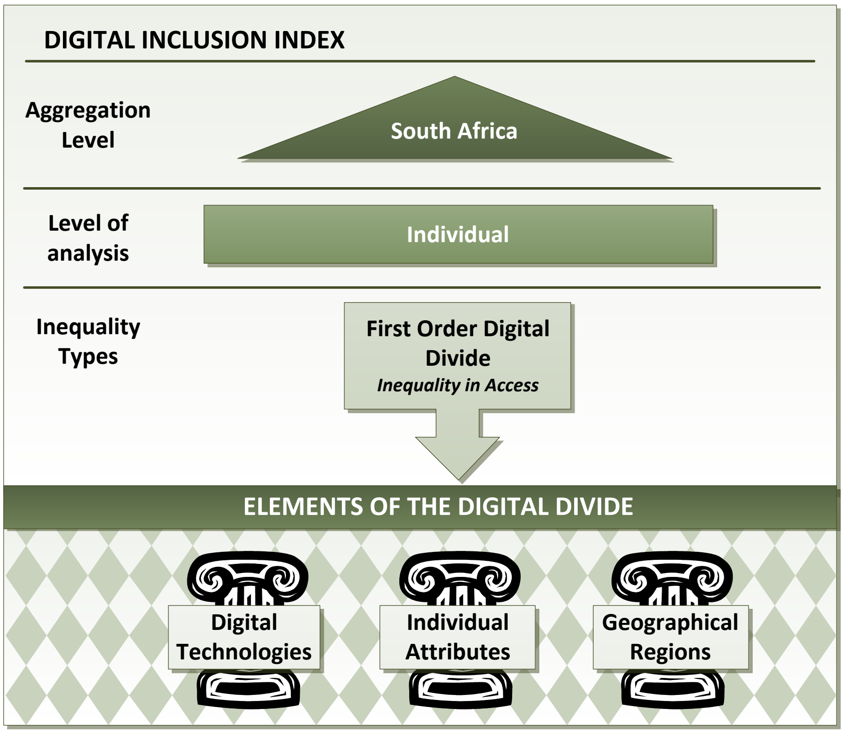
2.8 CONCLUSION

Many studies have been done on macro level, measuring the digital divide between countries (Billon et al., 2010; Chinn & Fairlie, 2007; Corrocher & Ordanini, 2002; Fuchs & Horak, 2008; Howard et al., 2009; James, 2009b; Vicente Cuervo & Lopez Menendez, 2006 and Vicente & Lopez, 2011). Research on individual level is limited because most existing indices measure the digital divide at the international and national level (Dewan & Riggins, 2005). The current focus on the higher levels of analysis short-changes detailed and vitally important data collection, and analysis at more micro levels" (Barzilai-Nahon, Gomez, & Ambikar, 2008). This study proposes an index that measures the digital access levels of individuals in South Africa. This measurement on micro level and the lowest possible granularity of analysis provide information essential to the identification of the risk group where individuals have limited digital access. The index on individual level also enables the profiling of groups of individuals with similar digital access levels.

Barzilai-Nahon (2006) added that two types of indices have been developed for the measurement of the digital divide, focused monotopical indices which are widely available and comprehensive indices which are rare. Comprehensive indices should be promoted over monotopical indices. The digital inclusion index proposed in this study is comprehensive because it takes various digital technologies into account and various attributes are used to profile and clarify the different levels of digital access. According to Vehovar et al. (2006), one of the complexities in choosing the appropriate indicators for measurement is the multiple technologies that are involved. It is also essential for new technologies to be incorporated into the indices continuously.

The digital inclusion index proposed in the study consists of the following components illustrated in Figure 4, below.

Figure 4: Digital Inclusion Index conceptual framework



The Digital Inclusion Index is a digital divide measurement based the individual digital access level of South Africans. The Digital Inclusion Index is based on whether individuals have access to broad scope of digital technologies and provide a level of digital access indicator to each individual. The different levels of digital access are then grouped and profiled according to individual attributes and geographical regions. The main benefit from the index is benchmarking because it would be possible to determine whether the digital divide is narrowing or widening from year to year.

CHAPTER 3: RESEARCH OBJECTIVES

3.1 INTRODUCTION

The objective of the study was to propose the Digital Inclusion Index as a digital divide measurement tool. The measurement was then utilised to profile groups of individuals with similar levels of digital access. The index was then applied to the previous year's (2009) data in order to determine whether the digital divide has been narrowing or widening between 2009 and 2010.

3.2 RESEARCH OBJECTIVE ONE:

a) Create a digital divide measurement tool for South Africa.

b) Profile the index according to the individual attributes of people with similar levels of digital access.

c) Profile the index according to the geographical regions in which individuals resides with similar levels of digital access.

3.2.1 Motivation

This research objective seeks to develop the Digital Inclusion Index based on the level of access individuals have to various digital technologies. Vehovar et al. (2006) argued that to fully understand the complex nature of the digital divide, researchers should look at all digital devices, because "no single indicator is sufficient to measure access to the information society" (International Telecommunication Union, 2003, p.20).

The index is then utilised to profile groups of individuals with similar levels of digital access. These individual attribute profiles enable the identification of potential risk groups where individuals have limited digital access. The digital divide identifies advantaged and disadvantaged individuals and groups within a community in terms of access to digital technologies (Atkinson et al., 2008). Bagchi (2005) articulated that the indicators that impact the digital divide are not the same for developing and industrialised nations in a given year. It is therefore important to determine who the individuals with limited digital access are.

3.3 RESEARCH OBJECTIVE TWO:

a) Determine whether the digital divide is narrowing or widening.

3.3.1 Motivation

According to Mutula (2008) there is no unanimity as to whether the digital divide is narrowing or widening in developing countries including those in sub-Saharan Africa. An index would play an integral role in such debates as it would quantify the extent of the digital divide. DiMaggio and Hargittai (2001) argued that access to a new technology is only accessible to a select few at first. As adoption of the new technology increases, the gap between the haves and the have-nots decreases (DiMaggio & Hargittai, 2001). However, according to the knowledge gap theory it 'should' be widening (Husing & Selhofer, 2004). The proposed index is designed to provide information regarding the trend of digital access.

CHAPTER 4: RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter discusses the research methodology used in this study. The literature review formed the theoretical basis for understanding the complex nature of the digital divide. First, the study seeks to measure the digital divide using a quantitative approach. Various technologies were taken into account to base the Digital Inclusion Index on.

Second, individual attributes that were expected to significantly influence and explain the digital divide were identified through exploratory research on literature. The relationship between these variables and the Digital Inclusion Index was then determined. Atkinson et al. (2008) warned that some indicators may be causally linked to the digital divide and others are simply correlated. Similarly, geographical regions are identified where digital access is lower than in other regions. A quantitative causal (relational) research design was used to establish the relationship between some variables and each category of the Digital Inclusion Index.

4.2 UNIT OF ANALYSIS

There are three levels of analysis on which the digital divide can be measured. The highest level is the global level, the next level is the organisational level and the lowest level is the individual level (Dewan & Riggins, 2005). The unit of analysis is individual South African adult citizens and is thus focused on the collection of data pertaining to the individual (Blumberg, Cooper, & Schindler, 2008).

4.3 POPULATION, SAMPLE SIZE AND SAMPLING METHOD

The population consists of adult residents in private households, hostels, residential hotels or similar accommodation in South Africa which amounts to 34 million citizens (SAARF, 2009). Residents of prisons and hospitals, military personnel on active service and minority sub-populations in certain geographical areas were excluded from the universe (SAARF, 2009). The population, in simple terms, consists of adults in South Africa with residential addresses.

The empirical basis of the study is a large representative sample of adults in South Africa. The sample size achieved was 25,160 individuals which include 12,560 males and 12,600 females (SAARF, 2009). Persons aged 15 years and older were considered adults for the purposes of this study. This definition was borrowed from SAARF (2009), which sought to put forward a definition that included child-headed households (SAARF, 2009).

The SAARF AMPS sample was designed by using multi-stage area stratified systematic probability sampling (SAARF, 2009). The residential addresses are listed on the Nielsen Media Research's geo-frame and alphabetically arranged by suburb name, street name and street number, within each geographic area (SAARF, 2009). The sample was selected in urban areas by using a random starting point and then selecting systematically with a fixed interval every n-th address number (SAARF, 2009). In rural areas where there were no formal addresses, sampling points were selected using global positioning technology (SAARF, 2009).

4.4 DATA COLLECTION

The South African Advertising Research Foundation (SAARF) conducts an annual All Media and Products Survey (AMPS) survey through personal, face-to-face, in-home interviews. SAARF is a non-profit organisation that was founded in 1974 to provide comprehensive, unbiased, valid, reliable and credible media audience and product consumption measures on an on-going basis (SAARF, 2009). The questionnaire covers the use of mass media which includes a battery of questions on Internet and mobile phone usage (SAARF, 2009). SAARF's objective was to measure the audiences of all traditional media in order to provide data for target marketing and to create a benchmark for the value of media space and time.

AMPS was considered the ideal vehicle for monitoring the diffusion of technology. The AMPS survey was representative of the total adult population of South Africa (SAARF, 2009). The survey was conducted through in-home interviews, using laptops with double screen computer assisted personal interviewing (DS-CAPI), to conduct the interviews (SAARF, 2009). The survey includes questions regarding newspapers, magazines, outdoor advertising, cinema, Internet and cell phone usage to name a few (SAARF, 2009). From 2002, information regarding 1500 brands has also been gathered which enriched information on products immensely (SAARF, 2009). AMPS is publically available data as SAARF is a non-profit organisation designed to collect the data on behalf of the South African market.

From 2009, the AMPS survey has been conducting in full national waves twice a year. Results are published every six months in the form of 12-month rolling data which covers the two most recent fieldwork periods. The secondary data obtained from the 2009 and 2010 survey has been used for this study. Two separate indices has been build, one on the 2009 survey results and one on the 2010 survey results. As secondary data is collected for other purposes (Blumberg et al., 2008), only selected questions from the AMPS survey were used for this study.

4.5 SURVEY QUESTIONS

The following questions from the AMPS survey were used in the study. The first set of questions concerns the respondents' technology access, the digital inclusion index is based on these responses. The second set of questions provided individual characteristics about the respondent and the third set provided information regarding the geographical regions of the respondent.

4.5.1 Research Objective One: Develop the Digital Inclusion Index

The following questions from the AMPS survey were identified as technology access indicators. Not all the questions were asked in the same manner and the data had to be recoded in a binary format to provide a yes (1) or a no (0) answer. In some instances more than one question was combined to determine access to a digital technology. This always occurred on an either/or basis. For example if the respondent had access to at least one of the advanced digital technologies the respondent would have access and be coded as yes (1). The table below provides the question and answer format from the AMPS survey as well as notes on the recoding of data; additional information regarding these questions can be found in the Appendix B in Table 366.

Table 7: AMPS Survey Questions for Research Objective One

TECHNOLOGY:	SURVEY QUESTION:	SURVEY ANSWER:	RECODING NOTE:
Electricity Access	By observation: Electricity in home. (Ask if not sure)	Yes/No	Yes/No (1, 0)
Television Access	How many, if any, television sets in working order are there in your household?	Number of television sets	A respondent should have at least one television set to have access. Yes/No (1, 0)
Satellite Television Access	Can your household receive the M-Net channel?	Yes/No	A respondent should have at least one of
	And does your household currently	Yes/No	

	receive any DStv Satellite channels?		these services to have access. Yes/No (1, 0)
	Apart from DStv and/or M-Net and/or TopTV, are there any other decoders currently actively in use in your household?	Yes/No	
DVD Access	Large appliances in household: DVD player?	Yes/No	Yes/No (1, 0)
Mobile Phone Access	Do you personally own, rent or have the use of a cell phone?	Yes/No	Yes/No (1, 0)
Digital Camera Access	Which of the following, if any, do you personally own/use? Digital camera (does not take film)	Yes/No	Yes/No (1, 0)
Personal Computer Access	Large appliances in household: Desktop computer in home?	Yes/No	A respondent should have access to a desktop or laptop computer or should use a computer at least monthly at work or at home. Yes/No (1, 0)
	Large appliances in household: Laptop computer in home?	Yes/No	
	Use of a computer at home: please indicate your personal frequency of each activity, if at all.	Weekly Monthly Yearly Not at all	
	Use of a computer at work: please indicate your personal frequency of each activity, if at all.	Weekly Monthly Yearly Not at all	
Advanced Digital Devices Access	And which of the following, if any, do you personally own or have access to? • Computer games • Car TV / Car DVD player • Handheld portable TV (with live feed) • iPod • iRiver • MP3 player • Portable DVD player • PSP • Sony Diskman • Sony Playstation (1,2,3) • Walkman/portable CD player • X-Box	Yes/No	A respondent should have at least one of the advanced digital devices to have access. Yes/No (1, 0)
Internet Access	Have you personally accessed the Internet/World Wide Web in the past 4 weeks?	Yes/No	Yes/No (1, 0)

4.5.2 Research Objective One, Part B: Individual Attributes Profile

In order to determine the individual attributes profile of each of the categories of the Digital Inclusion Index, the following questions from the AMPS survey were used.

Table 8: AMPS Survey Questions for Research Objective Two

INDIVIDUAL ATTRIBUTE:	SURVEY QUESTION:	SURVEY ANSWER:	RECODING NOTE:
Age	Into which age group do you fall?	• 15 • 16 - 19 • 20 - 24 • 25 – 34 • 35 - 44 • 45 - 49 • 50 - 54 • 55 - 64 • 65+	1 = 15 - 19 2 = 20 - 24 3 = 25 – 34 4 = 35 - 44 5 = 45 - 49 6 = 50 - 54 7 = 55 - 64 8 = 65+
Education	What is the highest level of education you personally have achieved?	• No schooling • Some primary school • Primary school completed • Some high school • Matric (Grade 12) • Artisan's certificate obtained • Post Matric (degrees/ diplomas/ certificates) • Technicon diploma/degree completed • University degree completed • Professional • Technical • Secretarial • Other (STATE)	1 = No schooling 2 = Some primary school 3 = Primary school completed 4 = Some high school 5 = Matric (Grade 12) 6 = Artisan's certificate obtained 6 = Post Matric (degrees/ diplomas/ certificates) 7 = Technicon diploma/degree completed 8 = University degree completed 9 = Professional 10 = Technical 11 = Secretarial 12 = Other
House Hold Income	Please give me the letter which best describes the TOTAL MONTHLY HOUSEHOLD INCOME of all these people before tax and other deductions. Please include all sources of income i.e. salaries, pensions, government grants, income from investments, etc.	A: R1 – R499 B: R500 – R599 C: R600 – R699 D: R700 – R799 E: R800 – R899 F: R900 – R999 G: R1000 – R1099 H: R1100 – R1199 I: R1200 – R1399 J: R1400 – R1599 K: R1600 – R1999 L: R2000 – R2499 M: R2500 – R2999 N: R3000 – R3999	1 = R1 – R499 2 = R500 – R599 3 = R600 – R699 4 = R700 – R799 5 = R800 – R899 6 = R900 – R999 7 = R1000 – R1099 8 = R1100 – R1199 9 = R1200 – R1399 10 = R1400 – R1599 11 = R1600 – R1999 12 = R2000 – R2499 13 = R2500 – R2999 14 = R3000 – R3999

		O: R4000 – R4999 P: R5000 – R5999 Q: R6000 – R6999 R: R7000 – R7999 S: R8000 – R8999 T: R9000 – R9999 U: R10000 – R10999 V: R11000 – R11999 W: R12000 – R 13999 X: R14000 – R15999 Y: R16000 – R19999 Z: R20000 – R24999 ZA: R25000 – R29999 ZB: R30000 – R39999 ZC: R40000 – R49999 ZD: R50000 +	15 = R4000 – R4999 16 = R5000 – R5999 17 = R6000 – R6999 18 = R7000 – R7999 19 = R8000 – R8999 20 = R9000 – R9999 21 = R10000 – R10999 22 = R11000 – R11999 23 = R12000 – R 13999 24 = R14000 – R15999 25 = R16000 – R19999 26 = R20000 – R24999 27 = R25000 – R29999 28 = R30000 – R39999 29 = R40000 – R49999 30 = R50000 +
Personal Income	Please give me the letter which best describes your PERSONAL TOTAL MONTHLY INCOME before tax and other deductions. Please include all sources of income i.e. salaries, pensions, grants, income from investments, etc.	A: R1 – R499 B: R500 – R599 C: R600 – R699 D: R700 – R799 E: R800 – R899 F: R900 – R999 G: R1000 – R1099 H: R1100 – R1199 I: R1200 – R1399 J: R1400 – R1599 K: R1600 – R1999 L: R2000 – R2499 M: R2500 – R2999 N: R3000 – R3999 O: R4000 – R4999 P: R5000 – R5999 Q: R6000 – R6999 R: R7000 – R7999 S: R8000 – R8999 T: R9000 – R9999 U: R10000 – R10999 V: R11000 – R11999 W: R12000 – R 13999 X: R14000 – R15999 Y: R16000 – R19999 Z: R20000 – R24999 ZA: R25000 – R29999 ZB: R30000 – R39999 ZC: R40000 – R49999 ZD: R50000 +	1 = R1 – R499 2 = R500 – R599 3 = R600 – R699 4 = R700 – R799 5 = R800 – R899 6 = R900 – R999 7 = R1000 – R1099 8 = R1100 – R1199 9 = R1200 – R1399 10 = R1400 – R1599 11 = R1600 – R1999 12 = R2000 – R2499 13 = R2500 – R2999 14 = R3000 – R3999 15 = R4000 – R4999 16 = R5000 – R5999 17 = R6000 – R6999 18 = R7000 – R7999 19 = R8000 – R8999 20 = R9000 – R9999 21 = R10000 – R10999 22 = R11000 – R11999 23 = R12000 – R 13999 24 = R14000 – R15999 25 = R16000 – R19999 26 = R20000 – R24999

			27 = R25000 – R29999 28 = R30000 – R39999 29 = R40000 – R49999 30 = R50000 + 31 = No Personal Income 32 = Refused

Occupation	Which one of these statements best describes your working life?	• Working full-time
		• Working part-time
		• Not working
		  • A housewife
		  • A student
		  • Retired
		  • Unemployed
			1 = Working full-time
			2 = Working part-time
			3 = Not working

	What is your occupation i.e. what type of work do you do?	Free text	1 = Processional and Technical 2 = Administrative and managerial 3 = Clerical and sales 4 = Transport and communication 5 = Service 6 = Agriculture 7 = Artisans and related 8 = Production and mining 9 = Not active 10 = Other
Gender	Gender by observation.	Male Female	0 = Female 1 = Male
SAARF LSM	Determined with AMPS data		1 = LSM 1 2 = LSM 2 3 = LSM 3 4 = LSM 4 5 = LSM 5 6 = LSM 6 7 = LSM 7 8 = LSM 8 9 = LSM 9 10 = LSM 10

4.5.3 Research Objective One, Part C: Geographical Regions

The following questions from the AMPS survey were used to establish the geographical region profile for each category of the Digital Inclusion Index.

Table 9: AMPS Survey Questions for Research Objective Three

GEOGRAPHICAL REGIONS:	RECODING NOTE:
Community Size	1 = Metropolitan areas (250 000 or more) 2 = Cities (100 000-249 999) 3 = Large towns (40 000-99 999) 4 = Small towns (8 000-39 999) 5 = Large villages (4 000-7 999) 6 = Small villages (500-3 999) 7 = Settlements (Less than 500) 8 = Non-urban
Province	1 = Western Cape 2 = Northern Cape 3 = Free State 4 = Eastern Cape 5 = Kwazulu-Natal 6 = Mpumalanga 7 = Limpopo 8 = Gauteng 9 = North West
Metropolitan Area	1 = Cape Town 2 = Cape Town Fringe Areas 3 = Port Elizabeth / Uitenhage 4 = East London 5 = Durban 6 = Bloemfontein 7 = Greater JHB (excl. Soweto) 8 = Reef (Urban Gauteng excl. Jhb, Pta, Vaal) 9 = Pretoria 10 = Kimberley 11 = Pietermaritzburg 12 = Soweto 13 = Vaal 14 = Welkom 15 = East Rand 16 = West Rand

4.6 DATA ANALYSIS

In the first phase of analysis, the Digital Inclusion Index was created. The second phase profiled each category of the Digital Inclusion Index according to individual attributes and geographical regions that have a significant relationship to the level of digital access. The intrinsic nature of the Digital Inclusion Index provided insights on whether the digital divide is growing or narrowing and identified a risk group based on individual characteristics and geographical areas where digital access levels are low.

4.6.1 Phase One: Developing the Digital Inclusion Index

The objective of the first phase was to create a scale on which individuals can be rated and compared according to their digital access level. Factor analysis was used to create the Digital Inclusion Index. The main application of factor analysis is to reduce the number of variables and to detect structure in the relationship between variables (Hill & Lewicki, 2005) which makes factor analysis an ideal method for constructing an index. According to Pallant (2010) factor analysis is used extensively in the development of scales. A benefit of these scales is its “ability to represent the multiple aspects of a concept in a single measure” (Hair, Black, Babin, & Anderson, 2009). Another key benefit is that no arbitrary weightings had to be assigned as in the case of the DDIX (Selhofer & Husing, 2002) and DIDIX (Husing & Selhofer, 2004). Factor analysis weightings (factors) were assigned to each case, quantifying the level of digital access of each individual. The scale was based on these factors which formed the base of the Digital Inclusion Index.

Data preparation

The responses per question from the AMPS data were binary coded, Yes (1) when a respondent had access to the technology and No (0) when the respondent did not have access. The Digital Inclusion Index was created using the following technology indicators.

Table 10: Indicators included in the Digital Inclusion Index

NO:	TECHNOLOGY:	ACCESS:
1	Electricity	Yes/No
2	Television	Yes/No
3	Satellite Television	Yes/No
4	DVD	Yes/No
5	Mobile Phone	Yes/No
6	Digital Camera	Yes/No
7	Personal Computer	Yes/No
8	Advanced Digital Devices	Yes/No
9	Internet	Yes/No

The first data analysis method used was factor analysis to combine the access indicators of the various technologies to form one factor. Factor analysis was developed as a means to examine and describe the internal structure of a covariance and correlation matrix (Lawley & Maxwell, 1962). Factor analysis is a data reduction technique to reduce several factors into one. The assumption is that any indication may be associated with any factor (Garson, 2011). According to Garson (2011) there are several different types of factor analysis, one of which is Principal Components Analysis. Principal Components Analysis is the preferred method for data reduction (Garson, 2011) and was used to reduce the level of access to the various technologies into one factor.

Because factor analysis is a technique that tries to identify groups or clusters of variables such that variables in each group are indicators of a common trait or factor (Sharma, 1996), the second step is visual binning to group the factors into different bins or categories. The Digital Inclusion Index was divided into five categories and in the second phase these categories were profiled according to various individual attributes and geographical regions.

4.6.2 Phase Two: Research Objective Two and Three

The second phase of data analysis involved profiling the categories of the Digital Inclusion Index. Descriptive statistics and *Chi*-Square cross-tabulations were used to profile each of these categories according to the various variables.

4.6.2.1 Descriptive Statistics

Descriptive statistics was used to compare the means and frequencies of the various digital technologies in each category of the Digital Inclusion Index. The mean is a particular informative measure of the central tendency of the variable if it is reported along with its confidence intervals (Hill & Lewicki, 2005). The mean in this case provides the proportion of respondents in each Digital Inclusion Index category with access to the specific digital technology. The larger the sample size (this sample contains 19,564 cases) the more reliable its mean (Hill & Lewicki, 2005).

4.6.2.2 Cross-tabulation

Cross-tabulation enables the examination of frequencies and proportions of observations that belong to specific categories of more than one variable (Hill & Lewicki, 2005) and this provides insight into the relationship between cross-tabulated variables. Categorical or nominal variables should be cross-tabulated (Hill & Lewicki, 2005).

Cross-tabulation was used to profile the Digital Inclusion Index categories according to the individual attributes and geographical regions. Cross-tabulation was conducted between the Digital Inclusion and each of the individual attributes and geographical regions listed below.

Table 11: Variables included in the study

INDIVIDUAL ATTRIBUTES:		
Age Bracket	Personal Income	Work Status
Education Level	Gender	SAARF LSM
Household Income	Occupation	
GEOGRAPHICAL REGIONS		
Community Size	Metropolitan Area	Province

4.6.2.3 Pearson *Chi*-Square

The Pearson *Chi*-Square is a test for significance of the relationship between categorical variables (Hill & Lewicki, 2005). The test is used when the relationship between two categorical variables needs to be explored. This test compares the observed frequencies or proportions of cases that occur in each of the categories with the value that would be expected if there was no association between the two variables being measured (Pallant, 2010). It is based on the cross-tabulation table, with cases classified according to the categories in each variable (Pallant, 2010).

With very large sample sizes it is important to consider that almost any effect is significant (Hair et al., 2009). This could lead to incurring Type II error which is the chance of not finding a correlation or mean difference when it does exist (Hair et al., 2009). In order to deal with this problem a random sample of a 1000 cases was selected to reduce the sample size.

Type I error is finding a difference or correlation when it actually does not exist (Hair et al., 2009). This error could be incurred when too many tests are conducted. In order to prevent this test from happening, only one variable is selected where variable that are multicollinear. Multicollinearity refers to the correlation among three or more independent variables. Bonferroni tests was also conducted, which serves as an approach for adjusting the selected alpha level to control for overall Type I error rate when performing a series of separate tests (Hair et al., 2009).

4.7 POSSIBLE LIMITATIONS

The Digital Inclusion Index was based on access to technologies identified in the AMPS survey. Because the AMPS survey is secondary data, only technologies that formed part of the questionnaire were included in the study. The same applies to variables used to profile the index. Only variables documented in the survey were included in the study.

The technologies that were identified to form part of the study, but did not exist in the secondary data were: GPS and tablet computer. Certain types of e-book reader were also not included in the survey questions. Only the iRiver e-book reader was included in the survey and other e-book readers such as the Kindle was not included.

Limitations surrounding factor analytic techniques also exists. According to Hair et al. (2009) many techniques exists for performing factor analysis and there are controversy over which techniques is best. He adds that the subjective aspects of factor analysis are all subject to many different opinion.

CHAPTER 5: RESULTS

5.1 INTRODUCTION

This chapter presents the results obtained using the data analysis methodologies defined for Phase One (see Section 4.6.1) and Phase Two (see Section 4.6.2) of the study. In Phase One, the various variables included in the index were carefully examined to ensure that they were appropriate for factor analysis. The Digital Inclusion Index was developed through factor analysis and visual binning and this chapter provides a comprehensive overview on how the index was developed. The second phase of the data analysis profiled each category of the Digital Inclusion Index by applying descriptive statistics, cross-tabulations and *Chi*-Square cross-tabulations to determine if there was a significant relationship between the Digital Inclusion Index and the variables used to profile the index.

5.2 PHASE ONE: DEVELOP A DIGITAL INCLUSION INDEX

Different technologies show different patterns of diffusion and the analysis of a single technology does not provide much information about the level of digital development (Billon et al., 2010). The Digital Inclusion Index is based on nine different digital technologies, some of which have been used in previous studies and some not. But no study that uses a variety of technologies to create an index has been found. The technologies were selected based on the popular digital technology in use presently, in combination with the AMPS secondary data on which the index is based. Two types of technologies are excluded because of the lack of data in the AMPS survey. These two technologies are GPS and tablet computer.

The table below contains the nine technologies on which the Digital Inclusion Index is based.

Table 12: Technologies included in the Digital Inclusion Index

TECHNOLOGIES:		
Electricity	DVD Player	Digital Camera
Television	Mobile Phone	Advanced Digital Devices
Satellite Television	Personal Computer	Internet

The advanced technologies consist of 12 different advanced digital technologies. To be profiled as having access to advanced digital technologies a respondent needed to have access to at least one. The table below contains the 12 advanced digital technologies included in this study.

Table 13: Advanced Digital Technologies included in the Digital Inclusion Index

ADVANCED TECHNOLOGIES:		
Computer games	iRiver	Sony Diskman
Car TV / Car DVD player	MP3 player	Sony Playstation (1,2,3)
Handheld portable TV (with live feed)	Portable DVD player	Walkman/portable CD player
iPod	PSP 9	X-Box

In order to create the index, access to each of these technologies was based on the AMPS survey as discussed in Section 4.5 and assigned a Yes (1) or No (0) indicator to each technology.

5.2.1 Initial Considerations

The first step in creating the Digital Inclusion Index was to examine the various technologies on which the index was based. Descriptive statistical methods were conducted to provide an overview of the various variables. The table below is an output file from SPSS and displays the number of cases, minimum value, maximum value and mean for each variable.

Table 14: Phase One: Descriptive Statistics

	N	Minimum	Maximum	Mean	Percentage
ELECTRICITY	19564	0	1	.97	97%
TELEVISION	19564	1	1	1.00	100%
SATELLITE TELEVISION	19564	0	1	.36	36%
DVD PLAYER	19564	0	1	.72	72%
MOBILE PHONE	19564	0	1	.81	81%
DIGITAL CAMERA	19564	0	1	.19	19%
PERSONAL COMPUTER	19564	0	1	.50	50%
ADVANCED TECHNOLOGIES	19564	0	1	.24	24%
INTERNET	19564	0	1	.27	27%
Valid N (listwise)	19564				

A sample size of 19,564 was achieved and according to the table above, each case had a value, Yes (1) or No (0), for each variable which indicates complete data integrity. The mean of each variable represents the percentage of access of each technology for the entire sample.

It is evident that television is entirely saturated in the South African market. The variable television is therefore eliminated from the dataset used to create the Digital Inclusion Index because every respondent in the survey had access to television. No other technology is entirely saturated in the South African market.

5.2.2 Data Screening

In order to conduct a factor analysis, the data is screened to assess the inter-correlation between variables and to subjectively examine the correlation matrix (Sharma, 1996). The table below is an output file from SPSS and displays the Pearson correlation between the all pairs of variables.

Table 15: Phase One: Correlation Matrix

Correlation Matrix

Correlation	ELECTRICITY	SATELLITE TELEVISION	DVD	MOBILE PHONE	DIGITAL CAMERA	PERSONAL COMPUTER	ADVANCED TECHNOLOGIES	INTERNET
ELECTRICITY	1.000	.117	.222	.109	.080	.135	.079	.092
SATELLITE TELEVISION	.117	1.000	.170	.192	.279	.367	.162	.293
DVD PLAYER	.222	.170	1.000	.175	.118	.225	.187	.147
MOBILE PHONE	.109	.192	.175	1.000	.183	.271	.159	.261
DIGITAL CAMERA	.080	.279	.118	.183	1.000	.337	.284	.345
PERSONAL COMPUTER	.135	.367	.225	.271	.337	1.000	.310	.458
ADVANCED TECHNOLOGIES	.079	.162	.187	.159	.284	.310	1.000	.338
INTERNET	.092	.293	.147	.261	.345	.458	.338	1.000

a. Determinant = .352

Although the Pearson's Correlation is not ideal for dichotomous variables, it provides the same correlation output for two dichotomies as what a *Phi* test would have provided. The correlation is significant at the 0.01 level for all variables as seen in Table 39 in Appendix C.

The two variables with the highest correlation were Internet and personal computer at 0.458. Low correlation among variables indicates that the variables do not have much in common or are heterogeneous variables (Sharma, 1996). This was clear in the case of Advanced Digital Technology and Electricity with a correlation of 0.079.

An opposing problem is when variables correlate too highly. Although mild multicollinearity is not a problem for factor analysis it is important to avoid extreme multicollinearity and singularity, because it becomes impossible to determine the unique contribution to a factor of the variables (Sharma, 1996). None of the variables in the table above were highly correlated. The determinant is 0.352 which is greater than the necessary value of 0.00001 and therefore multicollinearity was not a problem for this dataset.

The second step in the data screening was to examine the Kaiser measure of overall sampling adequacy. This measure, the Kaiser-Meyer-Olkin (KMO) measure, is a popular diagnostic measure to assess the extent to which the indicators of the constructs belong together (Sharma, 1996). It is suggested that the overall KMO should be greater than 0.80 (Sharma, 1996) and in the table below it is evident that the KMO for this sample is 0.804 which suggests that the correlation matrix was meritoriously appropriate for factoring.

Table 16: Phase One: Kaiser-Meyer-Olkin measure

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.804
Bartlett's Test of Sphericity	Approx. Chi-Square	20446.742
	df	28
	Sig.	.000

The Bartlett’s measure tests the null hypothesis that the original correlation matrix is an identity matrix. For factor analysis to work some relationship between variables is needed and therefore it is important that this test is significant. The significant test tells us that the correlation matrix was not an identity matrix and for this dataset the Bartlett’s test was highly significant ($p < 0.001$) (Sharma, 1996), and therefore factor analysis was appropriate. This test proved that the correlation between the various technologies was perfect in order to conduct factor analysis for the creation of the Digital Inclusion Index.

5.2.3 Factor Extraction

Principal component analysis is a data reduction method and therefore a method to reduce the number of variables (Hill & Lewicki, 2005). The next step in creating the Digital Inclusion Index was to determine the number of factors needed to explain variance among variables. The variances extracted by the factors are called eigenvalues (Hill & Lewicki, 2005). The most popular heuristics are the eigenvalue-greater-than-one rule and the scree plot (Sharma, 1996), both techniques are considered here. The table below displays the eigenvalues for the new factors extracted.

Table 17: Phase One: Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.613	32.666	32.666	2.613	32.666	32.666
2	1.092	13.650	46.316	1.092	13.650	46.316
3	.862	10.769	57.085			
4	.835	10.439	67.523			
5	.769	9.614	77.137			
6	.682	8.521	85.658			
7	.623	7.793	93.451			
8	.524	6.549	100.000			

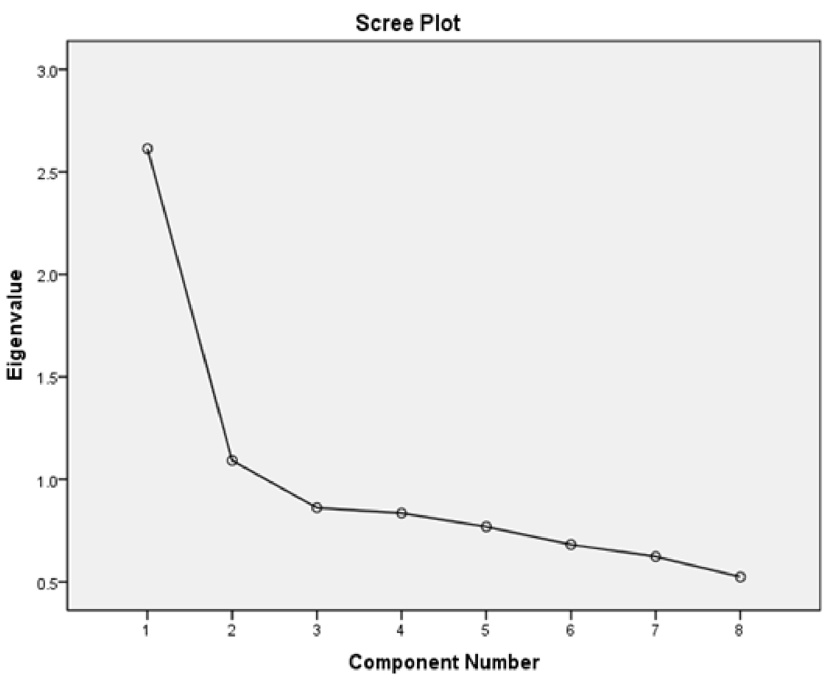
Extraction Method: Principal Component Analysis.

The second column (Total) above displays the variance of the new factors that were successively extracted (Hill & Lewicki, 2005). The third column (per cent of Variance) indicates these values as a per cent of the total variance (Hill & Lewicki, 2005). Component 1 accounts for 32.66 per cent of the variance and component 2 accounts for 13.65 per cent of the variance.

This exercise proved that it was possible to measure the variance which each successive factor extract but the number of factors to include was not decided on yet. According to Hill & Lewicki (2005) this decision is arbitrary but there are some guidelines that are commonly used. The first criterion suggests retaining factors with eigenvalues greater than one (Hill & Lewicki, 2005). There are two factors with eigenvalue greater than one, but the second factor is barely above 1 at 1.092, and a one factor solution therefore suggested.

The second criterion is to do a scree test. The scree plot below is a graphical method to plot the eigenvalues on a simple line plot (Hill & Lewicki, 2005). The scree test suggests finding the place where the smooth decrease of eigenvalues appears to level off to the right of the plot (Hill & Lewicki, 2005). The scree plot suggests a one factor solution because the plot flattens from the second factor.

Figure 5: Phase One: Scree Plot



From both criteria evaluated above it was evident that a one factor solution was appropriate for creating the Digital Inclusion Index. This means that one value was allocated to each respondent of the survey which indicated the level of digital access according to the access indictors of the nine different technologies. The factor score in this case was therefore a single value that serves as a scale to rank each respondent's level of digital access.

5.2.4 Loading the Factor Scores

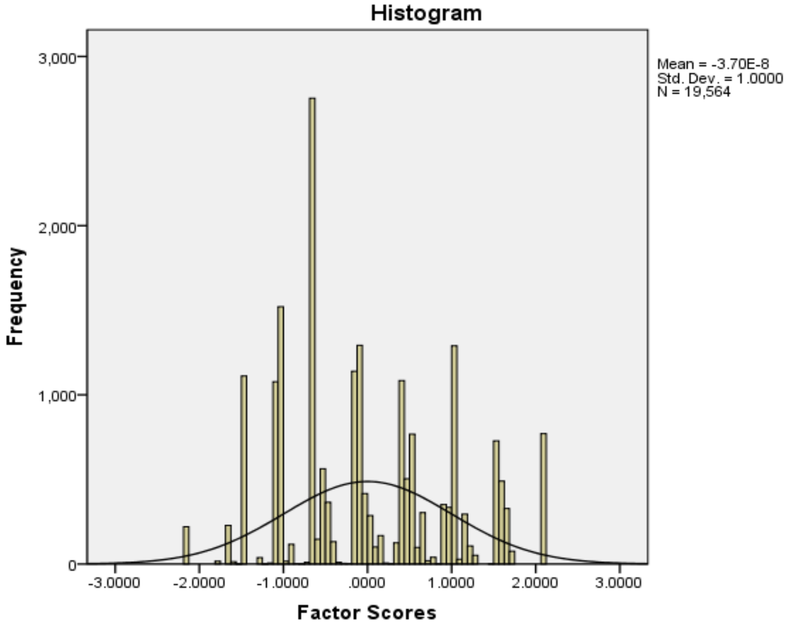
A single factor score was allocated to each case through principal component analysis. The method used to calculate the scores was regression. With principal component analysis it is assumed that all variability in an item should be used in the analysis and not only the variability that is common between items (Hill & Lewicki, 2005). Table 40 and Table 41 in Appendix C provide descriptive statistics about the factor scores created through factor analysis.

No missing values were detected which indicates that each case was allocated a factor score. The factor scores ranged between -2.1526 and 2.1061, the higher the score, the more access the respondent had to digital technologies. The next step was to group similar factor scores into categories. This means that each respondent was placed into a Digital Inclusion Index category according to their level of digital access.

5.2.5 Categorise the Factor Score

The final step in developing the Digital Inclusion Index was to group the factor scores into bins or categories. The histogram below displays the frequency of each factor score. The Stem-and-Leaf plot can be seen in Appendix C, Figure 30.

Figure 6: Phase One: Histogram of the Factor Scores

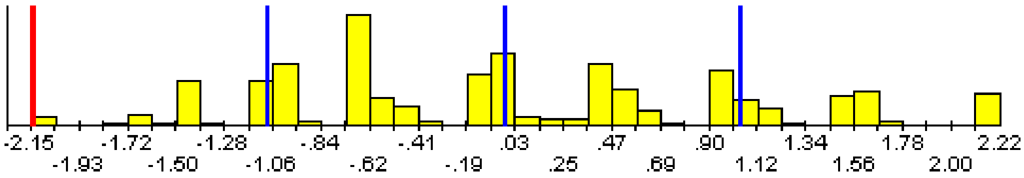


From the figure above it is evident that there were many different cases of factor scores. The objective was to create five categories for the Digital Inclusion Index. A split in five categories was deemed sufficient to illustrate the difference in digital access levels in concentration of 20 per cent of the possible range. A greater number of categories might have led to allot of overlap and repetition in similar access profiles. The following section provides a discussion on how the factor scores were divided into five categories.

Visual Binning

Visual binning was used to group the factor scores into five bins or groups. Four cut-off points were selected and these were based on equal width intervals. This means that the entire range of access levels represented by the factor score were divided into five equally spaced portions. This procedure divides the factor scores into the five categories of the Digital Inclusion Index. The objective of the binning is not to equally divide the respondents into five categories but rather to divide the range of possible levels of digital access into five categories. This method makes it possible to obtain information regarding the concentration of respondents in each category. The graph below illustrates the way in which the four cut-off points were made over the range of the factor scores.

Figure 7: Phase One: Visual Binning



The factor scores or digital access levels were divided equally into the five bins according to the following table. The factor scores ranged between -2.1526 and 2.1061 and each category represents 20 per cent of the digital access range.

Table 18: Phase One: Visual Binning

INDEX:	INDEX LABEL:	FACTORS VALUE FROM:	FACTOR VALUE TO:	ACCESS LEVEL:
DII-1	Digital Inclusion Index One		<= -2.1526	Very low
DII-2	Digital Inclusion Index Two	-2.1526	-1.0876	Low
DII-3	Digital Inclusion Index Three	-1.0876	0.0226	Medium
DII-4	Digital Inclusion Index Four	0.0226	1.0424	High
DII-5	Digital Inclusion Index Five	>= 1.0424		Very high

The respondents were divided into the five categories (1-5), with each category consisting of between 1.1 per cent and 43.4 per cent of the respondents. A respondent with no digital access would be placed in Category One (DII-1), while a respondent with very high digital access would be placed in Category Five (DII-5). Over 69 per cent of the respondents fell into Category Three and Four (DII-3 & DII-4) and 16.9 per cent of respondents fell into Category Five (DII-5). The bar chart below displays the number of respondents in each category of the Digital Inclusion Index. The SPSS output file for the frequencies can be found in Appendix C, Table 42.

Table 19: Phase One: Respondent Distribution graph

	Respondents per category			
	Category	Frequency	Percent	Cumulative Percent
Digital Inclusion Index	DII-1	220	1.1%	1.1%
	DII-2	2491	12.7%	13.9%
	DII-3	8483	43.4%	57.2%
	DII-4	5070	25.9%	83.1%
	DII-5	3300	16.9%	100.0%
	Total	19564	100.0%	

What is interesting is that there were a large number of respondents in the fifth category (DII-5) which consists out of almost 17 per cent of the respondents; these are people that have access to various digital and advanced digital technologies. Only a small number of respondents make up the lowest category (DII-1) with 1.1 per cent of the respondents falling into that category.

Each respondent was assigned a Digital Inclusion Index category based on the level of digital access that the respondent has. To provide more insight into these categories, the makeup of each of these categories is examined in the next section. The second phase of the data analysis section was to profile each of the five categories of the Digital Inclusion Index according to various individual attributes and geographical regions.

5.3 PHASE TWO: CATEGORY PROFILES OF THE DIGITAL INCLUSION INDEX

In order to fully understand each of the five categories of the Digital Inclusion Index, each category was carefully examined to provide a profile for each of the five categories. The makeup of each category of the Digital Inclusion Index is examined according to the profile of technology access, individual attributes and geographical regions. Table 20 below displays the collection of dimensions to which the Digital Inclusion Index was profiled.

Table 20: Dimensions of the Digital Inclusion Index

NO:	DIGITAL TECHNOLOGIES:	ADVANCED DIGITAL TECHNOLOGIES:	INDIVIDUAL ATTRIBUTES:	GEOGRAPHICAL REGIONS:
1	Electricity	Computer Games	Age Bracket	Community Size
2	Television Set	Car TV / DVD	Education Level	Metro Area
3	Satellite Television	Portable TV	Household Income	Province
4	DVD Player	iPod	Personal Income	
5	Mobile Phone	iRiver	Gender	
6	Digital Camera	MP3 player	Occupation	
7	Personal Computer	Portable DVD	Work Status	
8	Advanced Digital Technologies	PSP	SAARF LSM	
9	Internet	Sony Diskman		
10		Playstation		
11		Walkman		
12		X-Box		

The Digital Inclusion Index was profiled using 33 dimensions. Each of these dimensions was examined in relation to each category of the Digital Inclusion Index. A comprehensive profile was created for each of the categories through descriptive statistical techniques. *Chi*-Square cross-tabulations were used to explain the relationship between two of the dimensions and the Digital Inclusion Index. Graphs and tables were used to improve readability and trend-spotting. All SPSS output files can be found in Appendix C, D and E.

5.3.1 Digital Technology Access Profile

The first way in which the Digital Inclusion Index categories were profiled was according to level of access to digital technologies. Descriptive statistics was used to compare the means of the various digital technologies in each category of the Digital Inclusion Index. The mean in this case provides the percentage of individuals with access to the specific digital technology in each Digital Inclusion Index category. The technologies with the highest overall access were television, electricity and mobile phones. Table 21 below displays the digital technologies in ranking order according to the overall access level.

Table 21: Phase Two: Digital Technology Access Level per Category

		Digital Inclusion Index					
		DII-1	DII-2	DII-3	DII-4	DII-5	TOTAL
Digital Technologies	Television	100%	100%	100%	100%	100%	100%
	Electricity	0%	87%	100%	100%	100%	97%
	Mobile Phone	0%	12%	86%	96%	99%	81%
	DVD Player	0%	44%	71%	80%	90%	72%
	Personal Computer	0%	2%	25%	87%	99%	50%
	Satellite Television	0%	0%	17%	65%	69%	36%
	Internet	0%	0%	3%	39%	93%	27%
	Advanced Digital Technologies	0%	0%	8%	30%	76%	24%
	Digital Camera	0%	0%	3%	24%	70%	19%

As determined in Section 5.2.1 and evident in the table above again, every individual in the sample had access to a television set. Individuals in Category One (DII-1) only had access to a television set and none of the other technologies. Individuals in Category Two (DII-2) had higher access to electricity (87 per cent), but lower access to DVD players and mobile phones. All Individuals in Category Three (DII-3) had access to electricity and television, with 86 per cent access to mobile phones and 71 per cent access to DVD players. A quarter of the individuals in Category Three (DII-3) had access to PCs but the access to the other digital technologies was low. Individuals in Category Four (DII-4) had access to most technologies with 39 per cent of individuals that had access to the Internet. Individuals in Category Five (DII-5) had high access to all the digital technologies. It is interesting to see that in contradiction to the overall level of access, more individuals in Category Two (DII-2) had access to DVD players than mobile phones. In Category Three (DII-3) and Category Four (DII-4) many more individuals had access to satellite television than to the Internet, but more individuals in Category Five (DII-5) had access to the Internet than to satellite television.

5.3.2 Risk Groups and Naming Convention

As seen from the section above it is evident that there are individuals that do not have the same level of digital access than their fellow citizens. A risk group is therefore identified in order to examine the profile of these individuals because there is a concern that individuals without access to information technology could be disadvantaged (Dewan & Riggins, 2005; Jaeger, 2004; Wei et al., 2010). The purpose of the digital divide measurement is to identify advantaged and disadvantaged individuals and groups within a community (Atkinson et al., 2008).

The two Digital Inclusion Index categories with low digital access were Category One and Two (DII-1 & DII-2). Category One (DII-1) consisted of 1.1 per cent of the population and Category Two (DII-2) consisted of 12.7 per cent of the population. These two categories are combined from here on to simplify the results and to provide specific information regarding the risk group. A special focus falls on examining the risk group when analysing the results.

In order to increase readability of the results in the sections to follow, the following naming convention has been assigned to each of the categories of the Digital Inclusion Index.

Table 22: Naming convention for categories of the Digital Inclusion Index

DIGITAL INCLUSION INDEX:	NAME:	RISK:	ACCESS LEVEL:	PERCENTAGE OF POPULATION:
DII-1 & DII-2	Unconnected	Risk Group	Low	13.8%
		Digital Divide		
DII-3	Aspirer	No Risk	Medium	43.4%
DII-4	Connected	No Risk	High	25.9%
DII-5	Power User	No Risk	Very High	16.9%

"The digital divide refers to the separation between those who have access to digital information and communications technology and those who do not" (Dewan & Riggins, 2005, p.298). According to this definition the digital divide is recognised as the difference in levels of digital access between individuals in the Unconnected category and the individuals in the Aspirer, Connected and Power User category. In the analysis that follows, the risk group is referred to as the Unconnected and indicates the digital divide.

5.3.3 Advanced Digital Technology Access Profile

Advanced digital technologies are mostly only accessible by individuals that are Power users. The table below examines access to the various advanced digital technologies for each category of the Digital Inclusion Index. The table displays the advanced digital technologies in ranking order according to the overall level of advanced digital access of individuals. The SPSS output file can be found in Appendix C, Table 47.

Table 23: Advanced Technology Access Level per Category

		DIGITAL INCLUSION INDEX				
		Unconnected	Aspirer	Connected	Power User	TOTAL
Advanced Digital Technology	Computer Games	0%	1%	13%	45%	11%
	MP3 player	0%	3%	11%	33%	10%
	Playstation	0%	1%	6%	25%	6%
	Portable DVD	0%	4%	8%	10%	5%
	iPod	0%	0%	3%	16%	4%
	Car TV / DVD	0%	0%	1%	8%	2%
	Walkman	0%	1%	3%	6%	2%
	PSP	0%	0%	1%	7%	1%
	X-Box	0%	0%	1%	5%	1%
	Portable TV	0%	0%	0%	1%	0%
	iRiver	0%	0%	0%	1%	0%
	Sony Diskman	0%	0%	0%	1%	0%

Computer games had the highest level of access with an overall saturation percentage of 11 per cent, followed by MP3 players at 10 per cent. The only other technology to which power users had relatively high access was PlayStation. None of the other advanced digital technologies have been widely adopted in the South African market. It is evident that the unconnected does not have any access to advanced digital technologies. The next section examines the Digital Inclusion Index according to the attributes of the individuals to establish a profile of the individuals for each category of the index.

5.3.4 Digital Inclusion Index - Individual Attributes Profile

The second research objective seeks to identify the individual attributes that are related to each category of the Digital Inclusion Index. The profiling of the categories enabled the examination of differences in individual attributes to identify potential risk groups. The digital divide identified advantaged and disadvantaged individuals and groups within a community in terms of access to digital technologies (Atkinson et al., 2008). The Digital Inclusion Index was profiled using descriptive statistics and cross-tabulations for the following individual attribute variables.

Table 24: List of Individual Attributes

INDIVIDUAL ATTRIBUTES:		
Age Bracket	Personal Income	Work Status
Education Level	Gender	SAARF LSM
Household Income	Occupation	

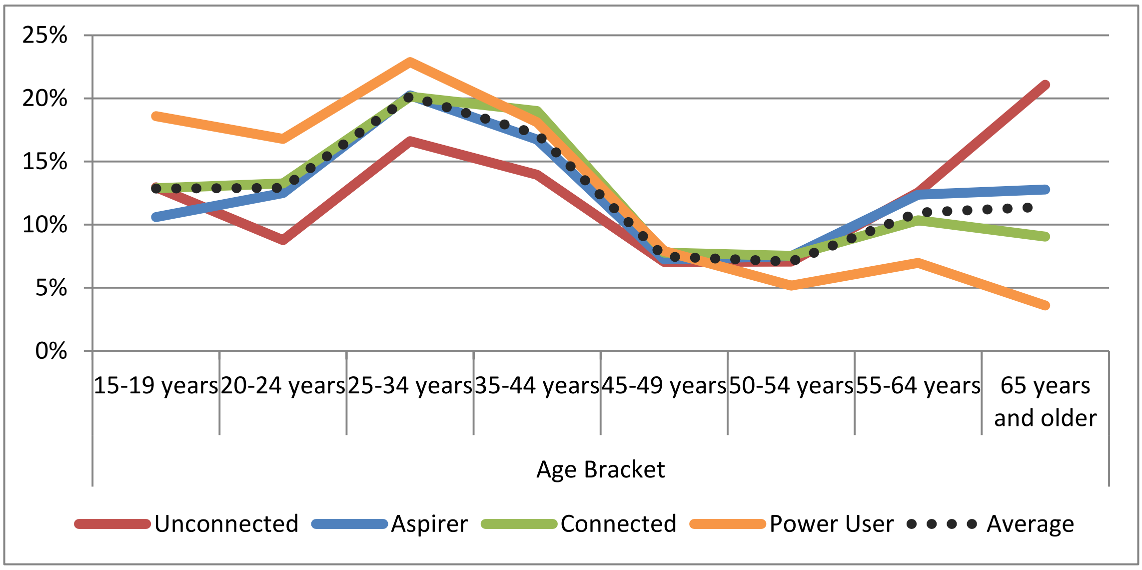
Cross-tabulations were used to compare the proportion between the various individual attributes for each category of the Digital Inclusion Index. Cross-tabulations enable the examination of frequencies of observations that belong to specific categories on more than one variable. (Hill & Lewicki, 2005). Age, gender and education was selected to test the relationship to the Digital Inclusion Index. *Chi*-Square test provides insight into the significance of the relationship between categorical variables (Hill & Lewicki, 2005). In performing the *Chi*-Square tests, the first check is to ensure that the assumptions concerning the 'minimum expected cell frequency' is not violated (Pallant, 2010). The assumption was checked in each test and the SPSS output files with the results can be seen in Appendix D.

A random sample of 6 per cent of the cases was selected through an SPSS functionality, the result delivered 1181 cases. The result can be seen in the table below. For all the *Chi*-Square cross-tabulations in the sections to follow, a smaller sample size of 1181 cases was used to ensure that Type II error was not incurred because of the original large sample size. The descriptive statistics for the result can be viewed in Appendix C, Table 49.

5.3.4.1 Digital Inclusion Index - Age Profile

In Appendix D, Table 50 the cross-tabulation table is displayed as the proportion of individuals in each category of the Digital Inclusion Index in relation to each age bracket. Figure 8 below displays this table graphically.

Figure 8: Age Brackets distribution per Digital Inclusion Index category



As seen in the figure above, individuals were similarly distributed between age brackets for all categories of the Digital Inclusion Index. The category with the highest variance was Power Users where more individuals tended to be in younger age brackets. The Aspirers and Connected were equally distributed to the average age of the respondents. The Unconnected had more individuals older than 55 years and fewer individuals between the ages of 20 and 44 years old than in the other categories.

According to the *Chi*-Square test there was also a significant relationship between the age brackets and whether the individual fell within the risk group (Unconnected) or not ($p<0.05$). The results can be seen in the table below. When examining each age bracket, through a Bonferroni inequality approach, it was found that there was only a significant relationship for age brackets 20-34 years old and 65 years and older. According to this, if one was between 20 and 34 years old one was likely not to fall in the risk group, but if one was 65 years and older one was very likely to fall within the risk group. Table 25 below it is evident that almost 30% of the individuals in the risk group are 65 years and older. The other age brackets do not differ significantly from each other.

Table 25: Age Bracket and Risk Group *Chi*-Square cross-tabulation (Bonferroni adjusted p-values)

Age Bracket * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		
		No	Yes	Total
Age Bracket	15-19 years	11.9%$_a$	11.8%$_a$	11.9%
	20-24 years	14.5%$_a$	6.7%$_b$	13.3%
	25-34 years	22.0%$_a$	10.7%$_b$	20.3%
	35-44 years	17.1%$_a$	16.3%$_a$	17.0%
	45-49 years	8.7%$_a$	7.9%$_a$	8.6%
	50-54 years	6.1%$_a$	8.4%$_a$	6.4%
	55-64 years	10.4%$_a$	9.0%$_a$	10.2%
	65 years and older	9.4%$_a$	29.2%$_b$	12.4%
Total		100.0%	100.0%	100.0%

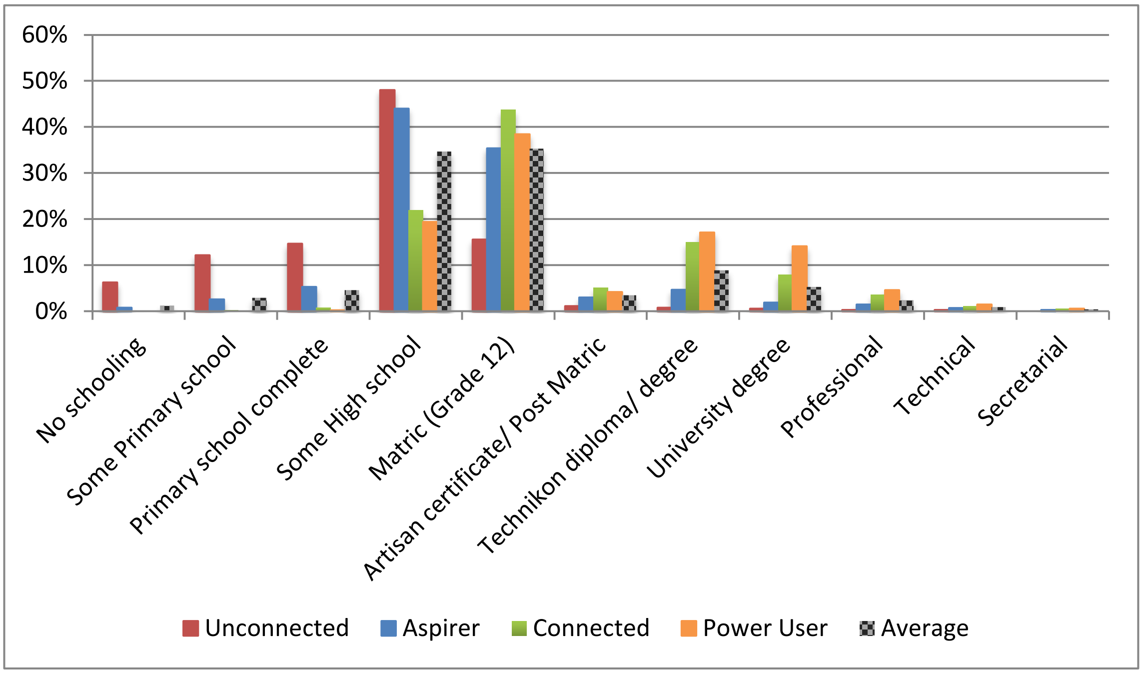
Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

It is therefore clear that there was a relationship between age and the digital divide for young adults and people over the age of 65. Young adults tend to have slightly higher levels of digital access and individuals over the age of 65 are prone to have lower levels of digital access.

5.3.4.2 Digital Inclusion Index – Education Profile

The education profile was divided into 11 groups from No schooling to Professional. Appendix D, Table 53 contains the *Chi*-Square Cross-tabulation table to show the education distribution between the various categories of the Digital Inclusion Index. The bar chart in Figure 9 below illustrates this distribution.

Figure 9: Education distribution per Digital Inclusion Index category



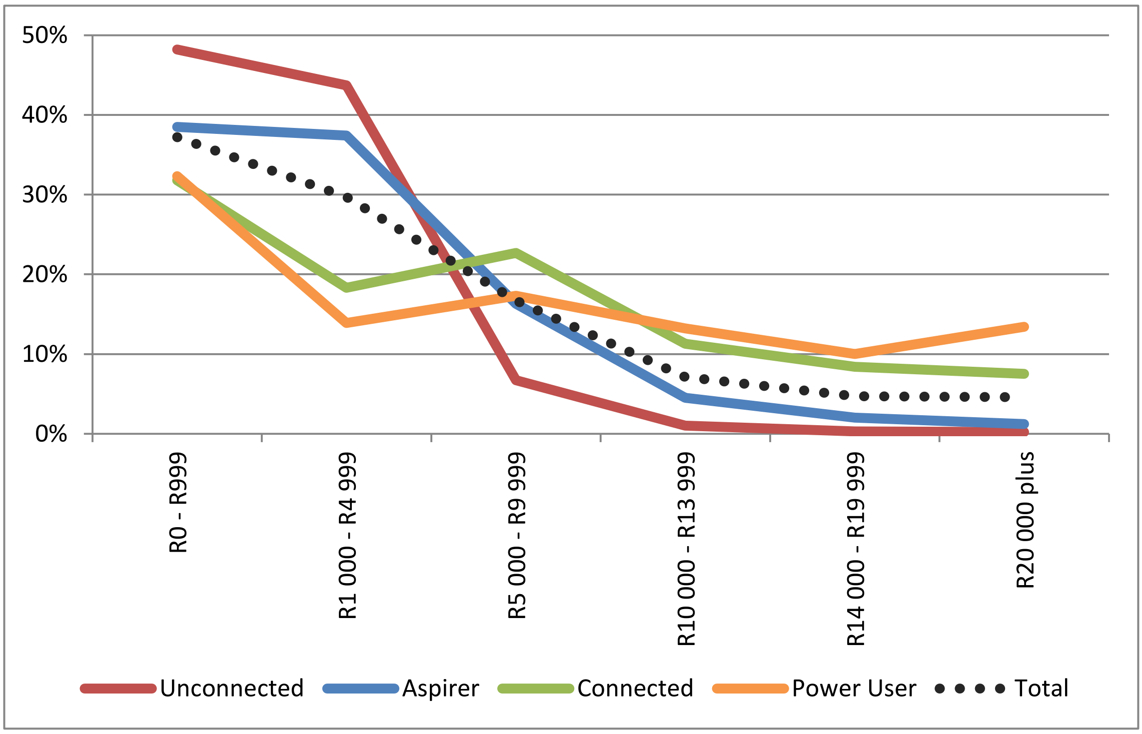
From the graph above it is evident that 80 per cent of the individuals in the Unconnected category had only some High School education or less, while the Connected and Power Users had at least some High school education or more. The Aspirers ranged among all of the educational levels with the highest concentration for some high school education and matriculants. 77 per cent of the Connected had at least the Matric qualification and higher. Power Users also had at least Matric and higher with 14per cent of Power Users that had a university degree. The *Chi*-Square test indicated that there is a significant relationship between education and the Digital Inclusion Index categories. It is also apparent from the graph above that education has a strong relationship with the Digital Inclusion Index categories; the higher the level of education, the higher the level of digital access.

When considering the digital divide, the difference between the “haves” and the “have-nots”, it is evident that for all levels of education there was a significant relationship between education and the digital divide ($p<0.05$). The SPSS output file containing these results can be seen in Appendix D, Table 54.

5.3.4.3 Digital Inclusion Index - Personal Income Profile

Appendix D Table 56 contains the cross-tabulation table showing the personal income distribution between the various categories of the Digital Inclusion Index. Figure 10 below illustrates this distribution.

Figure 10: Personal Income distribution between the various categories



As seen in the figure above, personal income for the Unconnected peeked at levels between R0 and R5 000 and income tapered down quickly after that. Aspirers had a very similar income profile to the Unconnected. The Connected and Power Users had interesting distributions. There were many individuals in the Connected and Power User categories that earned personal income in the lower income brackets. There were 10 per cent of the Connected that earned above R16 000 and 10 per cent that earned between R1 and R2 000. Power users had a similar profile, 12 per cent of Power Users earned above R20 000 and 9 per cent earned below R 2 000.

Descriptive statistics were conducted for personal income below R1 000. It was found that 14 per cent of individuals that earned below R1 000 are Power Users. The results can be seen in Table 58 in Appendix D. When analysing these individuals it was found that 80 per cent of them had household income above R10 000. (See Appendix D, Table 60). Almost 60 per cent of the individuals in the households that earned more than R10 000 were 24 years and younger which could infer that they were still dependents of their parents (Appendix D, Table 60).

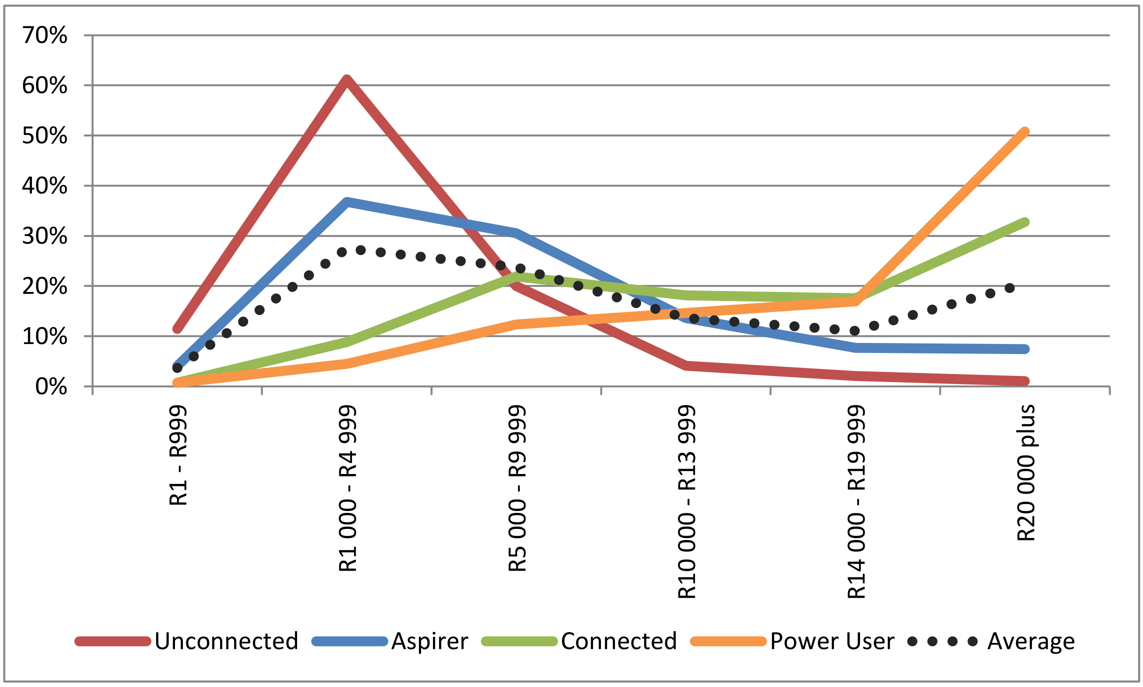
On the other hand, 12 per cent of individuals with personal income above R20 000 fell into the Aspirer and Unconnected category (Appendix D, Table 61). These individuals did not have access to personal computers, the Internet or advanced digital technologies. When examining their ages it was found that they were older and might not have an appetite for digital technologies. (See Appendix D, Table 612)

It is evident that individuals with higher levels of personal income tend to have higher levels of digital access. The individuals within the low income brackets with higher levels of digital access tend to be younger which could infer that they are depends and are begin sponsored their devices. The individuals within the high income brackets with low levels of digital access tend to be older and could infer that they don’t have an appetite for digital technologies.

5.3.4.4 Digital Inclusion Index - Household Income Profile

Appendix C Table 63 contains the cross-tabulation table showing the household income distribution between the various categories of the Digital Inclusion Index. Figure 11 below illustrates this distribution.

Figure 11: Household Income distribution between the various categories



The household income figure above is almost an exact image of the personal income figure, the distributions are only slightly shifted to the higher income brackets and with fewer households that earn below R1 000.

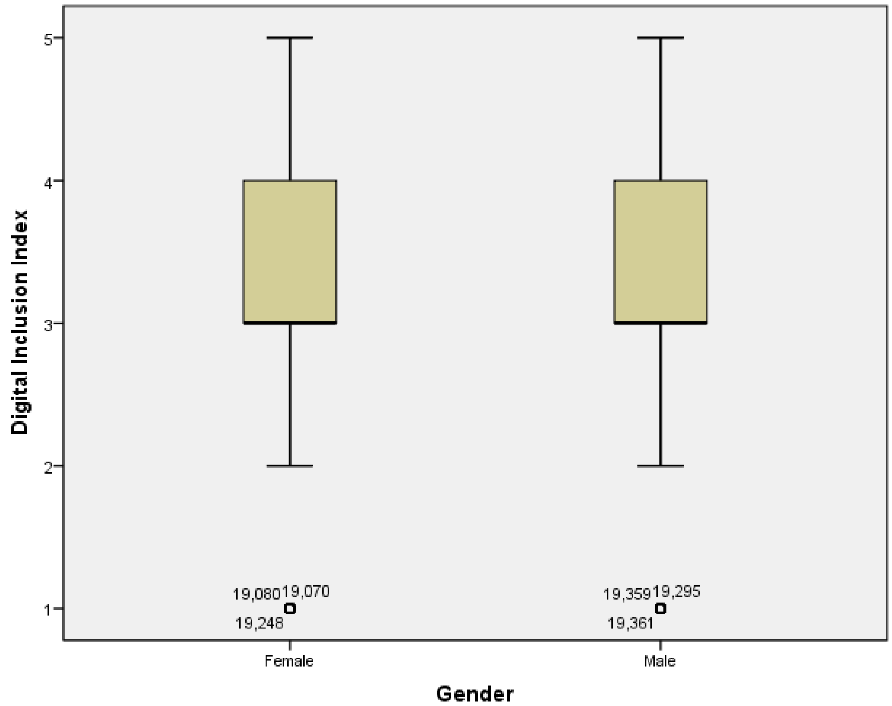
Almost half of the individuals in the Unconnected category had a household income below R2 500 and very few households earned above R10 000. Aspirer households earned mostly in the lower and middle income brackets, 70 per cent earned below R10 000. The Connected and Power Users had an interesting distribution. 40 per cent of the Connected had a household income above R16 000, but also 10 per cent with a household income below R5 000. 50 per cent of Power Users had a household income above R20 000 and 5 per cent below R5 000.

It is evident that individuals within higher income brackets have higher levels of digital access and individuals in lower income brackets have lower levels of digital access.

5.3.4.5 Digital Inclusion Index – Gender Profile

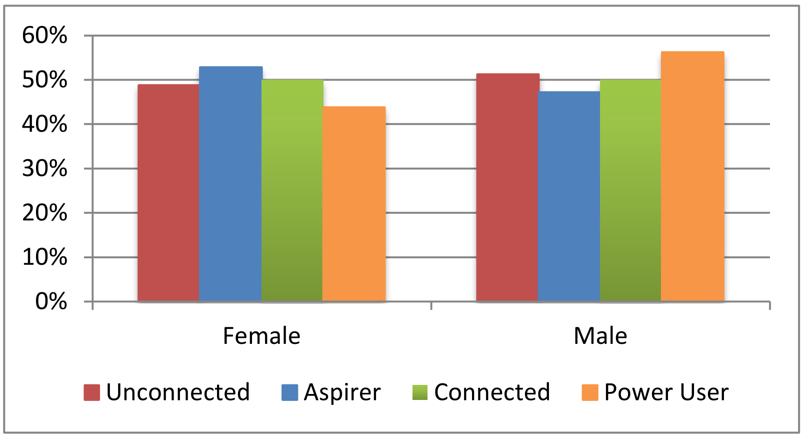
The categories of the Digital Inclusion Index were also profiled according to gender. The gender profile over all the categories can be seen in the box plot below. The female and male distribution over the range of the Digital Inclusion Index was very similar, as seen in the box plot below.

Figure 12: Digital Inclusion Index - Gender box plot



Appendix D, Table 64 contains the cross-tabulation table showing the gender distribution between the various categories of the Digital Inclusion Index. The gender profiles for all of the categories were very equally distributed except for Power Users where males made up 56.2 per cent of the individuals in the category. Figure 13 below shows the distribution of the gender for all the categories of the Digital Inclusion Index.

Figure 13: Digital Inclusion Index – Gender Profile



When looking at the *Chi*-Square test in Appendix D, Table 66 and the table below, there is not a significant relationship between gender and the risk group indicator (p=0.266, p>0.05). Gender does not have an influence on the level of digital access of an individual.

Table 26: Gender * Risk group cross tabulation (Bonferroni adjusted)

Gender * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		Total
		No	Yes	
Gender	Female	52.0%$_a$	47.2%$_a$	51.3%
	Male	48.0%$_a$	52.8%$_a$	48.7%
Total		100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

Table 27: Gender * Risk group *Chi*-Square

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.425[a]	1	.233		
Continuity Correction[b]	1.237	1	.266		
Likelihood Ratio	1.425	1	.233		
Fisher's Exact Test				.255	.133
Linear-by-Linear Association	1.424	1	.233		
N of Valid Cases	1181				

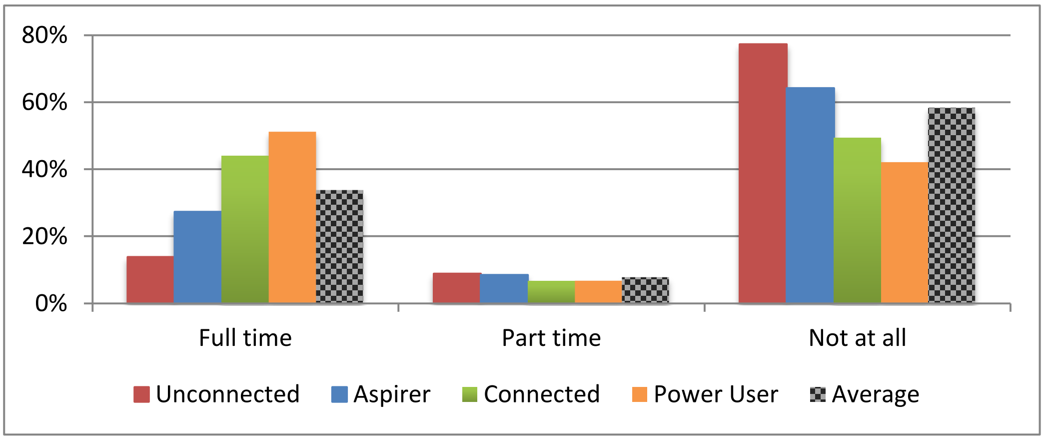
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 86.66.

b. Computed only for a 2x2 table

5.3.4.6 Digital Inclusion Index - Work Status Profile

The work status dimension was divided into three brackets: full time, part time and not at all. Appendix D, Table 68 contains the cross-tabulation table showing the work status distribution between the various categories of the Digital Inclusion Index. Figure 14 shows the same distribution graphically.

Figure 14: Work Status Profile



The large proportion of individuals who did not work at all in all the Digital Inclusion Index categories is interesting to note. In analysing this result it was found (see

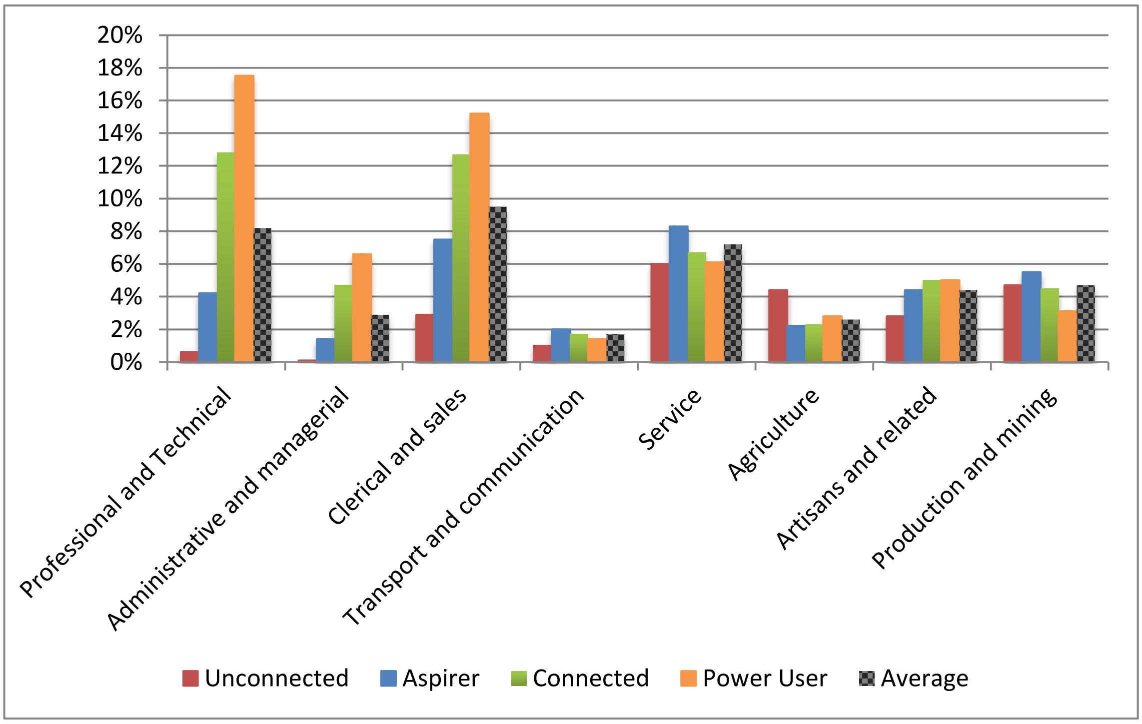
Appendix D, Table 69) that most of these individuals were either younger than 24 or older than 65. The large numbers of Power Users that do not work at all were mostly younger than 24 years (see Appendix D Table 70).

Most of the individuals in the Unconnected category do not work at all and 40 per cent of then are 55 years and above. The individuals with full-time jobs have a much better tendency of having higher levels of digital access, as more than 50 per cent of the Power Users have full-time jobs.

5.3.4.7 Digital Inclusion Index – Occupation Profile

The occupation dimension contained 10 different groupings of occupations. Appendix D, Table 71 contains the cross-tabulation table showing the occupation distribution between the various categories of the Digital Inclusion Index. Figure 15 displays the occupation distribution for the individuals that are employed.

Figure 15: Occupation Profile per Digital Inclusion Index category



As seen from the figure above and the cross-tabulation table, a large proportion of the Unconnected had an occupation in services, agriculture and production and mining. Aspirers were spread over the entire scope of occupations, but the highest concentration was in services, clerical and sales, and production and mining. Individuals in the Connected and Power User category had jobs mostly in professional and technical, and clerical and sales.

Occupation has an relationship on the level of digital access, but individuals with higher digital access can have almost any kind of occupation. Individuals in professional and technical, clerical and sales or administrative and managerial jobs had higher levels of digital access, while individuals in agriculture had lower digital access.

Digital Inclusion Index - SAARF LSM Profile

There are 10 LSM that segments markets according to SAARF consumer behaviour index. Appendix D, Table 72 contains the cross-tabulation table showing the LSM distribution between the various categories of the Digital Inclusion Index. Table 28 displays the LSM distribution.

Table 28: SAARF LSM Profile for each category of the Digital Inclusion Index

Digital Inclusion Index		Unconnected	Aspirer	Connected	Power User	Average
SAARF LSM	LSM 1	4.5%	0.1%	0.0%	0.0%	0.7%
	LSM 2	9.1%	0.6%	0.0%	0.0%	1.5%
	LSM 3	9.1%	1.8%	0.0%	0.0%	2.0%
	LSM 4	16.8%	6.6%	0.3%	0.1%	5.3%
	LSM 5	18.2%	13.8%	1.5%	0.2%	8.9%
	LSM 6	24.8%	28.6%	9.4%	3.6%	18.9%
	LSM 7	10.5%	21.3%	14.4%	7.1%	15.6%
	LSM 8	5.5%	15.2%	19.4%	12.7%	14.5%
	LSM 9	1.4%	9.9%	32.7%	31.3%	18.3%
	LSM 10	0.1%	2.2%	22.3%	45.1%	14.3%
	TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%

From the table above it is apparent that the Digital Inclusion Index does not compare perfectly with the LSM groups, but there is a strong relationship between the Digital

Inclusion Index and the LSM groups. Only 45 per cent of the Power Users, the individuals with high levels of digital access, were in LSM 10. There were many individuals in both the Connected and Power User categories that were in lower LSM. It is evident that the higher the LSM group for an individual is, the higher the level of digital access will be. And the lower the LSM group is, the lower the level of digital access will be.

5.3.5 Digital Inclusion Index - Geographical Region Profile

The third research objective seeks to identify the geographical regions variables related to the Digital Inclusion Index. Profiling the categories of the Digital Inclusion Index enabled the examination of differences in geographical regions to identify locations of risk groups. The digital divide identifies advantaged and disadvantaged individuals and groups within a community in terms of access to digital technologies (Atkinson et al., 2008). In addition to the individual attribute profiling, the Digital Inclusion Index was also profiled using the following geographical region variables.

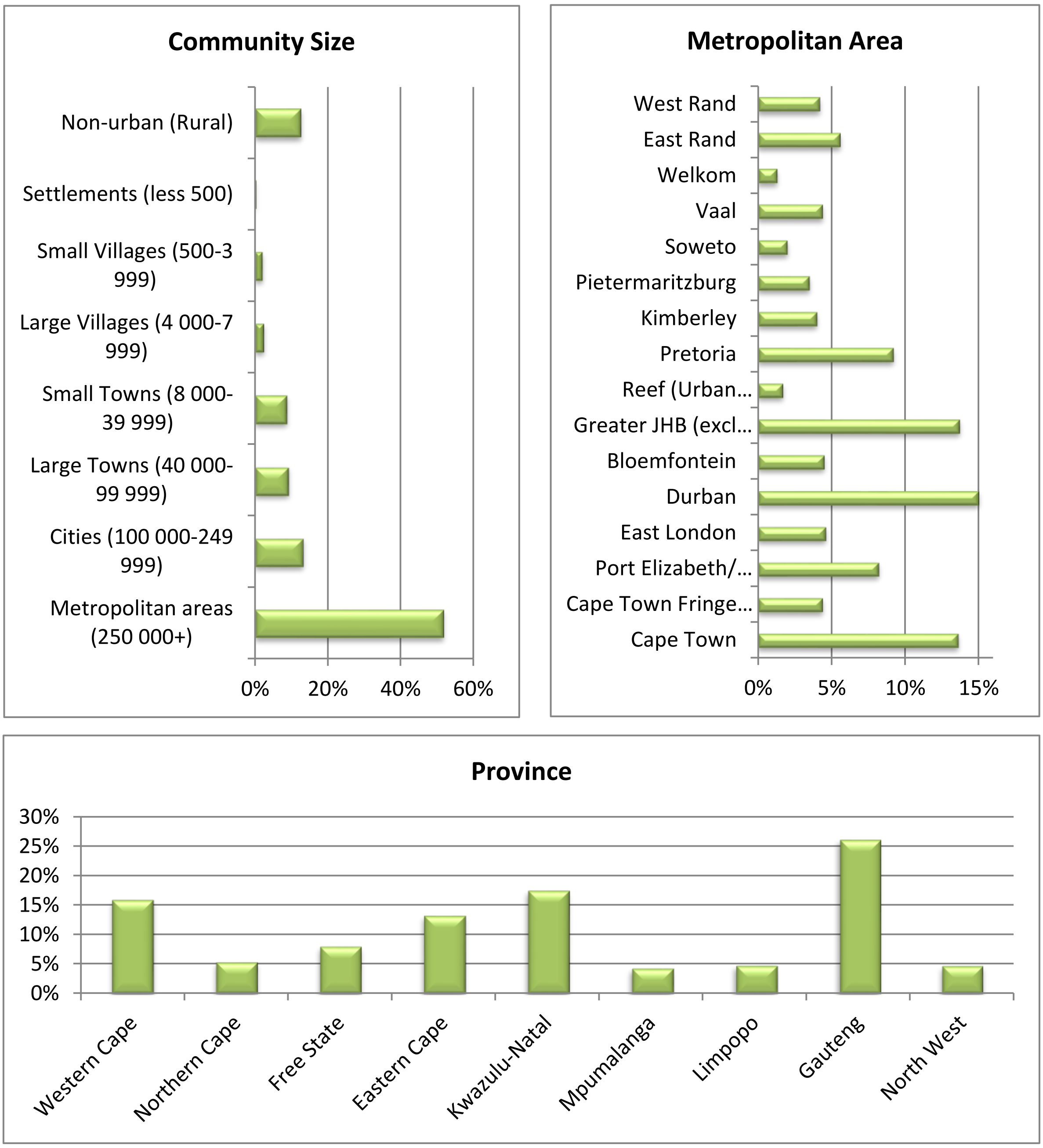
Table 29: Geographical Region variables

GEOGRAPHICAL REGIONS		
Community Size	Metropolitan Area	Province

Chi-Square cross-tabulations were used to compare the proportion of individuals in specific geographical regions against each category of the Digital Inclusion Index. Cross-tabulation tables enables the examination of frequencies of observations belonging to specific categories on more than one variable and the *Chi*-Square test provides insight into the significance of the relationship between categorical variables (Hill & Lewicki, 2005). In performing the *Chi*-Square tests, the first check is to ensure that the assumptions concerning the 'minimum expected cell frequency' are not violated (Pallant, 2010). The assumption was checked in each test and the SPSS output files with the results are documented in Appendix E.

Descriptive statistics were used to compare the frequencies in the various geographical region variables. This serves as illustration of the concentration of individuals within each region. Figure 16 displays the results.

Figure 16: Geographical Region variable frequencies

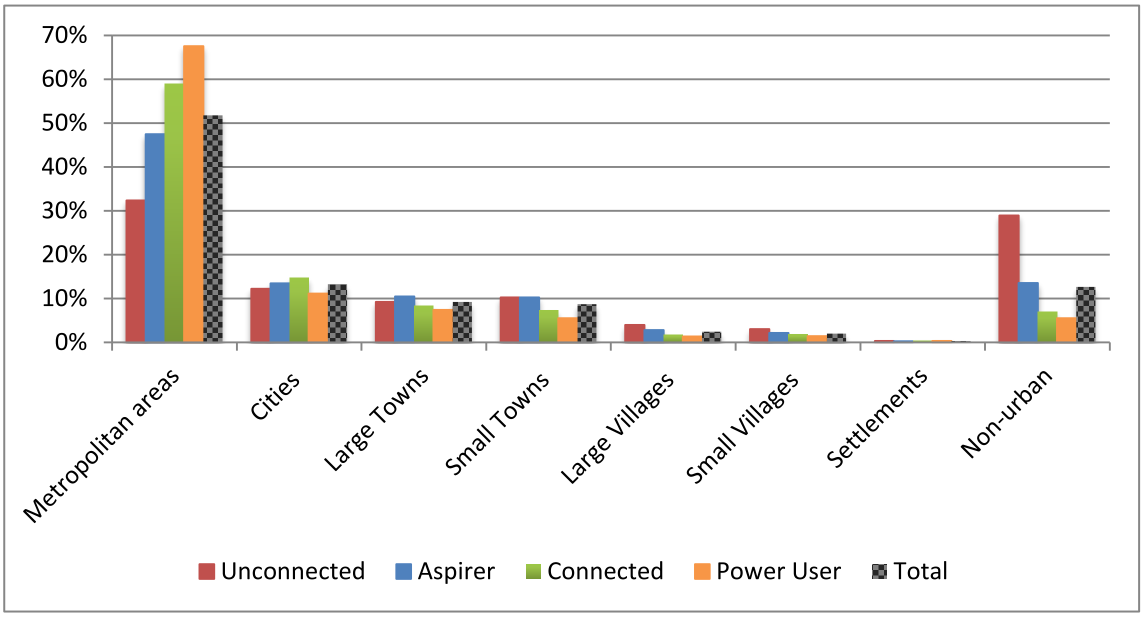


For each geographical region variable, both the Cross-tabulation tables for each Digital Inclusion Index category and risk group indicator were included. This was to examine the relationship between the Digital Inclusion Index categories and the risk groups which represent the digital divide.

5.3.5.1 Digital Inclusion Index – Community Size Profile

In Appendix E, Table 74 the cross-tabulation result is displayed showing the categories of the Digital Inclusion Index in relation to each community size group. Figure 17 is a representation of this table.

Figure 17: Community Size profile per Digital Inclusion Index category



29 per cent of the Unconnected lived in rural areas. It was also evident that individuals with higher digital access were prone to live in Metropolitan areas (over 250 000 people). According to the *Chi*-Square test in Appendix E, Table 74 there is a significant relationship (p<0.05) between the community size and the Digital Inclusion Index categories. When considering the Bonferroni results that are displayed in the table below, if one lives in a community size between smaller than 3999 or in a community of

between 8 000 and 249 999, there is no significant difference between the residents levels of digital access. Only for individuals residing in rural, large villages (4000-7999) or metropolitan areas are there a significant difference in their level of digital access.

Table 30: Community Size cross-tabulation for Digital Inclusion Index categories (Bonferroni approach)

Community Size * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

Community Size	Digital Inclusion Index				Total
	Unconnected	Aspirer	Connected	Power User	
Metropolitan areas (250 000+)	32.6%$_{a}$	50.7%$_{b}$	58.2%$_{b, c}$	66.1%$_{c}$	52.1%
Cities (100 000-249 999)	11.2%$_{a}$	10.4%$_{a}$	15.6%$_{a}$	11.1%$_{a}$	11.8%
Large Towns (40 000-99 999)	9.6%$_{a}$	10.9%$_{a}$	9.8%$_{a}$	7.4%$_{a}$	9.9%
Small Towns (8 000-39 999)	10.1%$_{a}$	10.0%$_{a}$	7.0%$_{a}$	5.3%$_{a}$	8.6%
Large Villages (4 000-7 999)	4.5%$_{a}$	2.7%$_{a, b}$	.4%$_{b}$	1.1%$_{a, b}$	2.2%
Small Villages (500-3 999)	.6%$_{a}$	1.8%$_{a}$	1.2%$_{a}$	1.6%$_{a}$	1.4%
Settlements (less 500)		.4%$_{a}$	.4%$_{a}$	.5%$_{a}$	.3%
Non-urban (Rural)	31.5%$_{a}$	13.1%$_{b}$	7.4%$_{b}$	6.9%$_{b}$	13.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

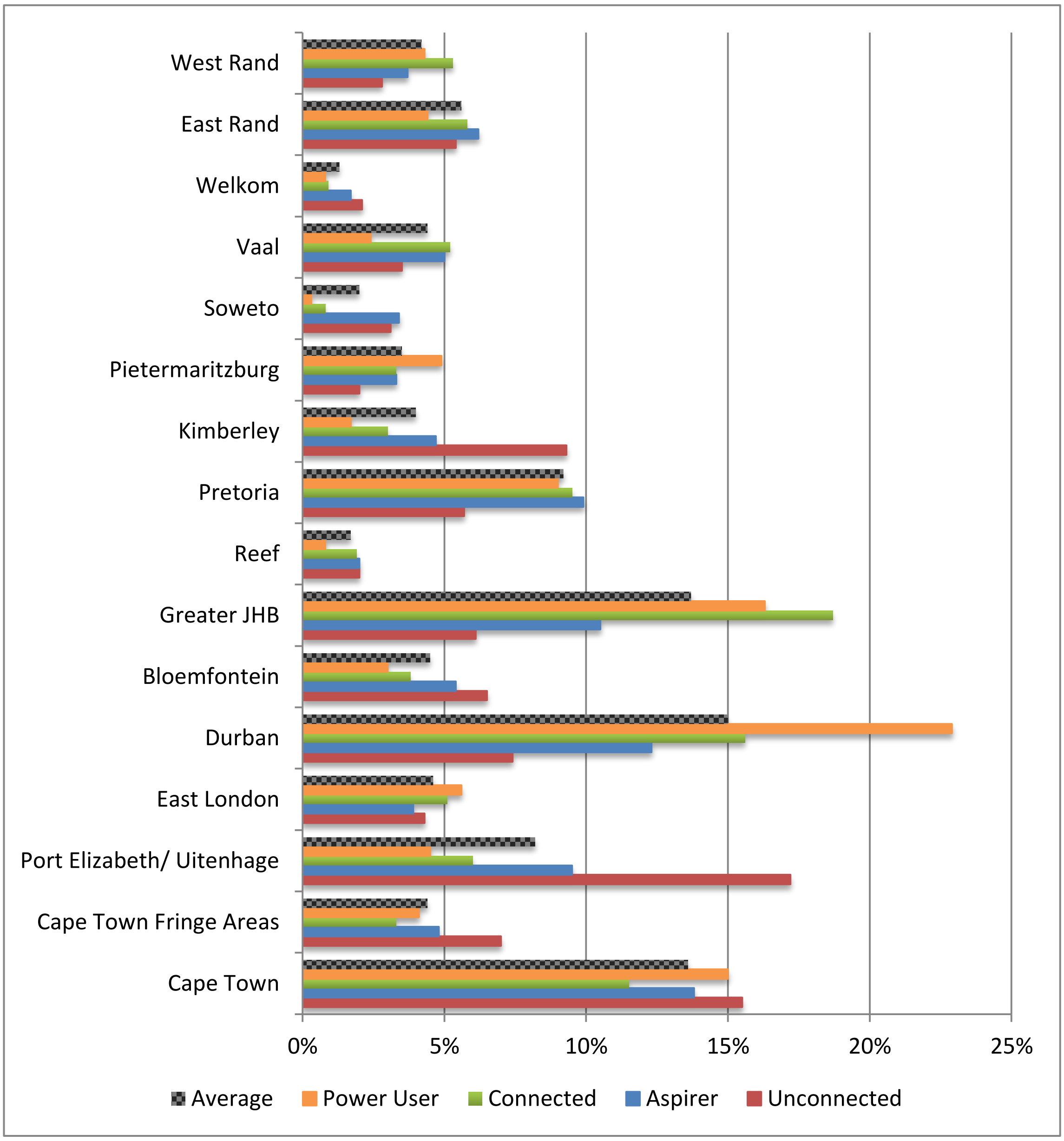
Each subscript letter denotes a subset of Digital Inclusion Index categories whose column proportions do not differ significantly from each other at the .05 level.

Even though the *Chi*-Square test provides a significant relationship between community size and Digital Inclusion Index, the Bonferroni results above show that there is only a significant difference in the level of digital access in certain sizes of communities. Individuals in metropolitan areas are prone to have higher levels of digital access and individuals in rural areas are prone to have lower levels of digital access. Individuals in other sized communities could have any level of digital access.

5.3.5.2 Digital Inclusion Index – Metropolitan Area Profile

There are many structural zeros for the metropolitan area variable as individuals residing in non-urban areas were not included in this set of variables. The metropolitan area profile was therefore only focussed on individuals residing in metropolitan areas. Figure 18 below is a graphical representation of the cross-tabulation table found in Appendix E, Table 76.

Figure 18: Digital Inclusion Index – Metropolitan Area Profile

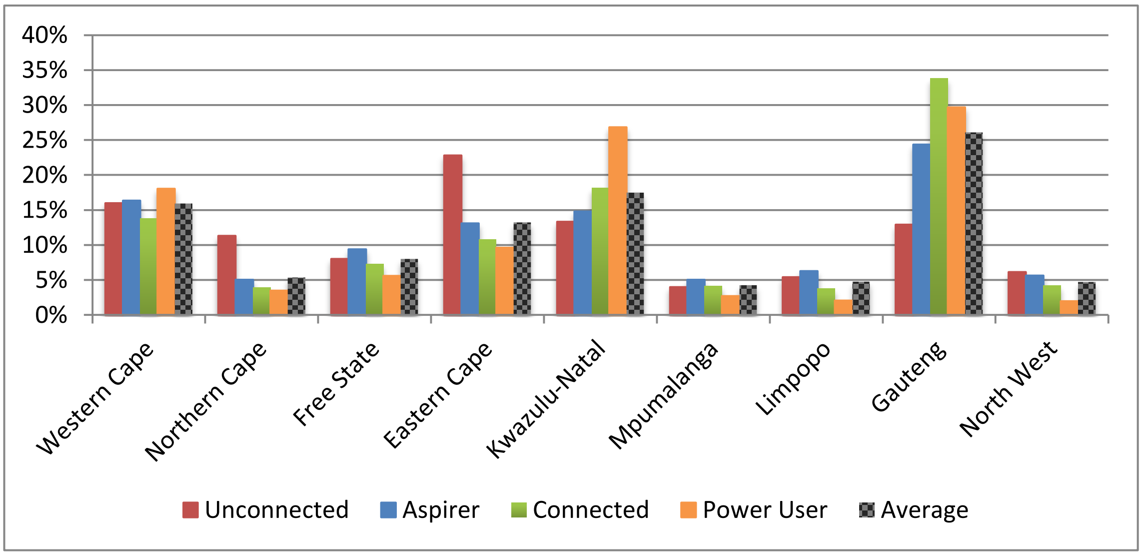


As is evident from the figure above, all categories are relatively equally distributed between the various metropolitan areas. Most of the individuals in the Unconnected category stayed in Port Elizabeth or Uitenhage, Cape Town and Kimberly. Most Power Users stayed in Durban, Greater Johannesburg and Cape Town. Individuals in rural areas were not considered but it is still evident that there are metropolitan areas where there is a big difference in digital access levels.

5.3.5.3 Digital Inclusion Index – Province Profile

There are nine provinces in South Africa. Appendix E, Table 77 contains the cross-tabulation table showing the provincial distribution between the various categories of the Digital Inclusion Index. The figure below displays the same results graphically.

Figure 19: Province distribution between the Digital Inclusion Index categories



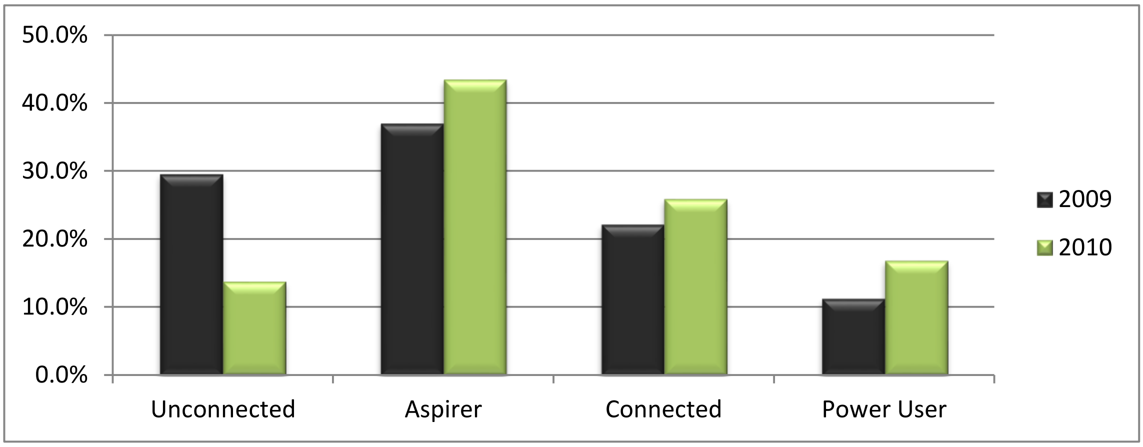
It is evident from the figure above that the distribution between the various categories was fairly similar. There were more Power Users residing in Kwazulu-Natal and Gauteng and more of the Unconnected residing in the Eastern Cape and Northern Cape.

The Digital Inclusion Index also has the inherent feature of determining whether the gap between the haves and the have-nots of digital technologies is narrowing or widening by applying the measurement to AMPS survey data from previous years. The next section compares the Digital Inclusion Index of 2010 to the Digital Inclusion Index of 2009 to determine the trend in digital access levels of individuals.

5.4 COMPARISON OF THE DIGITAL INCLUSION INDEX OF 2009

One of the features of the Digital Inclusion Index is that it aids in identifying whether the digital divide is narrowing or widening. To accomplish this, the index was also applied to the AMPS 2009 survey data and the results can be viewed in Appendix F. The Digital Inclusion Index in this study was based on the 2010 AMPS survey data. The graph below displays the respondent distribution between the 2009 and 2010 results obtained for the Digital Inclusion Index (Appendix F, Table 82).

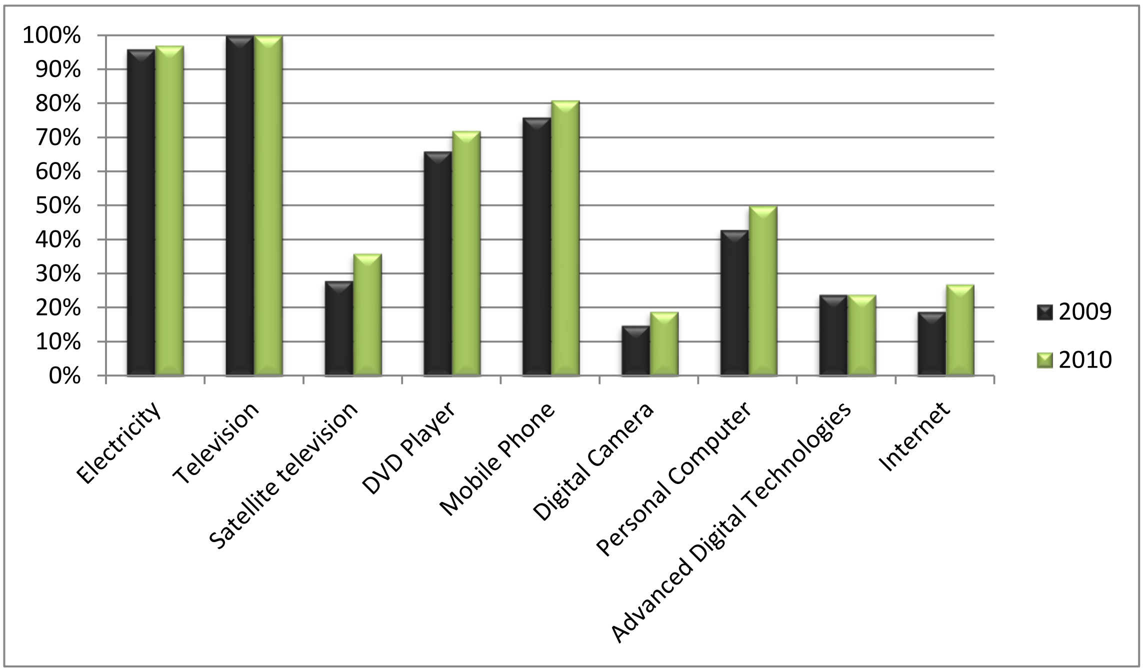
Figure 20: Respondent distribution between 2009 and 2010



It is clear that the number of individuals in the Unconnected category decreased substantially between 2009 and 2010. The individuals in the Aspirer, Connected and Power User categories increased. This indicates that more people had higher levels of digital access in 2010 than in 2009 and therefore that the digital divide is narrowing.

Considering the technology profile in 2009 versus 2010, it was found that access levels to all digital technologies increased over the last year. The largest increase in digital access levels was to the Internet and satellite television, followed by personal computers. The graph below displays the results obtained which can also be found in Appendix F, Table 83.

Figure 21: Technology access level between 2009 and 2010



It is clear from both the results above that the digital divide in South Africa narrowed from 2009 to 2010. Not only did the level of access to each digital technology improve, but the number of respondents in the risk group decreased from 29.6 per cent to 13.8 per cent. It is extremely exciting to find this result and to know that the digital society in South Africa is growing.

5.5 CONCLUSION

In this chapter the Digital Inclusion Index has been created in the first phase. The various variables included in the index were carefully examined to ensure that they were appropriate for factor analysis. The Digital Inclusion Index was developed through factor analysis and visual binning. The second phase of the data analysis profiled each category of the Digital Inclusion Index by applying descriptive statistics and cross-tabulations.

The risk group identified comprised of individuals with low levels of education, referring mostly to individuals that did not finish their secondary education. These individuals mostly have household or personal income lower than R1 000. The main element is unemployment; 77 per cent of individuals in the risk group do not work at all. Most of the individuals in the risk group reside in the Eastern Cape, Northern Cape and North West province. 29 per cent of the risk group resided in rural areas. The identification of the risk group deemed to be extremely fruitful. This feature of the Digital Inclusion Index has proven to be of great benefit.

The index was then applied to the previous year's (2009) data in order to determine whether the digital divide has been growing or narrowing between 2009 and 2010. It was establish that the digital divide has been narrowing. A full discussion on the results follow in the next chapter.

CHAPTER 6: DISCUSSION OF RESULTS

"Given the increasingly important role of the Internet in education, healthcare, and other essential services, it is important that we develop an understanding of the digital divide" (Agarwal, Animesh, & Prasad, 2009).

6.1 INTRODUCTION

Digital technologies have already penetrated so many facets of lifestyle and daily living that access to technology has even become a dimension of social inclusion (Husing & Selhofer, 2004) and is closely related to the much larger issue of social inequality (Attewell & Gates, 2001; DiMaggio et al., 2001; Vehovar et al., 2006; Warschauer, 2003). Rao (2005) and Schleife (2010) went as far as to say that the digital divide is an amplifier of economic and social divides. The focus on understanding the level of digital access in South Africa is therefore vital and the main reason for creating the Digital Inclusion Index, because there is a concern that individuals without access to information technology could be disadvantaged (Dewan & Riggins, 2005; Jaeger, 2004; Wei et al., 2010).

The knowledge gap hypothesis states that: "Segments of the population with higher socio-economic status tend to acquire information at a faster rate than the lower status segments so that the gap in knowledge between these segments tends to increase rather than decrease" (Tichenor, Donohue, & Olien, 1970, p.159). The study has supported this hypothesis because the Digital Inclusion Index identified four distinct categories into which individuals with different levels of digital access were grouped.

The Digital Inclusion Index was proposed as a digital divide measurement tool. The measurement was then utilised to profile groups of individuals with similar levels of digital access. This enabled the identification of a risk groups where individuals are excluded from the digital society. The index was then applied to the previous year's (2009) data in order to determine whether the digital divide is narrowing or widening between 2009 and 2010. The section below explains the construct of the Digital Inclusion Index.

6.2 RESEARCH OBJECTIVE ONE: DEVELOP THE DIGITAL INCLUSION INDEX

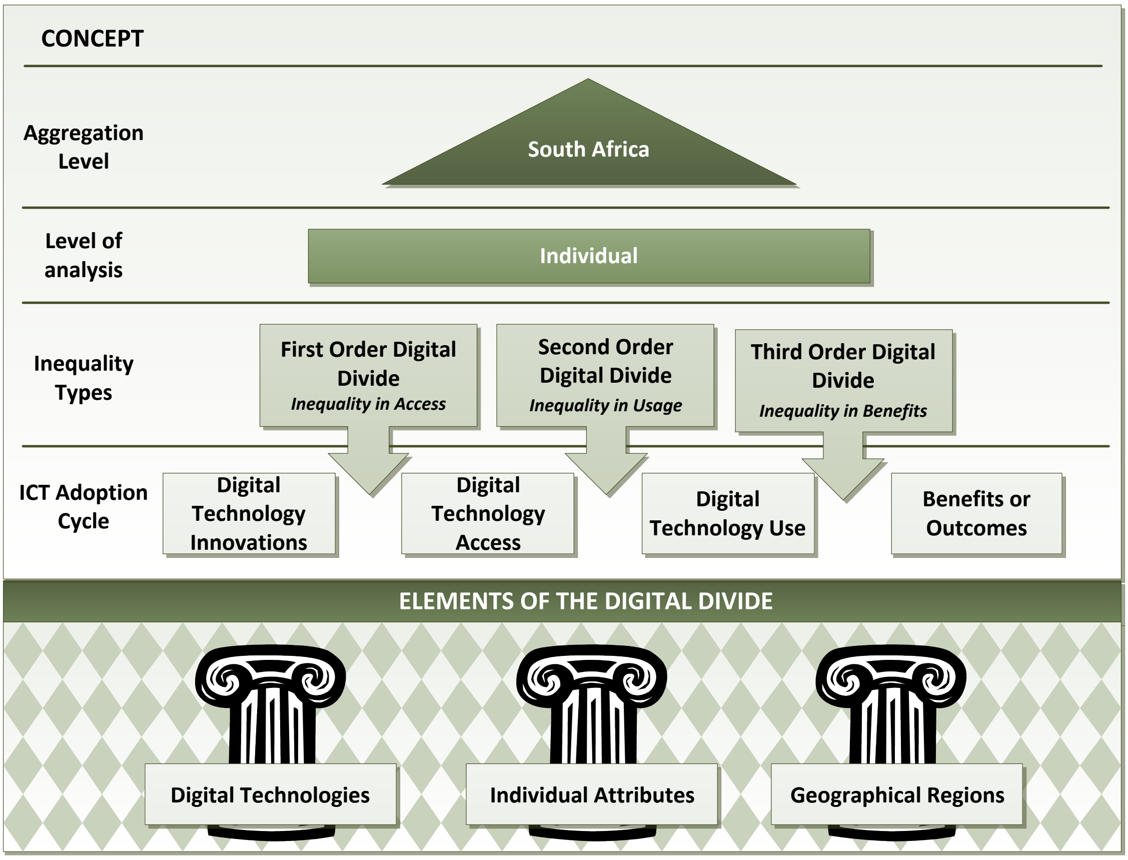
In this section, research objective one was discussed firstly, according to the conceptual framework used to base the Digital Inclusion Index on. Secondly, a discussion on the main features of the creation process of the Digital Inclusion Index. And lastly, a discussion on the second and third part of research objective one.

6.2.1 Conceptual framework of the Digital Inclusion Index

The Digital Inclusion Index was conceptually framed on the digital divide framework in Figure 22 below. It was important to take all the concepts of the digital divide into consideration when the Digital Inclusion Index was designed. Each of these concept is discussed according to the Digital Inclusion Index.

The Digital Inclusion Index was created to measure the levels of digital access for individuals residing in South Africa. The focus on the individual level is vitally important to gain lower level detailed information (Barzilai-Nahon et al., 2008) and many interesting findings has been obtained. The identification of the risk group would also not have been possible without the micro level focus. It was possible to assign a score or factor to each respondent quantifying their level of digital access because of the individual level focus. This enabled the functionality of the Digital Inclusion Index to examine various variables against the individuals level of digital access.

Figure 22: Conceptual framework of the digital divide



The Digital Inclusion Index are focus first order digital divide inequality type. The first order digital divide refers to the unequal physical access to digital technologies (Hargittai, 2002) and is the necessary prerequisite to gain digital benefits (Husing & Selhofer, 2004). Even though usage and benefits obtained from digital technologies would be the ultimate measurement, mere access is a precondition to both usage and benefits.

Because of the complexities in choosing appropriate indicators, current individual level measurements a limited and narrow in focus (Vehovar et al., 2006). The complexity arises from the multiple technologies are available (Vehovar et al., 2006). Most of the current studies on individual level only look at access to one technology at a time, such as the Internet in the Internet Connectedness Index (ICI) by Jung et al., (2001), or the indices created by Selhofer and Hüsing (2002) and Hüsing and Selhofer (2004) which looked at both computer access and Internet access. This study used a full spectrum of digital technologies. The digital technologies on which the Digital Inclusion Index was based are listed in the table below. It is evident that the list is comprehensive of all the currently available and widely used digital technologies.

Table 31: Digital Technologies included in the Digital Inclusion Index

DIGITAL TECHNOLOGIES:		
Electricity	DVD Player	Digital Camera
Television	Mobile Phone	Advanced Digital Devices
Satellite Television	Personal Computer	Internet
ADVANCED DIGITAL TECHNOLOGIES:		
Computer games	iRiver	Sony Diskman
Car TV / Car DVD player	MP3 player	Sony Playstation (1,2,3)
Handheld portable TV (with live feed)	Portable DVD player	Walkman/portable CD player
iPod	PSP 9	X-Box

Two types of digital technologies were excluded from the study because the relevant data were not available. These two technologies are GPS and tablet computer. If the data becomes available in the future it could be easily integrated because of the statistical method selected to create the index.

In order to identify advantaged and disadvantaged individuals and groups within a community in terms of access to digital technologies, individual attributes were selected to describe the different kind of technology users. These individual attributes can be seen in the table below and the Digital Inclusion Index was profiled using these individual attribute variables.

Table 32: List of Individual Attributes

INDIVIDUAL ATTRIBUTES:		
Age Bracket	Personal Income	Work Status
Education Level	Gender	SAARF LSM
Household Income	Occupation	

In addition to the individual attribute profiling, the Digital Inclusion Index was also profiled using the geographical variables. Profiling the Digital Inclusion Index according to geographical regions enabled the identification of the risk group. It was also possible to determine which locations have higher or lower levels of digital access. The Digital Inclusion Index was also profiled using the following geographical region variables.

Table 33: Geographical Region variables

GEOGRAPHICAL REGIONS		
Community Size	Metropolitan Area	Province

All the concept discussed above served as the framework for the construction of the Digital Inclusion Index. The section to follow discuss the result of the Digital Inclusion Index.

6.2.2 The creation of the Digital Inclusion Index

The Digital Inclusion Index was based on the bi-annual AMPS survey which provided data from a large number of respondents representing the South African population. Factor analysis was used to create the Digital Inclusion Index. The main benefit of this was that no arbitrary weightings had to be assigned to the different digital technologies included in the index as in the case of the DDIX (Selhofer & Husing, 2002) and DIDIX (Husing & Selhofer, 2004). Through factor analysis, scores were assigned to each case and the scale was based on these scores in order to create the Digital Inclusion Index. A capability of the method is that new technologies can be added effortlessly to the index as they emerge, taking into consideration the rapidly changing nature of the technological environment (Husing & Selhofer, 2004).

After the scale or factor scores were assigned, individuals with similar levels of digital access were grouped together. The range of possible levels of digital access was initially divided into five bins. This method provided information regarding the concentration of individuals in each category and can be compared with data in future to determine whether the digital divide is narrowing or widening.

Category One and Two (DII-1 and DII-2) were combined into one group; firstly, because both of these groups were identified to be risk groups and secondly, because Category One (DII-1) only consisted of 1.1 per cent of the population. Individuals in Category One (DII-1) did not have access to any technologies including electricity, while individuals in Category Two (DII-2) had access to electricity.

Table 34: Naming convention for categories of the Digital Inclusion Index

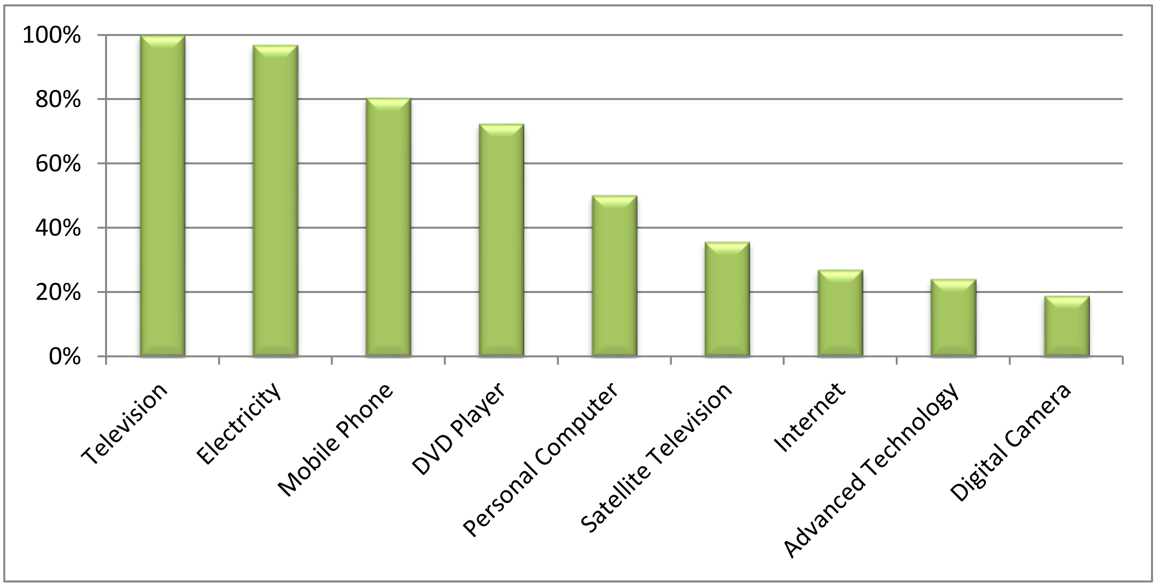
DIGITAL INCLUSION INDEX:	RISK:	ACCESS LEVEL:	PERCENTAGE OF POPULATION:
UNCONNECTED	Risk	Low	13.8%
	Digital Divide		
ASPIRER	No Risk	Medium	43.4%
CONNECTED	No Risk	High	25.9%
POWER USER	No Risk	Very High	16.9%

The digital divide refers to "the separation between those who have access to digital information and communications technology and those who do not" (Dewan & Riggins, 2005, p.298). A split to recognise the digital divide was determined. This split symbolised the difference between the "have" and the "have-nots" of digital access. The "have-nots" or risk group consists of 13.8 per cent of the population. These individuals do not have access to digital technologies such as mobile phones, personal computers or the Internet. According to Fuchs and Horak (2008), it is important to identify the individuals who are being left behind because the digital divide is not only a topic of access, but also one of benefits. Access levels to the various digital technologies are discussed below. The section below contains a summary of the interesting findings regarding the level of access to digital technologies in creating the Digital Inclusion Index.

6.2.2.1 Digital Technologies on which the Digital Inclusion Index was based

According to Fuchs and Horak (2008) older technologies such as electricity, the telephone and television have not been widely adopted in the developing world, while in developed countries these technologies have already saturated the market (Vehovar et al. 2006). This study found that all South African citizens had access to television and 81 per cent of individuals had access to mobile phones. Only 3 per cent of individuals did not have access to electricity in their homes. The graph below illustrates the level of access of each digital technology. It is evident that there is still allot of room for growth when it comes to access to digital technologies such as personal computers and the Internet as seen in Figure 23.

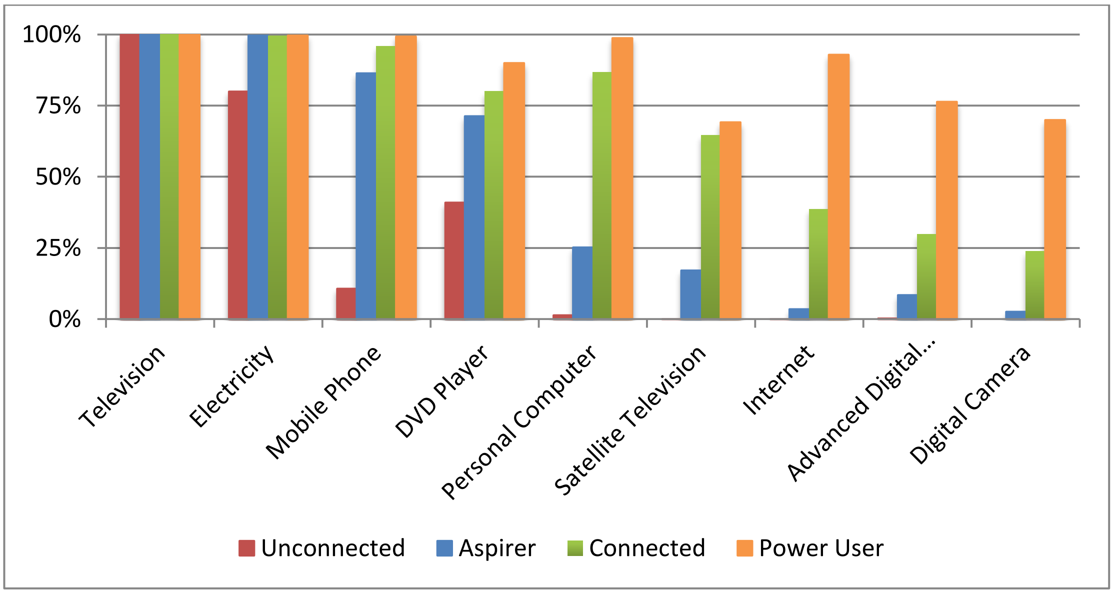
Figure 23: Level of digital access for each technology



Hüsing and Selhofer (2004) found that the diffusion of Internet users in the European Union population is still in the lower part of the S-curve. The same is true for South Africa where only 27 per cent of individuals have access to the Internet. The concern surrounding digital inequality is that there is an assumption that access to the Internet will provide greater access to goods and services and will also lead to enhanced life chances in the form of more education, better jobs, and higher incomes (DiMaggio & Hargittai, 2001). It is therefore extremely important to expose individuals to this universe of knowledge through access to the Internet. The Digital Inclusion Index serves as a digital divide measurement tool to identify the individuals that do not form part of this community. From a governmental perspective that focus could be more on the "have-nots" of digital access to focus policies and resources on the digital inequalities. While from a business or organisational perspective the focus could be on the "haves" of digital technologies because these individuals might serve as the target market segment and the Digital Inclusion Index also serves this objective.

Figure 24 shows the distribution of digital access between the various categories of the Digital Inclusion Index.

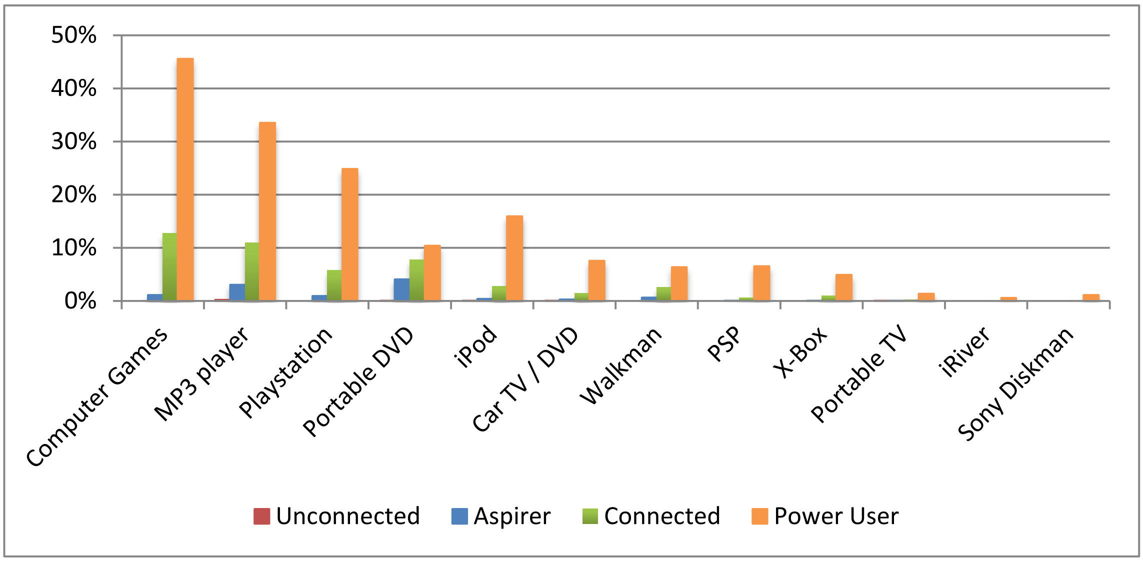
Figure 24: Digital technology access levels between the categories



The divide between the “haves” and the “have-nots” is clearly visible in the graph above. Power Users had high levels of access to all digital technologies, while the Unconnected only had access to television, 80 per cent to electricity and little access to any other type of technology. The gap between all four levels of digital access could infer that inequality to digital technologies could greatly affect people’s lives. Dimaggio et al., (2004) argued that access to the Internet facilitates access to education, jobs and better health. It is therefore extremely important for all citizens to form part of the digital society and the Digital Inclusion Index could direct the allocation of resources to bridge the digital divide.

The level of access to advanced digital technologies further expose the existence of the digital divide. The graph below displays the level of access between the categories of the Digital Inclusion Index and the advanced digital technologies. A respondent needed only to have access to one of these technologies to be label a user of advanced digital technology.

Figure 25: Advanced digital technology level of digital access



Of all the advanced digital technologies, computer games had the highest level of access with an overall saturation percentage of 11 per cent, followed by MP3 players at 10 per cent. The only other technology to which individuals had substantial access is PlayStation for Power Users. Access was fairly low for all other advanced digital technologies as they have not been widely adopted in the South African market. Nobody in the risk group, Unconnected category, had access to any of the advanced digital technologies. Digital technologies such as video games, computer games and the Internet forms part of children's everyday lives in the Western world whether they have access or not (Aarsand, 2007). This infer that even if a child has no access to these technologies, they are still influenced whether it is through other media sources or friends and family. The effects of the digital revolution is inescapable.

The risk group identified consisted of 13.8 per cent of the population and these individuals had low access levels to digital technologies such as mobile phones, personal computer and the Internet. These individuals also had no access to any advanced digital technologies.

6.3 RESEARCH OBJECTIVE ONE B: INDIVIDUAL ATTRIBUTE PROFILE

The second research objective of this study was to profile the Digital Inclusion Index according to attributes of individuals. Individual attributes refer to the attributes that describe the users of digital technologies. The study has observed that digital inequalities between dimensions such as gender is becoming trivial.

Dewan and Riggins (2005) found that computer ownership lagged for seniors and Schleife (2010) found that an individual's age is important. According to Hüsing and Selhofer (2004) the older-younger gap seemed to have widened until 2000, but the gap narrowed until 2004. This study found that young adults, between 20 and 34 years old, tend to have slightly higher levels of digital access and individuals over the age of 65 are prone to have lower levels of digital access. Almost 30 per cent of the individuals in the risk group are 65 years and older. It seems that an individual's age have a small impact on their level of digital access. Aarsand (2007) argued that the digital divide between the younger and older generation was not a problem but rather an interactional resource for gaining access to playtime with children. He provided an example of a conversation between a 10 year old boy and his grandfather, where the young boy explains how his video games works. The digital divide was not seen as a problem but rather as an excellent opportunity to interact.

Van Dijk and Hacker (2003) stated that education, income, and employment are strongly associated with the digital divide. Schleife (2010) acknowledged the important role of education with regard to the use of new technologies and said that highly educated employees and students exhibit a higher proportion of Internet users. This study also observed that higher levels of education is directly proportionate to higher levels of digital access. More than 80 per cent of the individuals that were Unconnected or had low levels of digital access had not completed their high school education. Education plays an integral role in many facets of society and is believed to be the cornerstone of a country's economy.

In agreement with Van Dijk and Hacker (2003) and Schleife (2010), this study found that higher income is positively related to technology adoption rates. Individuals with higher levels of personal and household income tend to have higher levels of digital access. The individuals within the low personal income brackets with higher levels of digital access tend to be younger which could infer that they are depends and are being sponsored their digital devices. The individuals within the higher personal income brackets with low levels of digital access tend to be older and could infer that they don't have an appetite for digital technologies. Because more and more of our daily lives will depend on digital technologies, such as in the case of banking services, more individuals regardless of their financial situation will form part of the digital society. Arrow (1962) argued that demand for information will not be optimal if the price of obtaining the information is above zero. Similarly for digital technologies, saturation will never be 100 per cent if public policy does not provide resources to facilitate access. The information age provides many opportunities but it is only destined to those with access to these technologies (Mariscal, 2005) and intervention by Government is the only way to ensure that everyone has access to these opportunities. The Digital Inclusion Index is created to enable this function.

Occupation has an influence on an individual's level of digital access. A large proportion of the individuals in the Unconnected category had an occupation in services, agriculture or production and mining. Individuals with higher levels of digital access can have almost any kind of occupation. But occupation is highly dependent on education and education expose individuals to more digital technologies. The linkage between education, income and occupation translates that individuals without education will have limited exposure. Certain occupations are also depend on certain digital skills and many new occupations are solely initiated by the digital society. Similarly with occupation, individuals with full-time jobs have higher levels of digital access. 77 per cent of the individuals in the Unconnected category did not work at all, therefore unemployed individuals are almost guaranteed to have low digital access. The Power Users that were not working were mostly younger than 24 years which explains this occurrence. Allot of individuals are being sponsored their digital devices such as parent that provide their children with mobile phones. Because digital technologies form such an integral part of life, many individual characteristics will not be a barrier to obtain access to the benefits which these technologies provide.

6.4 RESEARCH OBJECTIVE ONE C: GEOGRAPHICAL REGION PROFILE

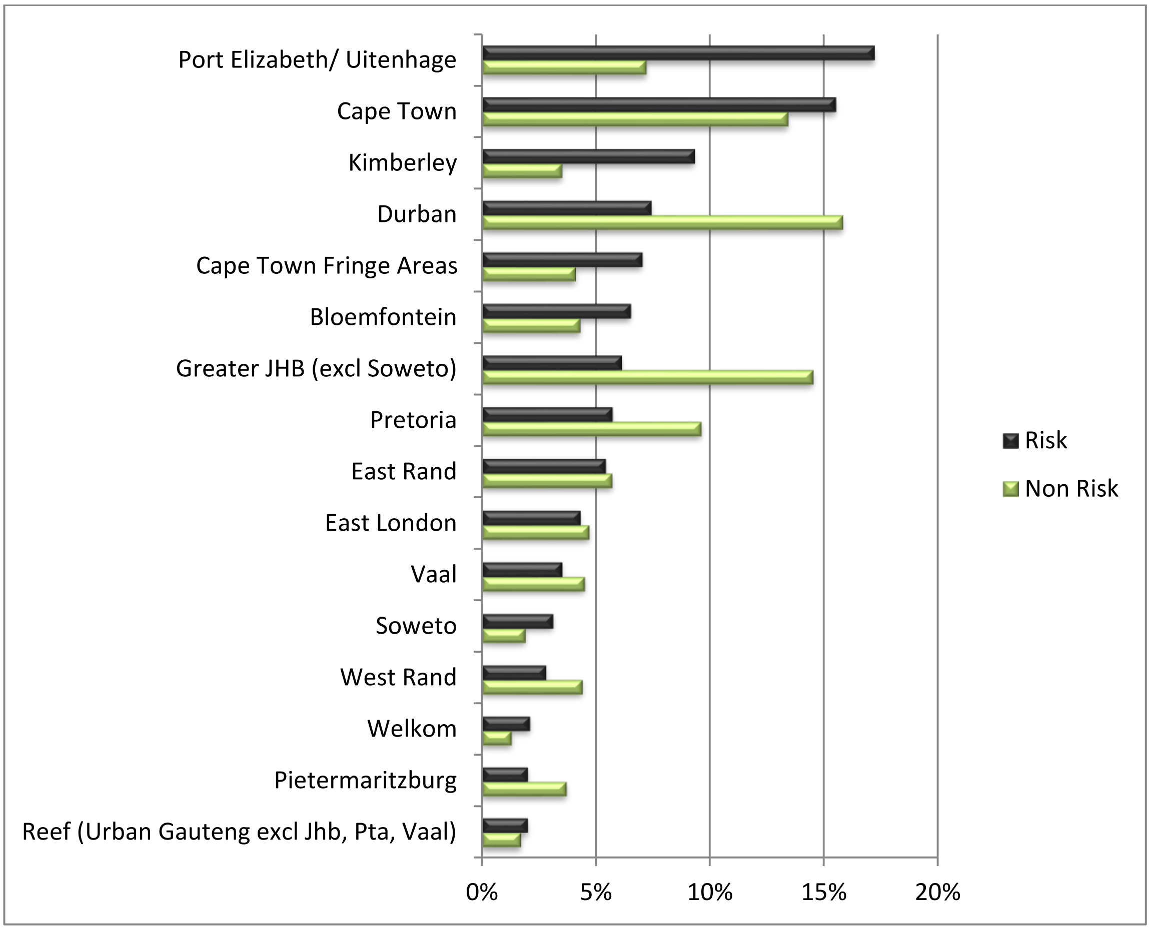
The third part of research objective one was to profile the Digital Inclusion Index according to the geographical regions of individuals. These geographical regions identified where individuals with different levels of digital access reside. The relationship between an individual’s level of digital access and their locality is discussed in this section. Hüsing and Selhofer (2004) said that spatial issues are a crucial dimension to consider.

A digital divide measurement should, according to Atkinson et al. (2008), identify advantaged and disadvantaged individuals and groups within a community in terms of access to ICT services. The Digital Inclusion Index examines exactly where these disadvantaged individuals lives. Agarwal et al. (2009) argued that there are large geographic variations in digital access levels and said that this is due to the “peer effect” (p.277). They argued that an individual choices are subject to social influence which originates from geographical proximity. Agarwal et al. (2009) explained this by saying that if a person’s family, friends, and broader community are Internet users, there would be increased incentive for them to go online otherwise there would be less of an incentive to go online. Conclusion may be drawn that geographical areas with limited digital access may not have an incentive to participate more in the digital society because of the “peer effect”. The opposite is also true where metropolitan area like Johannesburg, could induce residents to become more digitally active as they are exposed to more effects of digital technologies.

When considering the community size, it was found that individuals with high levels of digital access lived in metropolitan areas (over 250 000 and people) and the individuals with lower levels of digital access lived in rural areas. There was no significant difference in digital access between individuals living in cities, large or small towns, small villages and settlements. This could infer that living in these communities does not decrease or limited an individual's chance of obtaining digital access.

The study has found that some metropolitan areas had big difference in digital access levels. Most of the individuals in the Unconnected category lived in Port Elizabeth or Uitenhage, Cape Town and Kimberly. Most of the Power Users lived in Durban, Greater Johannesburg and Cape Town. Individuals in Port Elizabeth or Uitenhage and Kimberly areas had low levels of digital access while individuals in Durban and Greater Johannesburg had high levels of digital access. The graph below illustrates the relationship between the "haves" and the "have-nots" of digital access for South African metropolitan areas. The "peer effect" mentioned above might have an influence on the digital levels of various metropolitan areas.

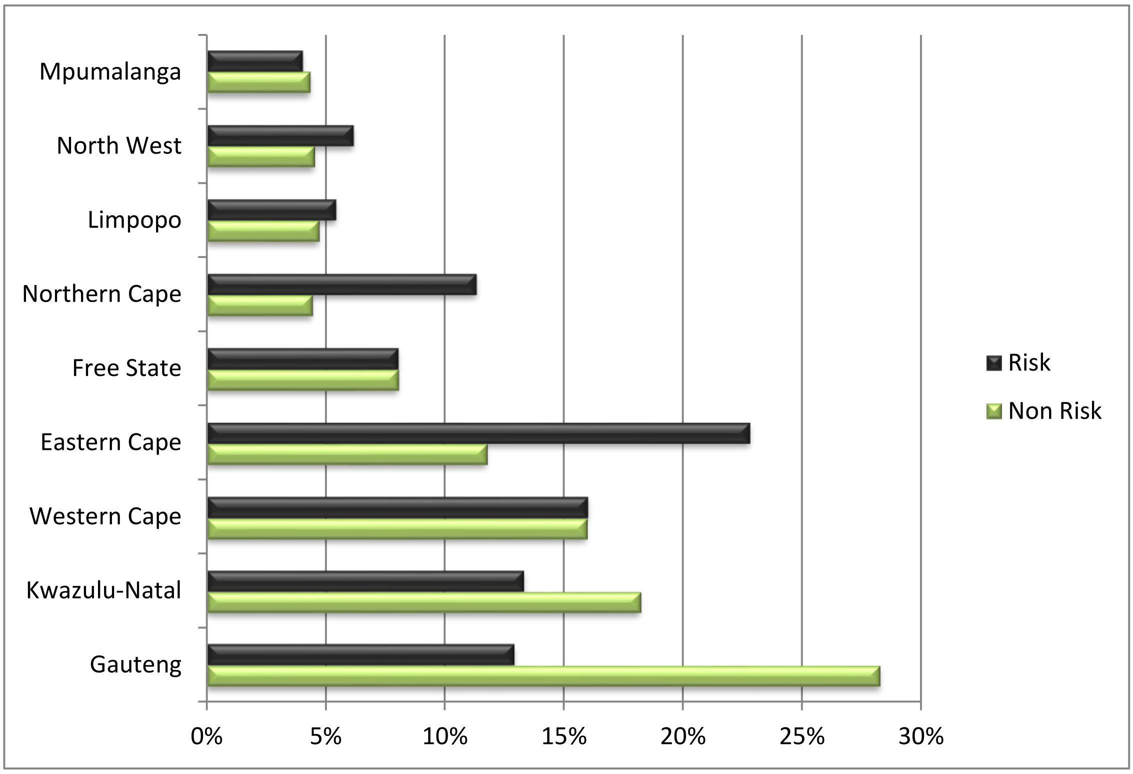
Figure 26: Digital divide between the metropolitan areas in South Africa



Infrastructure plays also a significant role when considering different geographical regions. Buys et al. (2009) stated that most Africans do not have access to the basic ICT services needed for a simple telephone call, while many other regions are dominated by advanced digital telecommunication systems and the Internet. The variance in available infrastructure may cause certain geographical areas to be disadvantaged in terms of digital access.

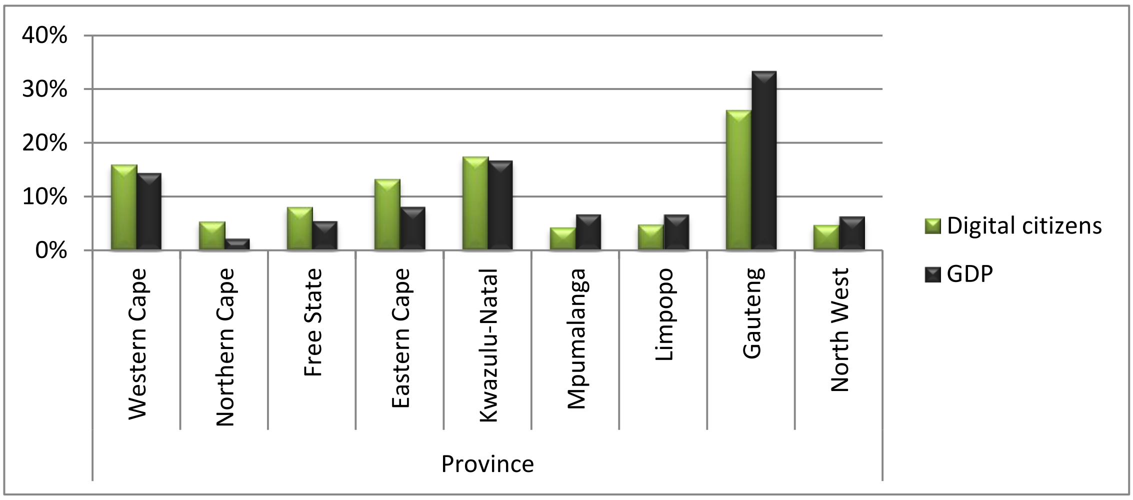
In examining the digital access levels between the South African provinces it was found that more Power Users resided in Kwazulu-Natal and Gauteng, and the Unconnected resided in the Eastern Cape and Northern Cape. Individuals had lower digital access in the Northern Cape, Eastern Cape and North West and higher digital access in Kwazulu-Natal and Gauteng. Significant differences were only found in five of the nine provinces and the graph below displays the digital divide for each province.

Figure 27: Digital divide between the provinces in South Africa



The GDP contribution per province in relation to the proportion of digital citizens is displayed in the graph below.

Figure 28: GDP contribution vs. digital level per provinces in South Africa



Source: GDP data obtained from Statistics South Africa (2011).

When considering the provinces in relation to their GDP contribution, it is interesting to see that the GDP contribution of a province is proportional to their contribution of digital levels. It might be an chicken and egg situation where high economic activity leads to high digital access levels or where high digital levels foster economic activity. But the relationship is clear.

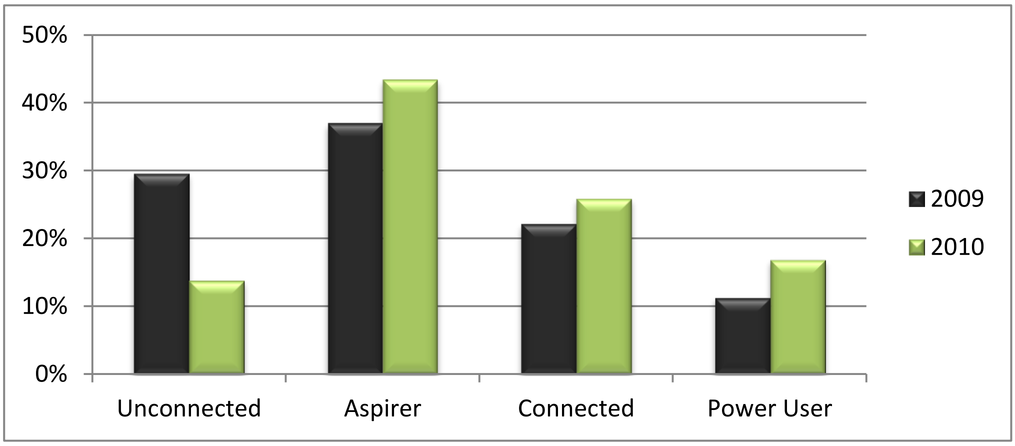
6.5 RESEARCH OBJECTIVE TWO: THE DIGITAL DIVIDE IS NARROWING

Because the Digital Inclusion Index was based on the bi-annual AMPS survey, the proposed index could be generated every year because the AMPS data is collected annually and it would therefore be possible to establish a trend in the level of digital access within South Africa year on year. In this research objective the trend in digital access level between 2009 and 2010 was establish.

According to Mutula (2008) there is no unanimity to ascertain whether the digital divide is narrowing or widening in developing countries, including those in sub-Saharan Africa. According to the knowledge gap theory it should be widening (Husing & Selhofer, 2004). The Digital Inclusion Index would play an integral role in such debates as it would quantify the extent of the digital divide. This study has proven that the digital divide in South Africa narrowed between 2009 to 2010. Not only did the level of access to each digital technology improve, but the number of respondents in the risk group decreased dramatically from 29.6 per cent to 13.8 per cent. It is extremely exciting to find this result and to know that the digital society in South Africa is growing. It is also striking to see that access to the Internet increased by 8 per cent from 19 per cent of the population in 2009 to 27per cent of the population in 2010. Access to personal computers increased by 7 per cent to 50 per cent of the population having access to personal computers in 2010.

The graph below illustrates the number of individuals in each category of the Digital Inclusion Index for 2009 and 2010. It is evident that digital society within South Africa is growing and that the group of individuals that do not benefit from the digital revolution is shrinking.

Figure 29: Digital Inclusion Index distribution between 2009 and 2010



Developing countries are systematically excluded from wealth and technological progress and the wealth gap between the West and Third World is ever increasing (Fuchs & Horak, 2008). It is therefore important to identify the driving forces to find appropriate policy programmes that are aimed at reducing these inequalities (Schleife, 2010). The Digital Inclusion Index shows that digital inequality is reducing, but that South Africa is still far from being an all-inclusive digital society. There is still allot of improvement to be made because the extraordinary benefits of the information revolution is limitless and it is important that nobody is left behind.

6.6 CONCLUSION

"…our digital devices are increasingly shaping our lives" (Orange, 2011)

Digital technologies are so entrenched in our daily living that access to digital technology has become a dimension of social inclusion (Husing & Selhofer, 2004). The Digital Inclusion Index created in this study expose the multifaceted character of the digital divide. In order for everyone to benefit from the digital information revolution it is essential to measure the adoption rate of digital technologies. Without a measurement, the divide can't be managed.

CHAPTER 7: CONCLUSION

"It is quite interesting to note that the time taken to reach 50 million people world over, by radio is 40 years, television is 16 years, personal computer is 12 years, whereas the Internet is only 5 years" (Rao, 2005, p.366).

The digital divide is closely related to the much larger issue of social inequality (Attewell & Gates, 2001; DiMaggio et al., 2001; Vehovar et al., 2006; Warschauer, 2003) and the explosive growth of the Internet is exacerbating these inequalities (Vehovar et al., 2006). Digital access to information is transforming all sectors of everyday life (Selwyn et al., 2005) and the Internet facilitates access to education, good jobs, and better health (Dimaggio et al., 2004). The digital divide therefore introduces a barrier between the "haves" and "have-nots" of digital access.

The study aimed to understand the digital environment of South Africa by creating the Digital Inclusion Index which measures the digital divide. The index was then applied to profile various levels of digital access in term of individual attributes and geographical regions. A risk group was identified where individuals have limited digital access. And lastly was the index applied to 2009 data to determine whether the digital divide has been growing or narrowing between 2009 and 2010.

7.1 DIGITAL INCLUSION INDEX

In order to conceptualise the gap between the "haves" and the "have-nots", a measurement tool to which lay-people can relate and which policy-makers can use to justify allocation of resources and to conduct benchmarking was created. Digital technologies have proven to have a remarkable impact on economic development and it is important to ensure that we embrace the benefits of the opportunities provided by digital technologies.

The Digital Inclusion Index was based on the AMPS survey secondary data, an annual survey representing the South African environment and therefore providing the opportunity to draw definite conclusions about the existence of the digital divide. The survey is conducted through personal interviews and information on the individual characteristics of digital behaviour is gathered. This made the Digital Inclusion Index extremely powerful as information on an individual level is vitally important and most studies are done on national levels, comparing countries with each other. The Digital Inclusion Index compared levels of digital access between individuals within South Africa.

The features of the Digital Inclusion Index include:

- Provide profiles of various digital access levels according to individual attributes and geographical regions,
- Identification of a risk group where individuals have limited digital access,
- Determining whether the digital divide is narrowing or widening and therefor serving as a benchmark,
- Market segmentation based on digital access levels of individuals.

Other advantages of the Digital Inclusion Index includes that the index can be created yearly because the AMPS survey on which it is based is conducted annually. The index has been based on a wide array of digital technologies and the construction method lend itself to the easy incorporation of new technologies in future years. No arbitrary weightings have been assigned. The index is based on clean statistical factor analysis and has not been exposed to subjectivity.

7.2 THE RISK GROUP

Equal access to digital services is an issue of social justice (Atkinson et al., 2008). It is widely assumed that access to digital technologies will result in higher standards of living and improved social welfare through interaction, commerce and learning in a global community (Dewan & Riggins, 2005) and individuals without access will not form part of this community.

This divide leads to social exclusion (Madon et al., 2009) and measurements have to be taken to direct allocation of resources and benchmarking (Barzilai-Nahon, 2006) to ensure focused attention to digitally excluded citizens. There are many governments in industrialised countries that have initiated ICT based programmes aiming to ensure that their citizens are included in the formation of the information society and global information economy (Selwyn, 2002). This study identified a risk group where individuals in South Africa have very low digital access. These individuals did not have access to digital technologies such as mobile phones, personal computers or the Internet.

Most individuals in the risk group had not finished their secondary education, had income below R1 000 and were unemployed. Most of the individuals in the risk group lived in rural areas or metropolitan areas such as Port Elizabeth or Uitenhage, Cape Town and Kimberly. The provinces which were home to the largest proportion of individuals with limited digital access were the Eastern Cape, Northern Cape and North West province.

7.3 BRIDGING THE DIVIDE

"*The only saving grace is in converting digital divide into digital dividend to mitigate the prevailing economic and social disparities*" (Rao, 2005, p.364).

Even though mere access to digital technologies is not sufficient to ensure the narrowing of a digital knowledge gap, it is nevertheless a necessary prerequisite for digital benefits (Husing & Selhofer, 2004). This study has proven that the digital divide in South Africa narrowed from 2009 to 2010. Not only did the level of access to each digital technology improve, but the number of respondents in the risk group decreased from 29.6 per cent to 13.8 per cent.

By ensuring that more citizens are included in the digital society, the effects of the leveraging of all the benefits and opportunities that the digital revolution promises, will increase. The digital society in South Africa is growing and it is important to sustain this momentum in order to ensure that more citizens are connected to digital technologies. As seen from the results determined above it is important to conduct this study annually to measure the digital divide. This will enable the institution of programs and initiatives to ensure that digital inequalities are minimized until they become trivial. Stakeholders such as the government might be interest in the Digital Inclusion Index for this reason and to ensure that South Africa bridge the digital divide.

National-level planning is required to bridge the digital divide as recommended by Rao (2005). Several public policy initiatives seek to bridge the digital divide by providing public access to the Internet or by subsidising access within people's homes (Dewan & Riggins, 2005). The information age provides many opportunities but it is only destined to those with access to these technologies (Mariscal, 2005) and intervention by government is the only way to ensure that everyone has access to these opportunities. The Digital Inclusion Index is created to enable this function.

7.4 BUSINESS CASE

The Digital Inclusion Index does not only identify the risk group but also serves as a market segmentation tool to group people with similar digital access profiles together. It is clear from the results obtained in Section 5.5 that each category of the Digital Inclusion Index has a fine focus on a specific group of individuals. Digital advertising is expected to grow exponentially in 2011 as marketers begin to appreciate the strength of online media (Mokgata, 2011). Appropriate decisions regarding the desired delivery method of digital messages to consumers can be made based on their market segment.

The Digital Inclusion Index proposed can be used as a market segmentation tool. The index groups people with similar digital access profiles together and provides statistics about the South African digital market. This is an immensely valuable tool as it is difficult to find statistics about the digital market (Mokgata, 2011). New and enabling technologies will play a key role in shaping the future society and virtual worlds will become increasingly important in all areas of life (Arnaldi et al., 2010).

7.5 LEAPFROGGING

Because of the rapidly changing technological environment, access to information is now more prone to happen from a mobile device which is becoming a substitute for personal computers (Husing & Selhofer, 2004). This phenomenon is referred to as leapfrogging, which is where new and up-to-date technology is implemented where the previous version of that technology has not been deployed yet (Fuchs & Horak, 2008).

Because of the rapidly changing technological environment, access to information is now more prone to happen from a mobile device which is becoming a substitute for a home computers (Husing & Selhofer, 2004). It is apparent that more individuals had access to mobile phones than to personal computers, which will serve as a platform to the Internet as smart phones become more readily available.

7.6 CONCLUSION – END NOTE

It is widely assumed that access to digital technologies would result in higher standards of living and improved social welfare through interaction, commerce and learning in a global community and individuals without digital access will be excluded from this community (Dewan & Riggins, 2005). The aim of the Digital Inclusion Index is to identify these individuals and to benchmark progress year on year in order to ensure progress is made.

When the Honourable Minister of Communications, Mr Radhakrishna Lutchmana Padayachie delivered his message about the future promise of a country moving towards an inclusive, people-centred information society, he committed to "take technology to the people in service of the people" (Padayachie, 2011, para. 8). The Digital Inclusion Index provides a tool that not only identifies which citizens are not benefiting from the opportunities provided by digital technologies, but also measures the improvement of initiatives regarding the current levels of digital access.

This study provided insight into the digital environment of South Africa through creating the Digital Inclusion Index. It is now possible to see that the digital divide is narrowing and that more South Africans have access to digital technologies in 2010 than in 2009. The tool is of great value in aiming to prioritise initiatives and allocation of resources aimed at improving the digital divide in South Africa. Businesses benefiting from digital technologies can also use the tool to coordinate and position marketing strategies.

7.7 SUGGESTIONS FOR FUTURE RESEARCH

The creation of an appropriate measure for the digital divide is not expected to occur over-night. It is expected that the Digital Inclusion Index should be refined. New and emerging technologies, not included in the index, should be added if deemed appropriate in future research. Factor analysis lend itself to this functionality.

The AMPS survey is conducted annually. The Digital Inclusion Index could be applied to the data every year to determine the trend and rate of technology diffusion in South Africa. This study has proven that the digital divide in South Africa narrowed between 2009 to 2010, but it will be interesting to see what happens in 2011 and in years to come.

Inequalities in access to digital technologies are only part of the problem, another level of digital divide is arising in the use and benefits obtained from using digital technologies. An area for future research is the examination of the digital divide between second order and third order digital divide as explained in Chapter 2. Access to technology is the prerequisite for the use and benefits obtained from digital devices. The next step will then be to measure the second and third order digital divide.

This study only provided insights into the digital access levels of individuals and did not explore the reasons behind their access. Future research might include a qualitative study on the reason why individual have limited digital access.

7.8 LIMITATIONS

Ted Turner, the founder of CNN, has argued:

> *"We talk about the digital divide. We talk about it all the time at Time-Warner too. We want to get computers in everyone's hands. But half the people in the world do not have electricity. Over a billion do not have access to clean drinking water. Forget the digital divide, they need food, water, clothing, shelter and a chance for an education''* (Fuchs & Horak, 2008, p.113).

Only variables, technologies, individual attributes and geographical regions from the AMPS survey could be used because the data was obtained from a secondary source. Digital technologies such as GPS and tablet computers were excluded from the study because the data was not available. It would be of great value of these technologies could have been included in the study.

Not all digital technologies should be rated equally in providing benefits to the digital society. Some technologies such as the Internet might be deemed more beneficial than technologies such as video games. A limitation of the study is that no distinction has been made between constructive and destructive digital technologies. All technologies were considered equal.

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APPENDIX A: DIGITAL DIVIDE MEASUREMENTS

Table 35: Digital Divide Indices on Multinational Level

INDEX & AUTHOR:	LEVEL:	INDICATORS:	VARIABLES:
Digital Access Index (DAI) (International Telecommunication Union, 2003)	Multinational	Indicators: • Fixed telephone subscribers per 100 inhabitants, • Mobile subscribers per 100 inhabitants, • Adult literacy, • Overall school enrolment (primary, secondary and tertiary), • Internet access price (20 hours per month) as percent of per capita income, • Broadband subscribers per 100 inhabitants, • Internet users per 100 inhabitants.	Variables: Index per Country.
Technology Distribution Index (TDI) (Howard et al., 2009)	Multinational	Indicators: • Computers, • Mobile phones, • Bandwidth, • Internet users.	Variables: • Index per Country.
Digital Opportunity Index (DOI) (International Telecommunication Union, 2005)	53 countries	Indicators: • Social, • Internet, • Computers and • Telecommunication	Variables: • Index per Country.
Digital divide: determinants and policies with special reference to Asia (Quibria, 2003)	157 developed and developing countries	Indicators: • Computers, • Mobile phones, • Fax Machine, • Telephone mainline, • Television • Internet users.	Variables: • GDP per Capita, • Size of population.
The Digital Divide: Current and Future Research Directions (Dewan & Riggins, 2005)	40 developed and developing countries	Indicators: • Mainframe, • Personal Computer, • Internet.	Variables: • Telephone lines per 1000, • Subscription cost per month, • Size of urban population, • GDP per Capita, • Years of schooling, • GDP.

The determinants of the global digital divide: a cross-country analysis of computer and internet penetration (Chinn & Fairlie, 2007)	161 developed and developing countries	<u>Indicators:</u> • Personal Computer per100, • Internet Users per 100.	<u>Variables:</u> • Telephone lines per 100, • Monthly telephone subscription charge, • Cost of 3 min call • Population Age, • Urban Population, • GDP per capita, • GDP, • Years of Schooling, • Regulatory quality, • Illiteracy rate, • PC penetration rate.
Measuring the digital divide: a framework for the analysis of cross-country differences (Corrocher & Ordanini, 2002)	Cross country 10 developed countries	<u>Indicators:</u> • Markets, • Diffusion, • Infrastructures, • Human resources, • Competitiveness.	<u>Variables:</u> • Country.
Factors contributing to global digital divide: some empirical results (Bagchi, 2005)	OECD (30 countries) and ECLAC (33 countries) Principal	<u>Indicators:</u> • Personal Computer per1000, • Internet Users per 1000, • Telephone per 1000, • Cell phone per 1000, • Digital distance from the US.	<u>Variables:</u> • GDP per capita, • Inflation • IT expenditure • Secondary education • Illiteracy rate • Urbanization • Ethno-linguistic

Appendix B: Survey Questions

Research Objective One: Develop the Digital Inclusion Index

The following questions from the AMPS survey were used to establish access to various technologies in order to create the Digital Inclusion Index. The table provides information regarding the section and the page number on where the question could be located on the AMPS survey.

Table 36: Detail of Survey Questions for Research Objective One

NO:	TECHNOLOGY:	AMPS SURVEY QUESTION:		AMPS SURVEY ANSWER:	SECTION:		PAGE:
1	Electricity	H3A	By observation: Electricity in home. (Ask if not sure)	Yes/No	H	YOUR HOME	21
2	Television	C1	How many, if any, television sets in working order are there in your household?	Number of television sets	C	ELECTRONIC MEDIA	8
3	Satellite Television	C2	Can your household receive the M-Net channel?	Yes/No	C	ELECTRONIC MEDIA	8
		C3	And does your household currently receive any DStv Satellite channels?	Yes/No	C	ELECTRONIC MEDIA	8
		C12	Do you have a TopTV decoder actively in use in your house?	Yes/No	C	ELECTRONIC MEDIA	9
		C13a	Apart from DStv and/or M-Net and/or TopTV, are there any other decoders currently actively in use in your household?	Yes/No	C	ELECTRONIC MEDIA	9
4	DVD	T119	Large appliances in household: DVD player?	Yes/No	T	DURABLES	40
5	Mobile Phone	D2	Do you personally own, rent or have the use of a cell phone?	Yes/No	D	CELLPHONE	15A

6	Digital Camera	L3	Which of the following, if any, do you personally own/use? Digital camera (does not take film)	Yes/No	L	FURNITURE/ APPLIANCES	29
7	Personal Computer	T116	Large appliances in household: Desktop computer in home?	Yes/No	T	DURABLES	40
		T117	Large appliances in household: Laptop computer in home?	Yes/No	T	DURABLES	40
		Q25a	Use of a computer at home: please indicate your personal frequency of each activity, if at all.	Weekly, Monthly, Yearly, Not at all			
		Q25a	Use of a computer at work: please indicate your personal frequency of each activity, if at all.	Weekly, Monthly, Yearly, Not at all			
8	Advanced Digital Devices	L4	Which of the following, if any, do you personally own or have access to?	• Computer games • Car TV / Car DVD player • Handheld portable TV (with live feed) • iPod • iRiver • MP3 player • Portable DVD player • PSP • Sony Diskman • Sony Playstation (1,2,3) • Walkman/portable CD player • X-Box	L	FURNITURE/ APPLIANCES	29
9	Internet	E3	Have you personally accessed the Internet/World Wide Web in the past 4 weeks?	Yes/No	E	INTERNET	16

RESEARCH OBJECTIVE TWO: PROFILE THE INDIVIDUAL ATTRIBUTES OF THE DIGITAL INCLUSION INDEX

Table 37: Detail of Survey Questions for Research Objective Two

NO:	CATEGORY:	AMPS SURVEY QUESTION:		AMPS SURVEY ANSWER:	SECTION:		PAGE
1	Age	PD7	Into which age group do you fall?	A. 15 B. 16 - 19 C. 20 - 24 D. 25 - 34 E. 35 - 44 F. 45 - 49 G. 50 - 54 H. 55 - 64 I. 65+	PD	PERSONAL DATA	43
2	Education	PD9	What is the highest level of education you personally have achieved?	A. No schooling B. Some primary school C. Primary school completed D. Some high school E. Matric (Grade 12) F. Artisan's certificate obtained G. Post Matric (degrees/ diplomas/ certificates) H. Technikon diploma/degree completed I. University degree completed J. Professional K. Technical L. Secretarial M. Other (STATE)	PD	PERSONAL DATA	44

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3	House hold Income	PD12	Please give me the letter which best describes the TOTAL MONTHLY HOUSEHOLD INCOME of all these people before tax and other deductions. Please include all sources of income i.e. salaries, pensions, government grants, income from investments, etc.	A: R1 – R499 B: R500 – R599 C: R600 – R699 D: R700 – R799 E: R800 – R899 F: R900 – R999 G: R1000 – R1099 H: R1100 – R1199 I: R1200 – R1399 J: R1400 – R1599 K: R1600 – R1999 L: R2000 – R2499 M: R2500 – R2999 N: R3000 – R3999 O: R4000 – R4999	PD	PERSONAL DATA	45
3	Personal Income	PD13	Please give me the letter which best describes your PERSONAL TOTAL MONTHLY INCOME before tax and other deductions. Please include all sources of income i.e. salaries, pensions, grants, income from investments, etc.	P: R5000 – R5999 Q: R6000 – R6999 R: R7000 – R7999 S: R8000 – R8999 T: R9000 – R9999 U: R10000 – R10999 V: R11000 – R11999 W: R12000 – R 13999 X: R14000 – R15999 Y: R16000 – R19999 Z: R20000 – R24999 ZA: R25000 – R29999 ZB: R30000 – R39999 ZC: R40000 – R49999	PD	PERSONAL DATA	45
4	Occupation	PD2	Which one of these statements best describes your working life?	• Working full-time • Working part-time • Not working ○ A housewife ○ A student ○ Retired	PD	PERSONAL DATA	42

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				○ Unemployed			
		PD4A	What is your occupation i.e. what type of work do you do?	Free text	PD	PERSONAL DATA	42
5	Gender		The gender by observation.	• Male • Female	PD	PERSONAL DATA	46
6	SAARF LSM		Determined from AMPS data.				

RESEARCH OBJECTIVE THREE: GEOGRAPHICAL REGIONS

Table 38: Detail of Survey Questions for Research Objective Three

GEOGRAPHICAL REGIONS:	RECODING NOTE:	
Community Size	1 = Metropolitan areas (250 000 or more) 2 = Cities (100 000-249 999) 3 = Large towns (40 000-99 999) 4 = Small towns (8 000-39 999)	5 = Large villages (4 000-7 999) 6 = Small villages (500-3 999) 7 = Settlements (Less than 500) 8 = Non-urban
Province	1 = Western Cape 2 = Northern Cape 3 = Free State 4 = Eastern Cape 5 = Kwazulu-Natal	6 = Mpumalanga 7 = Limpopo 8 = Gauteng 9 = North West
Metropolitan Area	1 = Cape Town 2 = Cape Town Fringe Areas 3 = Port Elizabeth / Uitenhage 4 = East London 5 = Durban 6 = Bloemfontein 7 = Greater JHB (excl. Soweto) 8 = Reef (Urban Gauteng excl. Jhb, Pta, Vaal)	9 = Pretoria 10 = Kimberley 11 = Pietermaritzburg 12 = Soweto 13 = Vaal 14 = Welkom 15 = East Rand 16 = West Rand

APPENDIX C: SPSS OUTPUT FILES: RESEARCH OBJECTIVE ONE

CORRELATION MATRIX BETWEEN TECHNOLOGIES

Table 39: Correlation between technologies

Correlations

		ELECTRICITY	SATELLITE TELEVISION	DVD PLAYER	MOBILE	DIGITAL CAMERA	PERSONAL COMPUTER	ADVANCED TECHNOLOGIES	INTERNET
ELECTRICITY	Pearson Correlation	1	.117**	.222**	.109**	.080**	.135**	.079**	.092**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
SATELLITE TELEVISION	Pearson Correlation	.117**	1	.170**	.192**	.279**	.367**	.162**	.293**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
DVD PLAYER	Pearson Correlation	.222**	.170**	1	.175**	.118**	.225**	.187**	.147**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
MOBILE	Pearson Correlation	.109**	.192**	.175**	1	.183**	.271**	.159**	.261**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
DIGITAL CAMERA	Pearson Correlation	.080**	.279**	.118**	.183**	1	.337**	.284**	.345**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
PERSONAL COMPUTER	Pearson Correlation	.135**	.367**	.225**	.271**	.337**	1	.310**	.458**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
ADVANCED TECHNOLOGIES	Pearson Correlation	.079**	.162**	.187**	.159**	.284**	.310**	1	.338**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
INTERNET	Pearson Correlation	.092**	.293**	.147**	.261**	.345**	.458**	.338**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	

Correlations

		ELECTRICITY	SATELLITE TELEVISION	DVD PLAYER	MOBILE	DIGITAL CAMERA	PERSONAL COMPUTER	ADVANCED TECHNOLOGIES	INTERNET
ELECTRICITY	Pearson Correlation	1	.117**	.222**	.109**	.080**	.135**	.079**	.092**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
SATELLITE TELEVISION	Pearson Correlation	.117**	1	.170**	.192**	.279**	.367**	.162**	.293**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
DVD PLAYER	Pearson Correlation	.222**	.170**	1	.175**	.118**	.225**	.187**	.147**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
MOBILE	Pearson Correlation	.109**	.192**	.175**	1	.183**	.271**	.159**	.261**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
DIGITAL CAMERA	Pearson Correlation	.080**	.279**	.118**	.183**	1	.337**	.284**	.345**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
PERSONAL COMPUTER	Pearson Correlation	.135**	.367**	.225**	.271**	.337**	1	.310**	.458**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
ADVANCED TECHNOLOGIES	Pearson Correlation	.079**	.162**	.187**	.159**	.284**	.310**	1	.338**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
INTERNET	Pearson Correlation	.092**	.293**	.147**	.261**	.345**	.458**	.338**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed).

FACTOR SCORE DESCRIPTIVE STATISTICS

Table 40: Case Processing Summary of the Factor Scores

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Factor Scores	19564	100.0%	0	.0%	19564	100.0%

Table 41: Descriptive Statistics of the Factor Scores

Descriptives

			Statistic	Std. Error
Factor Scores	Mean		.000000	.0071494
	95% Confidence Interval for Mean	Lower Bound	-.014014	
		Upper Bound	.014013	
	Median		-.070682	
	Variance		1.000	
	Std. Deviation		1.0000000	
	Minimum		-2.1526	
	Maximum		2.1061	
	Range		4.2587	
	Interquartile Range		1.3942	
	Skewness		.274	.018
	Kurtosis		-.721	.035

DESCRIPTIVE STATISTICS – RESPONDENT DISTRIBUTION

Table 42: Phase One: Index - Respondent Distribution

Digital Inclusion Index

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	1	220	1.1	1.1	1.1
	2	2491	12.7	12.7	13.9
	3	8483	43.4	43.4	57.2
	4	5070	25.9	25.9	83.1
	5	3300	16.9	16.9	100.0
	Total	19564	100.0	100.0	

STEM-AND-LEAF PLOT

Figure 30: Stem-and-Leaf Plot

```
Factor Scores Stem-and-Leaf Plot

 Frequency    Stem &  Leaf

   220.00       -2 .  11111111
      .00       -1 .
   244.00       -1 .  666666667
  1126.00       -1 .  444444444444444444444444444444444444445
    39.00       -1 .  2&
  2604.00       -1 .  00000000000000000000000000000000000000000000000000001111111111111111111111111111111111111
   135.00       -0 .  89999
  2911.00       -0 .  6666666666666666666666666666666666666666666666666666666666666666666666666666666666666666666666666666&
  1059.00       -0 .  444444444444444445555555555555555555
    19.00       -0 .  &
  2848.00       -0 .  00000000000000000000000000000000000000000000000000000000000111111111111111111111111111111111111111
   560.00        0 .  00000000000001111111
  1001.00        0 .  3333333333333333333333333333333333&
  1510.00        0 .  4444444444444444444444444555555555555555555555555555
   434.00        0 .  66666666666667
   688.00        0 .  999999999999999999999999&
  1613.00        1 .  0000000000000000000000000000000000000000000001111111111
   158.00        1 .  22222
  1210.00        1 .  555555555555555555555555555555555555555555&
   414.00        1 .  666666666666777
      .00        1 .
   771.00        2 .  111111111111111111111111111

 Stem width:    1.0000
 Each leaf:       29 case(s)


 & denotes fractional leaves.
```


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DIGITAL TECHNOLOGY ACCESS PROFILE

Table 43: Digital Technology Access Profile – Initial categories

Report

DIGITAL INCLUSION INDEX		ELECTRICITY	TELEVISION	SATELLITE TELEVISION	DVD PLAYER	MOBILE	DIGITALCAMERA	PERSONAL COMPUTER	ADVANCED DIGITAL TECHNOLOGIES	INTERNET
DII-1	Mean	.00	1.00	.00	.00	.00	.00	.00	.00	.00
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000	.000	.000
DII-2	Mean	.87	1.00	.00	.44	.12	.00	.02	.00	.00
	Std. Deviation	.338	.000	.035	.497	.321	.000	.123	.057	.020
DII-3	Mean	1.00	1.00	.17	.71	.86	.03	.25	.08	.03
	Std. Deviation	.065	.000	.377	.453	.343	.158	.434	.279	.183
DII-4	Mean	1.00	1.00	.65	.80	.96	.24	.87	.30	.39
	Std. Deviation	.051	.000	.478	.399	.199	.426	.340	.457	.487
DII-5	Mean	1.00	1.00	.69	.90	.99	.70	.99	.76	.93
	Std. Deviation	.025	.000	.462	.301	.087	.459	.112	.425	.258
Total	Mean	.97	1.00	.36	.72	.81	.19	.50	.24	.27
	Std. Deviation	.172	.000	.480	.447	.396	.393	.500	.429	.445

Table 44: Digital Technology Access Profile per Digital Inclusion Index category

Report

Mean

Digital Inclusion Index	ELECTRICITY	TELEVISION	SATELLITE TELEVISION	DVD PLAYER	MOBILE PHONE	DIGITAL CAMERA	PERSONAL COMPUTER	ADVANCED DIGITAL TECHNOLOGIES	INTERNET
Unconnected	.80	1.00	.00	.41	.11	.00	.01	.00	.00
Aspirer	1.00	1.00	.17	.71	.86	.03	.25	.08	.03
Connected	1.00	1.00	.65	.80	.96	.24	.87	.30	.39
Power User	1.00	1.00	.69	.90	.99	.70	.99	.76	.93
Total	.97	1.00	.36	.72	.81	.19	.50	.24	.27

Table 45: Digital Technology Access Profile per risk category

Report

Mean

RiskGroup	ELECTRICITY	TELEVISION	SATELLITE TELEVISION	DVD PLAYER	MOBILE PHONE	DIGITAL CAMERA	PERSONAL COMPUTER	ADVANCED DIGITAL TECHNOLOGIES	INTERNET
No	1.00	1.00	.42	.78	.92	.22	.58	.28	.32
Yes	.80	1.00	.00	.41	.11	.00	.01	.00	.00
Total	.97	1.00	.36	.72	.81	.19	.50	.24	.27

ADVANCED DIGITAL TECHNOLOGY ACCESS PROFILE

Table 46: Advanced Digital Technology Access Profile

Report

DIGITAL INCLUSION INDEX		Computer Games	Car TV / DVD	Portable TV	iPod	iRiver	MP3 player	Portable DVD	PSP	Sony Diskman	Playstation	Walkman	X-Box
DII-1	Mean	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	Std. Deviation	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
DII-2	Mean	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	Std. Deviation	.000	.028	.020	.020	.000	.045	.020	.000	.000	.000	.000	.000
DII-3	Mean	.01	.00	.00	.00	.00	.03	.04	.00	.00	.01	.01	.00
	Std. Deviation	.103	.047	.029	.057	.000	.170	.197	.027	.000	.092	.077	.024
DII-4	Mean	.13	.01	.00	.03	.00	.11	.08	.01	.00	.06	.03	.01
	Std. Deviation	.333	.118	.040	.163	.034	.312	.266	.077	.031	.233	.156	.096
DII-5	Mean	.45	.08	.01	.16	.01	.33	.10	.07	.01	.25	.06	.05
	Std. Deviation	.498	.264	.115	.366	.072	.472	.304	.247	.102	.432	.243	.215
Total	Mean	.11	.02	.00	.04	.00	.10	.05	.01	.00	.06	.02	.01
	Std. Deviation	.318	.131	.055	.185	.034	.297	.228	.113	.045	.238	.139	.104

Table 47: Advanced Digital Technology Access Profile per Digital Inclusion Index category

Report

Mean

Digital Inclusion Index	Computer Games	Car TV / DVD	Portable TV	iPod	IRiver	MP3 player	Portable DVD	PSP	Sony Diskman	Playstation (1,2,3)	Walkman	X-Box
Unconnected	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Aspirer	.01	.00	.00	.00	.00	.03	.04	.00	.00	.01	.01	.00
Connected	.13	.01	.00	.03	.00	.11	.08	.01	.00	.06	.03	.01
Power User	.45	.08	.01	.16	.01	.33	.10	.07	.01	.25	.06	.05
Total	.11	.02	.00	.04	.00	.10	.05	.01	.00	.06	.02	.01

Table 48: Advanced Digital Technology Access Profile per risk category

Report

Mean

RiskGroup	Computer Games	Car TV / DVD	Portable TV	iPod	IRiver	MP3 player	Portable DVD	PSP	Sony Diskman	Playstation (1,2,3)	Walkman	X-Box
No	.13	.02	.00	.04	.00	.11	.06	.01	.00	.07	.02	.01
Yes	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Total	.11	.02	.00	.04	.00	.10	.05	.01	.00	.06	.02	.01

Table 49: Descriptive statistics for the random sample

Descriptive Statistics

	N	Minimum	Maximum	Mean
Digital Inclusion Index	1181	1	5	3.24
Valid N (listwise)	1181			

APPENDIX D: SPSS OUTPUT FILES: RESEARCH OBJECTIVE ONE, PART B

1. AGE BRACKET PROFILE

Age Bracket * Digital Inclusion Index Cross tabulation

Table 50: Age Profile cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age Bracket * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Age Bracket * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	
Age Bracket	15-19 years	12.9%	10.6%	12.9%	18.6%	12.9%
	20-24 years	8.8%	12.5%	13.3%	16.8%	12.9%
	25-34 years	16.6%	20.2%	20.1%	22.9%	20.1%
	35-44 years	13.9%	16.7%	19.0%	18.1%	17.2%
	45-49 years	7.0%	7.3%	7.8%	7.9%	7.5%
	50-54 years	7.1%	7.5%	7.5%	5.2%	7.1%
	55-64 years	12.5%	12.4%	10.4%	7.0%	11.0%
	65 years and older	21.1%	12.8%	9.1%	3.6%	11.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square – Age Bracket * Risk Group Cross-tabulation

Table 51: Age Profile Chi-Square Cross-tabulation for the risk group

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Age Bracket * Risk Group	1181	100.0%	0	.0%	1181	100.0%

Age Bracket * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		
		No	Yes	Total
Age Bracket	15-19 years	11.9%$_a$	11.8%$_a$	11.9%
	20-24 years	14.5%$_a$	6.7%$_b$	13.3%
	25-34 years	22.0%$_a$	10.7%$_b$	20.3%
	35-44 years	17.1%$_a$	16.3%$_a$	17.0%
	45-49 years	8.7%$_a$	7.9%$_a$	8.6%
	50-54 years	6.1%$_a$	8.4%$_a$	6.4%
	55-64 years	10.4%$_a$	9.0%$_a$	10.2%
	65 years and older	9.4%$_a$	29.2%$_b$	12.4%
Total		100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	66.267[a]	7	.000
Likelihood Ratio	58.354	7	.000
Linear-by-Linear Association	33.994	1	.000
N of Valid Cases	1181		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.45.

2. Education Profile

Education * Digital Inclusion Index cross-tabulation

Table 52: Education profile cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Education * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Education * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		1	3	4	5	Total
Education	No schooling	6.3%	.8%	.0%		1.2%
	Some Primary school	12.2%	2.6%	.2%		2.9%
	Primary school complete	14.7%	5.3%	.8%	.2%	4.6%
	Some High school	48.0%	44.0%	21.9%	19.4%	34.7%
	Matric (Grade 12)	15.6%	35.4%	43.7%	38.4%	35.3%
	Artisan certificate/ Post Matric (degree/ diploma/ certifica	1.1%	3.0%	5.1%	4.2%	3.5%
	Technikon diploma/ degree completed	.8%	4.7%	15.0%	17.1%	8.9%
	University degree completed	.6%	1.9%	7.9%	14.1%	5.3%
	Professional	.3%	1.5%	3.6%	4.6%	2.4%
	Technical	.3%	.7%	1.1%	1.5%	.9%
	Secretarial	.0%	.3%	.6%	.6%	.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square - Education * Digital Inclusion Index cross-tabulation

Table 53: Education Profile Chi-Square cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Education * Digital Inclusion Index	1181	100.0%	0	.0%	1181	100.0%

Education * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

Education	Digital Inclusion Index				Total
	Unconnected	Aspirer	Connected	Power User	
No schooling	$6.2\%_{a}$	$.7\%_{b}$			1.3%
Some Primary school	$12.4\%_{a}$	$3.2\%_{b}$	$.4\%_{b}$		3.5%
Primary school complete	$18.5\%_{a}$	$5.2\%_{b}$		$.5\%_{c}$	5.3%
Some High school	$43.8\%_{a}$	$42.8\%_{a}$	$23.0\%_{b}$	$19.0\%_{b}$	34.9%
Matric (Grade 12)	$15.7\%_{a}$	$38.9\%_{b}$	$48.8\%_{c}$	$32.3\%_{b}$	36.5%
Artisan certificate/ Post Matric	$.6\%_{a, b}$	$1.1\%_{b}$	$4.3\%_{a, c}$	$5.8\%_{c}$	2.5%
Technikon degree completed	$.6\%_{a}$	$5.2\%_{b}$	$14.1\%_{c}$	$21.2\%_{c}$	9.0%
University degree completed	$1.1\%_{a, b}$	$.7\%_{b}$	$4.3\%_{a}$	$15.3\%_{c}$	3.9%
Professional		$1.4\%_{a}$	$3.5\%_{a}$	$3.2\%_{a}$	1.9%
Technical	$1.1\%_{a}$	$.5\%_{a}$	$.8\%_{a}$	$1.6\%_{a}$	.8%
Secretarial		$.2\%_{a}$	$.8\%_{a}$	$1.1\%_{a}$	.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Digital Inclusion Index categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	424.028[a]	30	.000
Likelihood Ratio	397.759	30	.000
Linear-by-Linear Association	246.158	1	.000
N of Valid Cases	1181		

a. 16 cells (36.4%) have expected count less than 5. The minimum expected count is .75.

Chi-Square – Education * Risk Group cross-tabulation

Table 54: Education profile Chi-Square cross-tabulation for the risk group

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Education * Risk Group	1181	100.0%	0	.0%	1181	100.0%

Education * Risk Group Cross-tabulation

% within Risk Group

Education	Risk Group		Total
	No	Yes	
No schooling	.4%$_a$	6.2%$_b$	1.3%
Some Primary school	1.9%$_a$	12.4%$_b$	3.5%
Primary school complete	3.0%$_a$	18.5%$_b$	5.3%
Some High school	33.3%$_a$	43.8%$_b$	34.9%
Matric (Grade 12)	40.2%$_a$	15.7%$_b$	36.5%
Artisan certificate/ Post Matric	2.8%$_a$	.6%$_a$	2.5%
Technikon diploma/ degree completed	10.5%$_a$	.6%$_b$	9.0%
University degree completed	4.4%$_a$	1.1%$_b$	3.9%
Professional	2.3%$_a$		1.9%
Technical	.8%$_a$	1.1%$_a$	.8%
Secretarial	.5%$_a$		.4%
Total	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

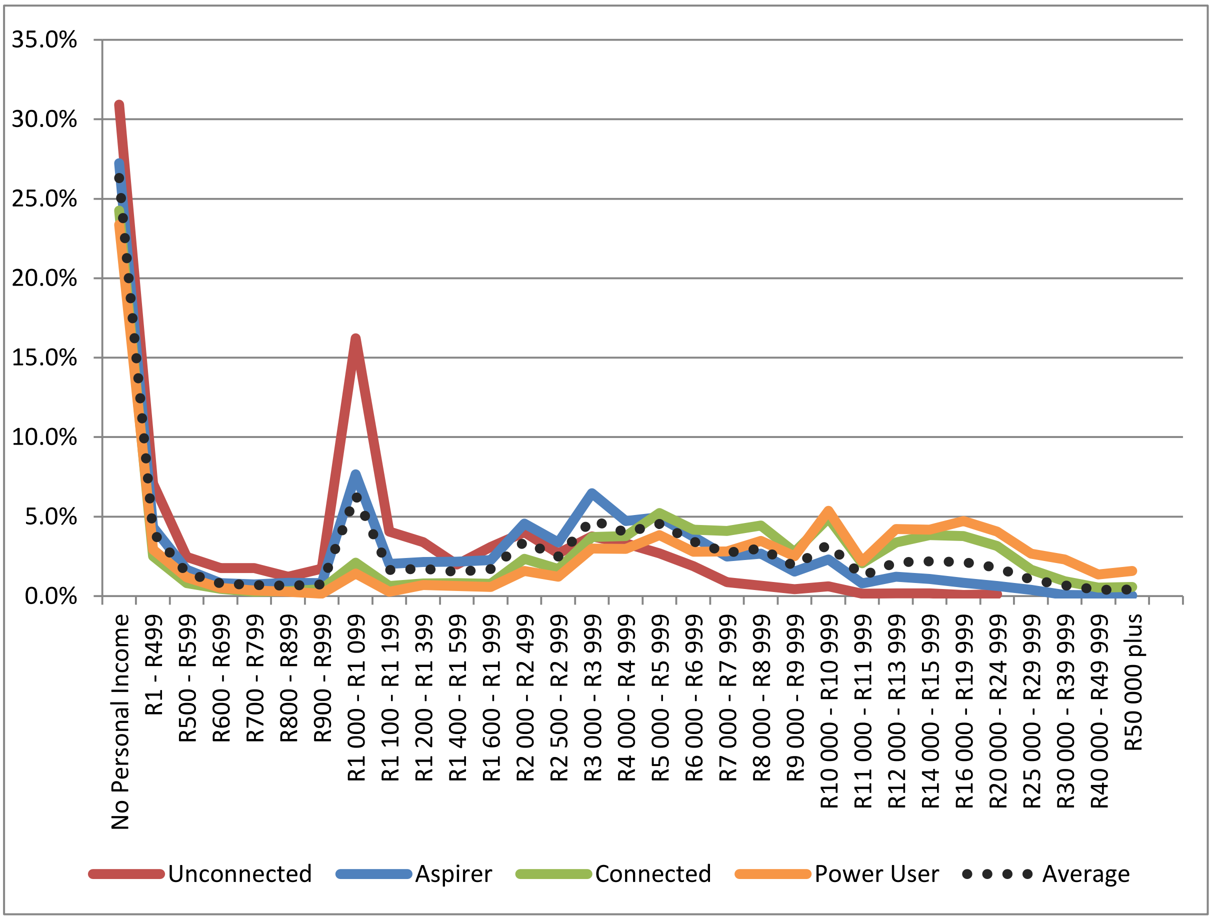
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	214.417[a]	10	.000
Likelihood Ratio	186.621	10	.000
Linear-by-Linear Association	117.450	1	.000
N of Valid Cases	1181		

a. 6 cells (27.3%) have expected count less than 5. The minimum expected count is .75.

3. Personal Income Profile

Figure 31: Personal Income distribution between the various categories



Personal Income * Digital Inclusion Index cross-tabulation

Table 55: Personal Income Chi-Square cross-tabulation for the categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Personal Income * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Personal Income * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		Unconnected	Aspirer	Connected	Power User	Total
Personal Income	R1 - R499	7.1%	4.3%	2.5%	2.9%	4.0%
	R500 - R599	2.5%	1.7%	.8%	1.2%	1.5%
	R600 - R699	1.8%	.8%	.5%	.5%	.8%
	R700 - R799	1.8%	.7%	.3%	.4%	.7%
	R800 - R899	1.2%	.8%	.3%	.3%	.7%
	R900 - R999	1.7%	.8%	.4%	.2%	.7%
	R1 000 - R1 099	16.2%	7.7%	2.1%	1.4%	6.4%
	R1 100 - R1 199	4.1%	2.0%	.6%	.3%	1.7%
	R1 200 - R1 399	3.4%	2.1%	.8%	.7%	1.7%
	R1 400 - R1 599	2.0%	2.2%	.8%	.6%	1.5%
	R1 600 - R1 999	3.1%	2.3%	.8%	.6%	1.7%
	R2 000 - R2 499	4.0%	4.6%	2.3%	1.6%	3.4%
	R2 500 - R2 999	2.7%	3.4%	1.7%	1.2%	2.5%
	R3 000 - R3 999	3.8%	6.5%	3.7%	3.0%	4.8%
	R4 000 - R4 999	3.3%	4.7%	3.8%	3.0%	4.0%
	R5 000 - R5 999	2.7%	5.0%	5.2%	3.8%	4.5%
	R6 000 - R6 999	1.9%	3.7%	4.2%	2.8%	3.4%
	R7 000 - R7 999	.9%	2.5%	4.1%	2.8%	2.7%
	R8 000 - R8 999	.7%	2.7%	4.4%	3.5%	3.0%
	R9 000 - R9 999	.4%	1.5%	2.8%	2.5%	1.9%
	R10 000 - R10 999	.6%	2.3%	4.9%	5.4%	3.3%
	R11 000 - R11 999	.1%	.8%	2.1%	2.2%	1.3%
	R12 000 - R13 999	.2%	1.2%	3.4%	4.2%	2.1%
	R14 000 - R15 999	.2%	1.1%	3.8%	4.2%	2.2%
	R16 000 - R19 999	.1%	.8%	3.8%	4.7%	2.2%
	R20 000 - R24 999	.1%	.6%	3.2%	4.1%	1.8%
	R25 000 - R29 999		.4%	1.7%	2.7%	1.0%
	R30 000 - R39 999	.0%	.1%	.9%	2.3%	.7%
	R40 000 - R49 999		.0%	.5%	1.4%	.4%
	R50 000 plus		.0%	.6%	1.6%	.4%
	No Personal Income	30.9%	27.2%	24.3%	23.4%	26.3%
	Refused	2.5%	5.3%	8.7%	10.8%	6.7%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Personal Income * Risk Group cross-tabulation

Table 56: Personal Income Chi-Square cross-tabulation-for the risk group

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Personal Income * Digital Inclusion Index	1111	94.1%	70	5.9%	1181	100.0%

Personal Income * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		Total
		No	Yes	
Personal Income	R0 - R999	35.4%	43.2%	36.6%
	R1 000 - R4 999	28.9%	49.4%	32.1%
	R5 000 - R9 999	17.9%	6.8%	16.1%
	R10 000 - R13 999	7.8%		6.6%
	R14 000 - R19 999	5.7%	.6%	4.9%
	R20 000 plus	4.4%		3.7%
Total		100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	62.520[a]	5	.000
Likelihood Ratio	84.705	5	.000
Linear-by-Linear Association	37.846	1	.000
N of Valid Cases	1111		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.50.

Age * Risk Group Cross tabulation (Personal Income R0-R 999)

Table 57: Age Cross tabulation for the risk group (Personal Income R0 – R 999)

Age Bracket * Risk Group Cross-tabulation

			Risk Group		Total
			No	Yes	
Age Bracket	15-19 years	Count	1716	307	2023
		% within Age Bracket	84.8%	15.2%	100.0%
		% within Risk Group	31.1%	24.1%	29.8%
	20-24 years	Count	1138	175	1313
		% within Age Bracket	86.7%	13.3%	100.0%
		% within Risk Group	20.6%	13.7%	19.3%
	25-34 years	Count	1021	271	1292
		% within Age Bracket	79.0%	21.0%	100.0%
		% within Risk Group	18.5%	21.3%	19.0%
	35-44 years	Count	683	208	891
		% within Age Bracket	76.7%	23.3%	100.0%
		% within Risk Group	12.4%	16.3%	13.1%
	45-49 years	Count	275	98	373
		% within Age Bracket	73.7%	26.3%	100.0%
		% within Risk Group	5.0%	7.7%	5.5%
	50-54 years	Count	292	102	394
		% within Age Bracket	74.1%	25.9%	100.0%
		% within Risk Group	5.3%	8.0%	5.8%
	55-64 years	Count	297	92	389
		% within Age Bracket	76.3%	23.7%	100.0%
		% within Risk Group	5.4%	7.2%	5.7%
	65 years and older	Count	93	20	113
		% within Age Bracket	82.3%	17.7%	100.0%
		% within Risk Group	1.7%	1.6%	1.7%
Total		Count	5515	1273	6788
		% within Age Bracket	81.2%	18.8%	100.0%
		% within Risk Group	100.0%	100.0%	100.0%

Descriptive Statistics for personal income between R0 and R 999

A filter was applied to show only individuals with a personal income between R0 and R999.

Table 58: Descriptive statistics for personal income between R0 and R999

Digital Inclusion Index

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Unconnected	1273	18.8	18.8	18.8
	Aspirer	3092	45.6	45.6	64.3
	Connected	1473	21.7	21.7	86.0
	Power User	950	14.0	14.0	100.0
	Total	6788	100.0	100.0	

Household Income * Digital Inclusion Index Cross tabulation (Low personal income)

The filter was for individuals with a personal income between R0 and R 999.

Table 59: Household Income Cross tabulation for low personal income

Household Income * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		Unconnected	Aspirer	Connected	Power User	Total
Household Income	R1 - R999	24.4%	11.0%	2.5%	2.3%	10.5%
	R1 000 - R4 999	55.3%	36.4%	9.8%	4.7%	29.8%
	R5 000 - R9 999	15.3%	29.1%	22.9%	14.5%	23.1%
	R10 000 - R13 999	2.7%	11.7%	20.4%	15.8%	12.5%
	R14 000 - R19 999	1.4%	6.3%	15.8%	19.6%	9.3%
	R20 000 plus	.9%	5.4%	28.6%	43.1%	14.9%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Descriptive Statistics for low personal income and high household income

The filter was applied to show only individuals with a personal income between R0 and R999, with a household income higher than R10 000.

Table 60: Descriptive statistics for low personal income and high household income

Age Bracket

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	15-19 years	964	38.8	38.8	38.8
	20-24 years	468	18.8	18.8	57.6
	25-34 years	350	14.1	14.1	71.7
	35-44 years	272	10.9	10.9	82.6
	45-49 years	124	5.0	5.0	87.6
	50-54 years	121	4.9	4.9	92.4
	55-64 years	138	5.5	5.5	98.0
	65 years and older	50	2.0	2.0	100.0
	Total	2487	100.0	100.0	

Descriptive Statistics for personal income above R20 000

A filter was applied to show only individuals with a personal income above R 20 000.

Table 61: Descriptive statistics for personal income above R20 000

Digital Inclusion Index

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unconnected	4	.5	.5	.5
	Aspirer	100	11.8	11.8	12.3
	Connected	348	41.1	41.1	53.4
	Power User	395	46.6	46.6	100.0
	Total	847	100.0	100.0	

Descriptive Statistics for high personal income and low digital access

A filter was applied to show only individuals with a personal income above R 20 000 and which falls in the Aspirer and Unconnected category of the Digital Inclusion Index. These two categories are the categories with the lowest level of digital access.

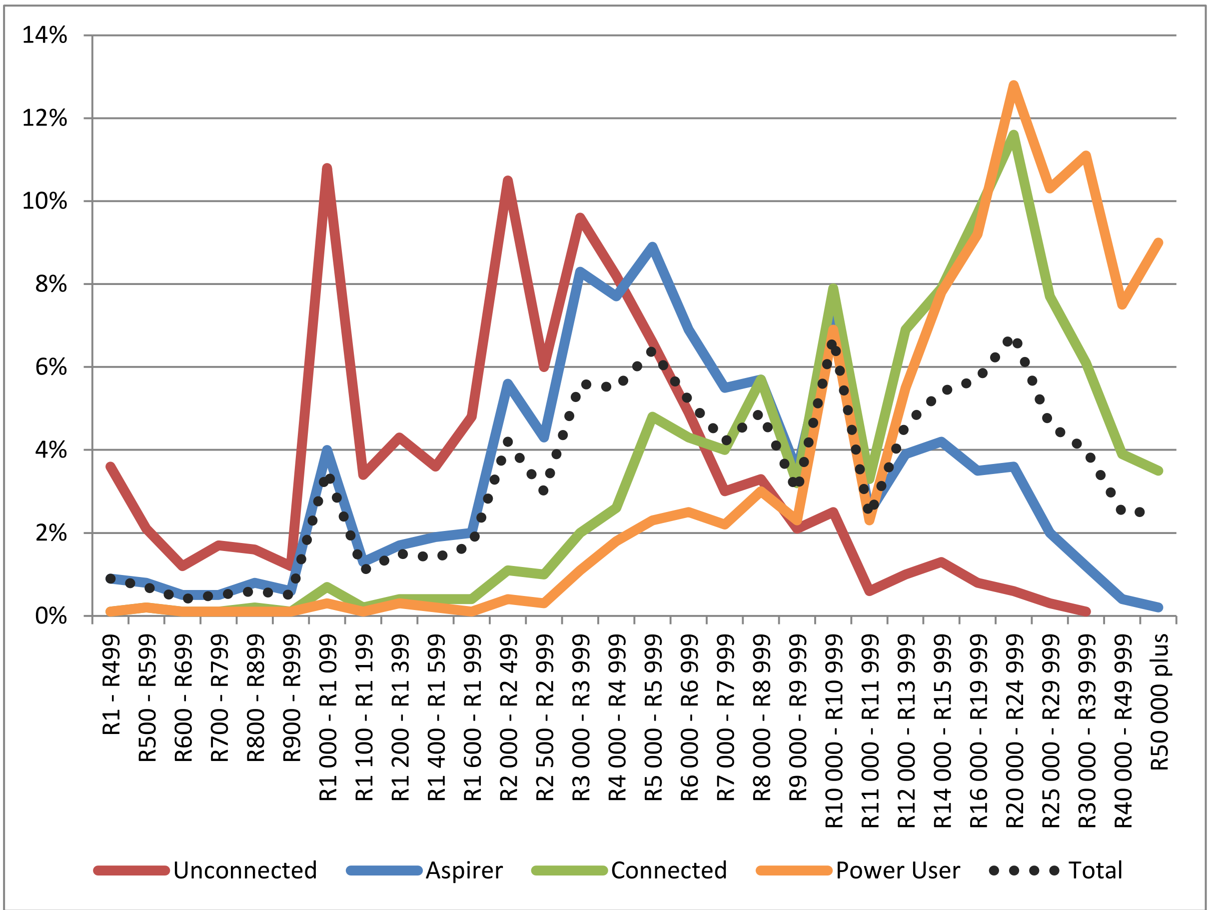
Table 62: Descriptive statistics for high personal income and low digital access

Age Bracket

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	15-19 years	6	5.8	5.8	5.8
	20-24 years	2	1.9	1.9	7.7
	25-34 years	13	12.5	12.5	20.2
	35-44 years	18	17.3	17.3	37.5
	45-49 years	18	17.3	17.3	54.8
	50-54 years	11	10.6	10.6	65.4
	55-64 years	23	22.1	22.1	87.5
	65 years and older	13	12.5	12.5	100.0
	Total	104	100.0	100.0	

4. Household Income Profile

Figure 32: Household Income distribution between the various categories



Household Income * Digital Inclusion Index cross-tabulation

Table 63: Household Income cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Household Income * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Household Income * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		Unconnected	Aspirer	Connected	Power User	Total
Household Income	R1 - R999	11.5%	4.1%	.8%	.7%	3.7%
	R1 000 - R4 999	61.2%	36.7%	8.8%	4.5%	27.5%
	R5 000 - R9 999	20.0%	30.5%	21.9%	12.3%	23.8%
	R10 000 - R13 999	4.1%	13.6%	18.1%	14.7%	13.6%
	R14 000 - R19 999	2.1%	7.7%	17.6%	17.0%	11.0%
	R20 000 plus	1.1%	7.4%	32.8%	50.8%	20.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

5. GENDER PROFILE

Gender * Digital Inclusion Index Cross tabulation

Table 64: Gender Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Gender * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Gender * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		Unconnected	Aspirer	Connected	Power User	Total
Gender	Female	48.8%	52.8%	50.0%	43.8%	50.0%
	Male	51.2%	47.2%	50.0%	56.2%	50.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square – Gender * Digital Inclusion Index Cross tabulation

Table 65: Gender Chi-Square Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Gender * Digital Inclusion Index	1181	100.0%	0	.0%	1181	100.0%

Gender * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	
Gender	Female	47.2%$_{a,\ b}$	54.8%$_{b}$	54.7%$_{b}$	40.2%$_{a}$	51.3%
	Male	52.8%$_{a,\ b}$	45.2%$_{b}$	45.3%$_{b}$	59.8%$_{a}$	48.7%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Digital Inclusion Index categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.477[a]	3	.002
Likelihood Ratio	14.526	3	.002
Linear-by-Linear Association	.839	1	.360
N of Valid Cases	1181		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 86.66.

***Chi*-Square – Gender * Risk Group Cross tabulation**

Table 66: Gender *Chi*-Square Cross tabulation for the risk group

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Risk Group	1181	100.0%	0	.0%	1181	100.0%

Gender * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		Total
		No	Yes	
Gender	Female	52.0%$_a$	47.2%$_a$	51.3%
	Male	48.0%$_a$	52.8%$_a$	48.7%
Total		100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.425[a]	1	.233		
Continuity Correction[b]	1.237	1	.266		
Likelihood Ratio	1.425	1	.233		
Fisher's Exact Test				.255	.133
Linear-by-Linear Association	1.424	1	.233		
N of Valid Cases	1181				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 86.66.

b. Computed only for a 2x2 table

6. Work Status Profile

Work Status Frequency table

Table 67: Work Status frequency table

Work Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full time	6608	33.8	33.8	33.8
	Part time	1521	7.8	7.8	41.6
	Not at all	11435	58.4	58.4	100.0
	Total	19564	100.0	100.0	

Work Status * Digital Inclusion Index Cross tabulation

Table 68: Work Status Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Work Status * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Work Status * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	
Work Status	Full time	13.8%	27.3%	44.0%	51.2%	33.8%
	Part time	8.9%	8.5%	6.6%	6.8%	7.8%
	Not at all	77.3%	64.2%	49.4%	42.1%	58.4%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Descriptive Statistics for the unemployed

The filter was applied for individuals who are not working at all.

Table 69: Descriptive statistics for the unemployed

Age Bracket

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	15-19 years	2390	20.9	20.9	20.9
	20-24 years	1727	15.1	15.1	36.0
	25-34 years	1660	14.5	14.5	50.5
	35-44 years	1146	10.0	10.0	60.5
	45-49 years	509	4.5	4.5	65.0
	50-54 years	628	5.5	5.5	70.5
	55-64 years	1352	11.8	11.8	82.3
	65 years and older	2023	17.7	17.7	100.0
	Total	11435	100.0	100.0	

Age * Digital Inclusion Index Cross tabulation for the unemployed

The filter was applied for individuals who are not working at all.

Table 70: Age Cross tabulation for the unemployed

Age Bracket * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				
		Unconnected	Aspirer	Connected	Power User	Total
Age Bracket	15-19 years	16.2%	15.7%	24.6%	41.7%	20.9%
	20-24 years	9.2%	14.5%	16.6%	23.6%	15.1%
	25-34 years	12.9%	16.1%	14.0%	11.8%	14.5%
	35-44 years	10.3%	10.9%	9.9%	6.3%	10.0%
	45-49 years	5.5%	4.8%	3.7%	2.7%	4.5%
	50-54 years	6.3%	6.3%	5.0%	2.3%	5.5%
	55-64 years	12.8%	13.4%	10.9%	5.5%	11.8%
	65 years and older	26.8%	18.3%	15.3%	6.1%	17.7%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

7. Occupation Profile

Occupation * Digital Inclusion Index Cross tabulation

Table 71: Occupation Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Occupation * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Occupation * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

Occupation	Digital Inclusion Index				Total
	Unconnected	Aspirer	Connected	Power User	
Professional and Technical	.6%	4.2%	12.8%	17.5%	8.2%
Administrative and managerial	.1%	1.4%	4.7%	6.6%	2.9%
Clerical and sales	2.9%	7.5%	12.7%	15.2%	9.5%
Transport and communication	1.0%	2.0%	1.7%	1.4%	1.7%
Service	6.0%	8.3%	6.7%	6.1%	7.2%
Agriculture	4.4%	2.2%	2.3%	2.8%	2.6%
Artisans and related	2.8%	4.4%	5.0%	5.0%	4.4%
Production and mining	4.7%	5.5%	4.5%	3.1%	4.7%
Not active	77.3%	64.2%	49.4%	42.1%	58.4%
Other	.1%	.2%	.4%	.2%	.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

8. SAARF LSM PROFILE

LSM * Digital Inclusion Index Cross tabulation

Table 72: SAARF LSM Cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
SAARF LSM * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

SAARF LSM * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	
SAARF LSM	1	4.5%	.1%			.7%
	2	9.1%	.6%	.0%		1.5%
	3	9.1%	1.8%	.0%		2.0%
	4	16.8%	6.6%	.3%	.1%	5.3%
	5	18.2%	13.8%	1.5%	.2%	8.9%
	6	24.8%	28.6%	9.4%	3.6%	18.9%
	7	10.5%	21.3%	14.4%	7.1%	15.6%
	8	5.5%	15.2%	19.4%	12.7%	14.5%
	9	1.4%	9.9%	32.7%	31.3%	18.3%
	10	.1%	2.2%	22.3%	45.1%	14.3%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Appendix E: SPSS Output files: Research Objective One, Part C

1. Community Size Profile

Community Size * Digital Inclusion Index Cross tabulation

Table 73: Community Size cross-tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Community Size * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Community Size * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	Total
Community Size	Metropolitan areas (250 000+)	32.3%	47.4%	58.9%	67.5%	51.7%
	Cities (100 000-249 999)	12.2%	13.4%	14.7%	11.1%	13.2%
	Large Towns (40 000-99 999)	9.2%	10.4%	8.3%	7.4%	9.2%
	Small Towns (8 000-39 999)	10.2%	10.2%	7.3%	5.5%	8.7%
	Large Villages (4 000-7 999)	3.9%	2.8%	1.7%	1.3%	2.4%
	Small Villages (500-3 999)	3.0%	2.1%	1.8%	1.4%	2.0%
	Settlements (less 500)	.3%	.2%	.3%	.3%	.3%
	Non-urban (Rural)	28.9%	13.5%	7.0%	5.5%	12.6%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Chi-Square – Community Size * Digital Inclusion Index Cross tabulation

Table 74: Community Size Chi-Square Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Community Size * Digital Inclusion Index	1181	100.0%	0	.0%	1181	100.0%

Community Size * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

Community Size	Digital Inclusion Index				Total
	Unconnected	Aspirer	Connected	Power User	
Metropolitan areas (250 000+)	32.6%a	50.7%b	58.2%b, c	66.1%c	52.1%
Cities (100 000-249 999)	11.2%a	10.4%a	15.6%a	11.1%a	11.8%
Large Towns (40 000-99 999)	9.6%a	10.9%a	9.8%a	7.4%a	9.9%
Small Towns (8 000-39 999)	10.1%a	10.0%a	7.0%a	5.3%a	8.6%
Large Villages (4 000-7 999)	4.5%a	2.7%a, b	.4%b	1.1%a, b	2.2%
Small Villages (500-3 999)	.6%a	1.8%a	1.2%a	1.6%a	1.4%
Settlements (less 500)		.4%a	.4%a	.5%a	.3%
Non-urban (Rural)	31.5%a	13.1%b	7.4%b	6.9%b	13.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Digital Inclusion Index categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	100.589[a]	21	.000
Likelihood Ratio	95.796	21	.000
Linear-by-Linear Association	73.860	1	.000
N of Valid Cases	1181		

a. 9 cells (28.1%) have expected count less than 5. The minimum expected count is .60.

Chi-Square – Community Size * Risk Group Cross tabulation

Table 75: Community Size Chi-Square Cross tabulation for the risk group

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Community Size * Risk Group	1181	100.0%	0	.0%	1181	100.0%

Community Size * Risk Group Cross-tabulation

% within Risk Group

		Risk Group		Total
		No	Yes	
Community Size	Metropolitan areas (250 000+)	55.5%$_a$	32.6%$_b$	52.1%
	Cities (100 000-249 999)	11.9%$_a$	11.2%$_a$	11.8%
	Large Towns (40 000-99 999)	10.0%$_a$	9.6%$_a$	9.9%
	Small Towns (8 000-39 999)	8.4%$_a$	10.1%$_a$	8.6%
	Large Villages (4 000-7 999)	1.8%$_a$	4.5%$_b$	2.2%
	Small Villages (500-3 999)	1.6%$_a$	.6%$_a$	1.4%
	Settlements (less 500)	.4%$_a$		.3%
	Non-urban (Rural)	10.5%$_a$	31.5%$_b$	13.6%
Total		100.0%	100.0%	100.0%

Each subscript letter denotes a subset of Risk Group categories whose column proportions do not differ significantly from each other at the .05 level.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	71.597[a]	7	.000
Likelihood Ratio	62.820	7	.000
Linear-by-Linear Association	60.837	1	.000
N of Valid Cases	1181		

a. 4 cells (25.0%) have expected count less than 5. The minimum expected count is .60.

2. METROPOLITAN AREA PROFILE

Metro Area * Digital Inclusion Index Cross tabulation

Table 76: Metro Area Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Metro Area * Digital Inclusion Index	12674	64.8%	6890	35.2%	19564	100.0%

Metro Area * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

Metro Area	Digital Inclusion Index				Total
	Unconnected	Aspirer	Connected	Power User	
Cape Town	15.5%	13.8%	11.5%	15.0%	13.6%
Cape Town Fringe Areas	7.0%	4.8%	3.3%	4.1%	4.4%
Port Elizabeth/ Uitenhage	17.2%	9.5%	6.0%	4.5%	8.2%
East London	4.3%	3.9%	5.1%	5.6%	4.6%
Durban	7.4%	12.3%	15.6%	22.9%	15.0%
Bloemfontein	6.5%	5.4%	3.8%	3.0%	4.5%
Greater JHB (excl Soweto)	6.1%	10.5%	18.7%	16.3%	13.7%
Reef (Urban Gauteng excl Jhb, Pta, Vaal)	2.0%	2.0%	1.9%	.8%	1.7%
Pretoria	5.7%	9.9%	9.5%	9.0%	9.2%
Kimberley	9.3%	4.7%	3.0%	1.7%	4.0%
Pietermaritzburg	2.0%	3.3%	3.3%	4.9%	3.5%
Soweto	3.1%	3.4%	.8%	.3%	2.0%
Vaal	3.5%	5.0%	5.2%	2.4%	4.4%
Welkom	2.1%	1.7%	.9%	.8%	1.3%
East Rand	5.4%	6.2%	5.8%	4.4%	5.6%
West Rand	2.8%	3.7%	5.3%	4.3%	4.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

3. Province Profile

Province * Digital Inclusion Index Cross tabulation

Table 77: Province Cross tabulation for Digital Inclusion Index categories

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Per cent	N	Per cent	N	Per cent
Province * Digital Inclusion Index	19564	100.0%	0	.0%	19564	100.0%

Province * Digital Inclusion Index Cross-tabulation

% within Digital Inclusion Index

		Digital Inclusion Index				Total
		Unconnected	Aspirer	Connected	Power User	
Province	Western Cape	16.0%	16.3%	13.8%	18.0%	15.9%
	Northern Cape	11.3%	5.1%	3.9%	3.5%	5.4%
	Free State	8.0%	9.4%	7.3%	5.6%	8.0%
	Eastern Cape	22.8%	13.1%	10.8%	9.6%	13.3%
	Kwazulu-Natal	13.3%	14.8%	18.2%	26.8%	17.5%
	Mpumalanga	4.0%	5.0%	4.2%	2.7%	4.3%
	Limpopo	5.4%	6.3%	3.8%	2.1%	4.8%
	Gauteng	12.9%	24.4%	33.8%	29.7%	26.1%
	North West	6.2%	5.6%	4.2%	2.0%	4.7%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

APPENDIX E: SPSS OUTPUT FILES: RESEARCH OBJECTIVE TWO

DIGITAL INCLUSION INDEX 2009

Table 78: Digital Inclusion Index 2009 - Communalities between indicators

Communalities

	Initial	Extraction
Electricity	1.000	.096
Satellite television	1.000	.376
DVD Player	1.000	.247
Mobile Phone	1.000	.238
Digital Camera	1.000	.401
Personal Computer	1.000	.555
Advanced Digital Technologies	1.000	.348
Internet	1.000	.475

Extraction Method: Principal Component Analysis.

Table 79: Digital Inclusion Index 2009 - Total variance between indicators

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.736	34.198	34.198	2.736	34.198	34.198
2	1.082	13.527	47.725			
3	.845	10.557	58.282			
4	.815	10.188	68.470			
5	.746	9.324	77.794			
6	.646	8.077	85.871			
7	.612	7.655	93.526			
8	.518	6.474	100.000			

Extraction Method: Principal Component Analysis.

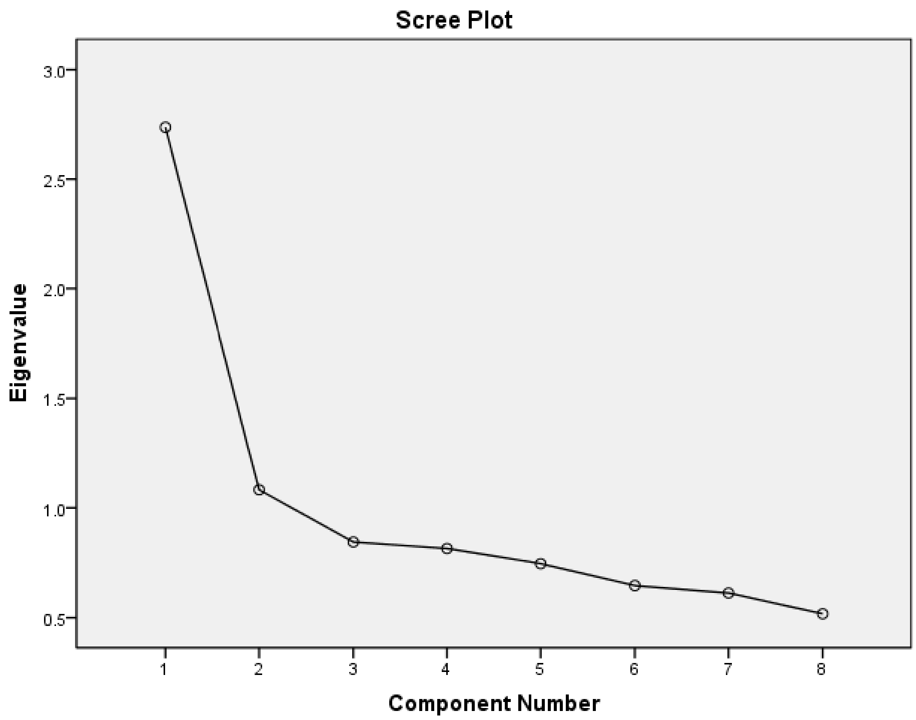
Table 80: Digital Inclusion Index 2009 - Component Matrix

Component Matrix[a]

	Component
	1
Electricity	.309
Satellite television	.613
DVD Player	.497
Mobile Phone	.488
Digital Camera	.633
Personal Computer	.745
Advanced Digital Technologies	.590
Internet	.689

Extraction Method: Principal Component Analysis. a. 1 components extracted.

Figure 33: Digital Inclusion Index 2009 - Scree Plot



DESCRIPTIVE STATISTICS - FACTOR SCORE

Figure 34: Digital Inclusion Index 2009 – Visual binning

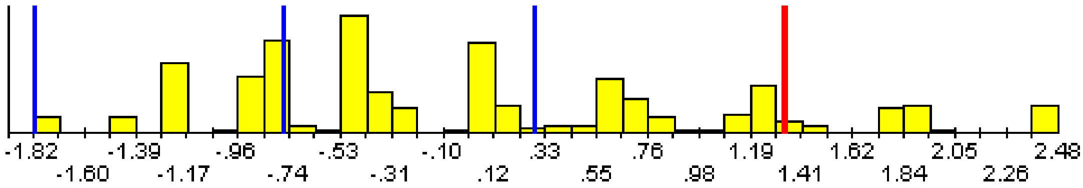


Table 81: Digital Inclusion Index 2009 – Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
REGR factor score 1 for analysis 1	25170	-1.81618	2.37228	.0000000	1.00000000
Valid N (listwise)	25170				

DESCRIPTIVE STATISTICS – RESPONDENT DISTRIBUTION 2009

Table 82: Digital Inclusion Index 2009 – Respondent distribution

Digital Inclusion Index 2009

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	444	1.8	1.8	1.8
	2	6998	27.8	27.8	29.6
	3	9313	37.0	37.0	66.6
	4	5575	22.1	22.1	88.7
	5	2840	11.3	11.3	100.0
	Total	25170	100.0	100.0	

DESCRIPTIVE STATISTICS – DIGITAL TECHNOLOGY PROFILE 2009

Table 83: Digital Inclusion Index 2009 – Digital Technology profile

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Electricity	25170	0	1	.96	.206
Television	25170	1	1	1.00	.000
Satellite television	25170	0	1	.28	.451
DVD Player	25170	0	1	.66	.472
Mobile Phone	25170	0	1	.76	.428
Digital Camera	25170	0	1	.15	.360
Personal Computer	25170	0	1	.43	.495
Advanced Digital Technologies	25170	0	1	.24	.425
Internet	25170	0	1	.19	.394
Valid N (listwise)	25170				

APPENDIX F: MARKET SEGMENTATION TOOL

The Digital Inclusion Index was created and four categories were identified. The profile of each of the categories of the digital inclusion Index in terms of individual attributes and geographical regions are discussed in the sections to follow.

Digital Inclusion Index: Unconnected

The Unconnected category of the Digital Inclusion Index consisted of individuals with very little digital access. Individuals in this category mostly had access only to television; 80 per cent had access to electricity and 40 per cent had access to DVD players. These individuals had no access to personal computers or the Internet. This category consisted of 13 per cent of the population and was classified as the risk group which requires special focus in the future.

Figure 35: Digital technology profile of the Unconnected

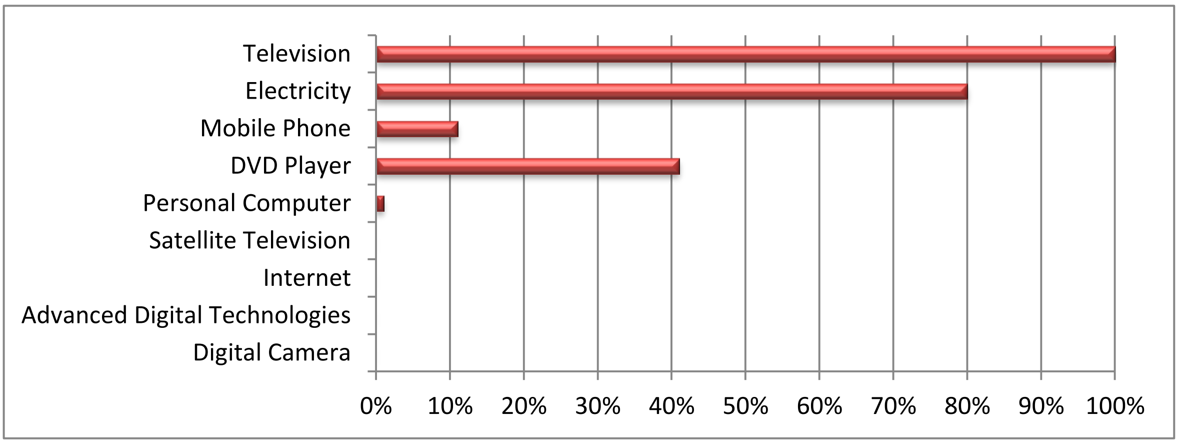


Table 84: Unconnected category profile

UNCONNECTED PROFILE:	
Education	No schooling to Some High School
Personal Income	Less than R 2 000
Household Income	Less than R 3 000
Work status	Only 14per cent with full time jobs
LSM	LSM 4, LSM 5 and LSM 6
Metropolitan Area	Mostly rural areas but also Port Elizabeth/ Uitenhage and Cape Town
Province	Eastern Cape & Western Cape

Digital Inclusion Index: Aspirer

The Aspirer category of the Digital Inclusion Index consisted of individuals with some digital access. Individuals in this category mostly had access only to television, electricity and 86per cent had access to mobile phones. 71 per cent of individuals also had access to DVD players and a quarter of the individuals had access to personal computers. This category consisted of 43 per cent of the population and it is alarming that only 3 per cent of the individuals in this category had access to the Internet.

Figure 36: Digital technology profile of the Aspirer

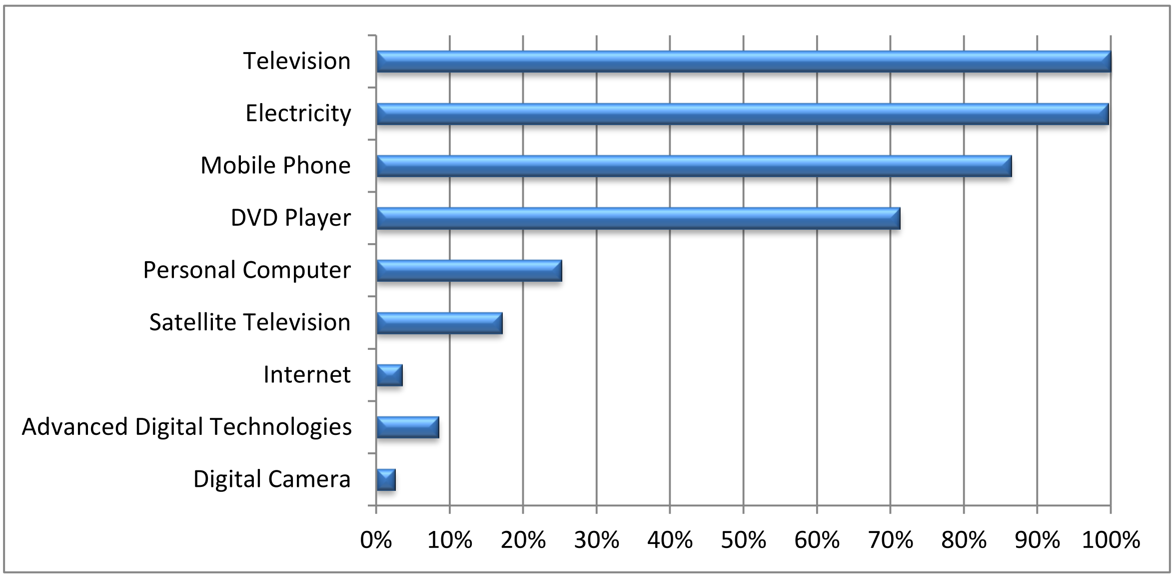


Table 85: Aspirer category profile

ASPIRER PROFILE:	
Education	Some High School or Matric
Personal Income	Less than R 7 000
Household Income	Less than R 10 000
Work status	27per cent with full time jobs
LSM	LSM 6, LSM 7 and LSM 8
Metropolitan Area	Cape Town, Durban and Greater Johannesburg
Province	Gauteng and Western Cape

Digital Inclusion Index: Connected

Individuals in the Connected category had access to most of the digital technologies, but a small portion had access to digital cameras and advanced digital technologies. 87 per cent of individuals had access to a personal computer but only 39 per cent had access to the Internet. This category consisted of 26 per cent of the population. More detail on this category appears in the figure and table below.

Figure 37: Digital technology profile of the Connected

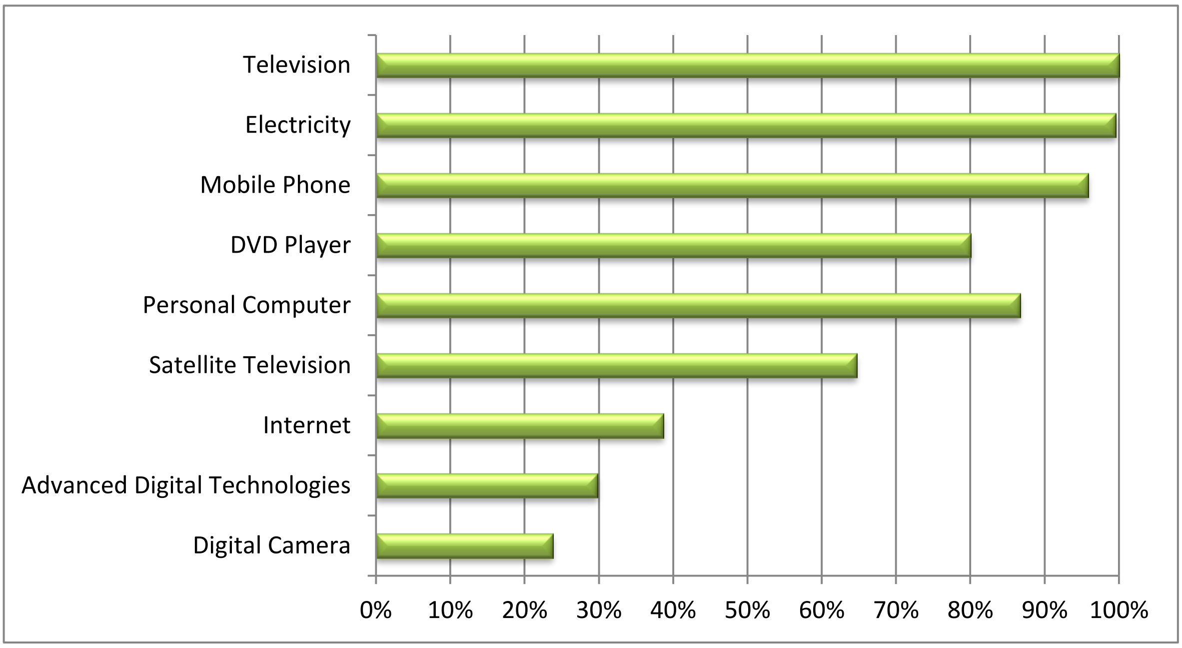


Table 86: Connected category profile

CONNECTED PROFILE:	
Education	Matric or Technikon diploma/ certificate
Personal Income	More than R 7 000
Household Income	More than R 9 000
Work status	44per cent with full time jobs
LSM	LSM 8, LSM 9 and LSM 10
Metropolitan Area	Greater Johannesburg and Durban
Province	Gauteng and Kwazulu-Natal

Digital Inclusion Index: Power User

Power Users had access to all digital technologies. 99 per cent of these individuals had access to personal computers and 93 per cent had access to the Internet. It is pleasant to know that this category consisted of 17 per cent of the population. These individuals also had access to advanced digital technologies such as computer games, MP3 players and PlayStation.

Figure 38: Digital technology profile of the Power User

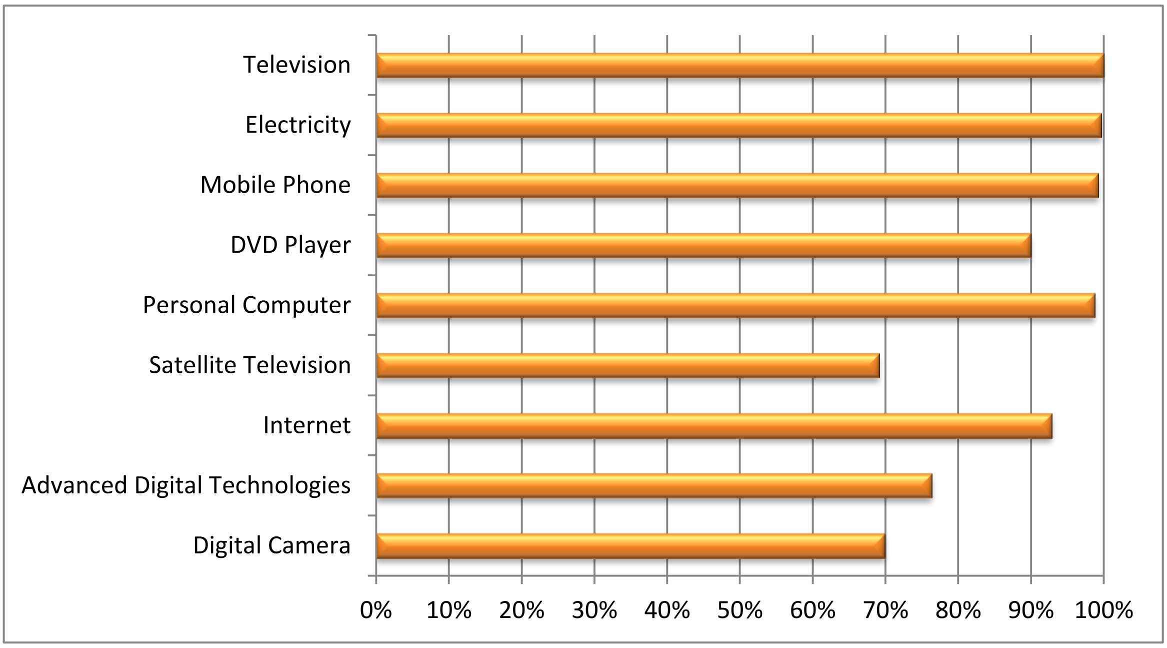


Table 87: Power User category profile

POWER USER PROFILE:	
Education	Matric, Technicon or University degree
Personal Income	More than R 10 000
Household Income	More than R 20 000
Work status	51per cent with full time jobs
LSM	LSM 9 and LSM 10
Metropolitan Area	Durban, Greater Johannesburg and Cape Town
Province	Gauteng and Kwazulu-Natal