UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING & INFORMATICS

MSC.INFORMATION SYSTEMS PROJECT:

A FRAMEWORK TOWARDS DIGITAL INCLUSION. A CASE STUDY OF KIAMBU COUNTY

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P56/61412/2013

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A research Project submitted to the School of Computing and Informatics in partial fulfillment of the requirement for the award of Masters of Science in Information Systems of the University of Nairobi.

June, 2016

DECLARATION AND APPROVAL

This proposal is my original work and has not been presented for a degree in any other University.

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APPROVAL

This proposal has been submitted for review with my approval as the University Supervisor.

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ACKNOWLEDGEMENT

I would like to thank the Almighty God for His wisdom and strength even at the most difficult times of my study. My sincere gratitude also goes to the School of informatics, University of Nairobi fraternity for availing to me an opportunity to pursue a Master of Science in Information Systems. I am also thankful to all the lecturers and in particular my supervisor, Dr. Kahonge for his support, time and invaluable contribution. To you all, I say a big thank you and God's blessings upon your lives.

DEDICATION

I dedicate this study to my dear parents, for their love and unstinting support throughout the study.

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ABBREVIATIONS

ICT	-	Information and Communication Technology
ITU	-	International Telecommunication Union
OECD	-	Organization for Economic Cooperation and Development
WSIS	-	World Summit of the Information Society
CCK	-	Communication Commission of Kenya
PC	-	Personal Computer
IT	-	Information Technology
SPSS	-	Statistical Package for Social Sciences
STEM	-	Science, Technology, Engineering and Mathematics
NTIA	-	National Telecommunication and Information Agency
LDC	-	Least Developed Countries

ABSTRACT

The Internet as a global phenomenon has transformed the way people conduct business, interact, and learn on an international scale. Though more than half of the world's inhabitants have access to ICT, the distribution of resources has not been uniform throughout the world. Digital divide is the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies and to their use of the Internet for a wide variety of activities. Internet access is a requisite for overcoming inequality in a society [where] dominant functions and social groups are increasingly organized around the Internet. Improved ICT access and use in Kenya rural areas can help to: Promote education through enhanced educational and teaching methods using e-learning approach; improve governance through involvement in policy-making; promote sanitation standards and increase health care provisions; promote E-farming where farmers access support and training on current and diverse farming trends using ICT and mobile platforms; help establish a global community where people can share ideas and opinions; promote local talents and job creation; help in attracting a wider range of investors and tourists and most important to the community, bring government services to the people. This study attempts to bridge digital divide by developing a framework for adoption to promote digital inclusion. To achieve this objective, the researcher adopted a descriptive survey that purposively targeted rural respondents to understand causes of digital divide. The researcher used questionnaires and document analysis guide as the main research instruments plus structured interview. The gathered data was then descriptively analyzed and presented in the form of frequencies, charts and graphs. This formed the basis for the discussion, findings and recommendations of the study. Data obtained was organized, coded and analyzed using qualitative and quantitative methods using SPSS (Version 20). The research findings suggest that whereas the digital gap on material access is closing in the region under study, the gap on access to skills, usage and utilization is still wide and requires intervention. The proposed framework for adoption indicates that government and infrastructure, human capital development and social perspectives are the main dimensions that weigh heavily on digital inclusion.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Information and communication technology (ICT) has fostered economic growth and social progress in the past few decades in various regions across the world. Prior studies have shown that ICT plays a critical role in the national e-commerce growth (Fathian, 2008) economic growth (Hanafizadeh, 2009) and country development (Heeks, 2008). Both developed and developing countries in the world have boosted their national investments in ICT to drive their economic growth (Dewan and Kraemer, 2000; Andrianaivo and Kpodar, 2011; Tcheng, 2007).

Heeks (2008) argues that ICT development requires new technologies and new approaches to innovate and integrate. The diffusion of ICT in recent years also has surprised many analysts who serve with leading international organizations. These include the United Nations, the World Bank, the Organization for Economic Cooperation and Development (OECD), and the International Telecommunication Union (ITU), as well as the governments of many countries. For example, benchmark progress in worldwide ICT access with an emphasis on mobile applications was realized in 2008. This was earlier than the prediction of 2015 made by the World Summit of the Information Society (WSIS) in 2005. The estimation is that more than half of the world's inhabitants will have access to ICTs by 2015.

In developing countries, the number of subscribers using mobile devices to access the Internet has jumped up rapidly too. As the largest developing country in the world, China had 233 million mobile Internet users with an estimated annual growth rate of 51% in 2009 (Liang, 2010). These mobile applications have been designed not only for voice communications, but also business transactions and information access. Many countries have endeavored to develop ICT through heavy resource investments over the years. Wealthier countries are considered to have more resources at their disposal in ICT development and may have created a higher level of ICT development.

The Internet as a global phenomenon has transformed the way people conduct business, interact, and learn on an international scale. According to Internet World Stats; a web resource on statistics and population, in 1995, fewer than 10 million people used the net; however, as of 2011, over 2 billion people were connected to the Internet. Africa's internet usage stood at 15.6%. (ITU, 2011). By end 2015, 34% of households in developing countries had Internet access, compared with more than 80% in developed countries. In least developed countries (LDCs), only 7% of households have Internet access, compared with the world average of 46% (ITU, 2016).

This is an indication that there is a long way to go to close the digital divide. Although a proxy, equal distribution of Internet users related to population share would demonstrate progress in closing the gap of global inequity.

Internet-based services have an almost unlimited and unparalleled potential to bring people together from across the world, to enhance educational opportunities, to provide health care benefits, to aid in and generate commerce, and to provide entertainment. The net makes this rapid and cheap communication exchange possible through e-mail, chat rooms, and search engines that allow users to access a wide variety of information.

Though more than half of the world's inhabitants have access to ICT, the distribution of resources has not been uniform throughout the world. For example, there is more communication fiber in the Asian, North American and European continents than in the African continent. Even within the same continent though, there are different levels of ICT access for different countries and regions. As ICT plays a key role in economic growth, the disparities have created many socio-economic imbalance problems in the world. The phrase digital divide, in particular, has caught the attention of academic researchers and policy-makers worldwide. The digital divide refers to the gap between those who have access to IT and those who do not (Rice and Katz, 2003).

The OECD (2001) defined digital divide as ''the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies and to their use of the Internet for a wide variety of activities.'' Thus, the concept of digital divide has two key

components: granularity and contents. Granularity refers to the level of entities such as individuals, businesses, countries and regions where the gap occurs. Contents refer to activities that define the gap, for example, in terms of ICT development and use of the Internet.

Castells (1996) describes Internet access as a requisite for overcoming inequality in a society [where] dominant functions and social groups are increasingly organized around the Internet. Scholars and policymakers are often vague in their reference to computers and the Internet as ICTs because rapid digital innovations make ICT difficult to define. Castells argues that ICT should be considered an umbrella term for a broad range of technological applications (computer hardware and software), digital broadcast technologies (video cameras), telecommunications technologies (mobile phones), and electronic information resources (Internet).

Digital divide is considered a multifaceted phenomenon due to its multidimensional determinant factors. Van Dijk (2005) in his study included socio-economic, institutional and physiological factors in order to gain a greater understanding of the digital divide. He categorizes digital divide into five areas which most typically represent the components of such projects: physical access and connectivity; computer skills and literacy; economic regeneration; civic participation; and diversity, difference and social exclusion. Korukonda (2004) included the "big five" personality dimensions (agreeableness, conscientiousness, neuroticism, extraversion, and openness) in his digital divide study and their relation to computer use, attitude and stress. He found that computer anxiety and technophobia are major barriers of computer and Internet access especially among seniors, people with low educational level and a part of the female population. These phenomena do not completely disappear with a rise in computer experience.

Though the pace of internet development in Kenya is good, there are some constraints limiting accessibility. Much of the workforce has low incomes and this makes it difficult for many people to afford internet accessibility (Mutula, 2008). A study by Synovate (2009) indicates that there is significant interest in the internet in Kenya. At least half of the current non-users are keen to use it if they had access.

Currently, there are concentrated efforts by government and other players to promote ICT infrastructure access and connectivity in Kenya, but the inequality in skill, which constitutes the capacity to respond pragmatically and intuitively to the challenges and opportunities in a manner that exploits the Internet's full potential is still at large (DiMaggio, 2001).

There's evidenced of relatively weak performance of rural businesses in innovation and the take-up of new technologies Keeble et al., (1992). Generally, in Kenya, rural businesses are less innovative and slower to adopt new technologies than their counterparts in more urban locations. With regard to ICTs, some studies suggest a lower level of awareness and utilization of ICTs, both basic and advanced, in rural areas (Clark et al., 1995; Berkeley et al., 1996; Smallbone and North, 1999).

Improved ICT access and use in Kenya rural areas can help to: Promote education through enhanced educational and teaching methods using e-learning approach; improve governance through involvement in policy-making; promote sanitation standards and increase health care provisions; promote E-farming where farmers access support and training on current and diverse farming trends using ICT and mobile platforms; help establish a global community where people can share ideas and opinions; promote local talents and job creation; help in attracting a wider range of investors and tourists and most important to the community, bring government services closer to the people. Other application of ICT's supported through internet include E-governance, E-commerce, E-Payments, E-mails, E-marketing, E-voting, E-learning and many other applications.

The Internet has significantly changed lives regionally and will continue to reshape the way people live. Policymakers have seen the importance of ensuring that all corners of the world participate in and benefit from the Internet and technological advances. The Internet will drive Kenya's future economic and cultural growth. Policy makers must therefore implement flexible policies to encourage ICT's growth especially in the Kenya's rural areas and possible consider redistribution of information and technological resources.

1.2 Statement of the Problem

Globally 3.2 billion people were using the Internet by end 2015, of which 2 billion were from developing countries. For every Internet user in the developed world there were 2 in the developing world. However, 4 billion people from developing countries remain offline, representing 2/3 of the population residing in developing countries. Of the 940 million people living in the least developed countries (LDCs), only 89 million use the Internet corresponding to a 9.5% penetration rate (ITU, 2016). This is an indication that there is a long way to go to close the digital divide. Although a proxy, equal distribution of Internet users related to population share would demonstrate progress in closing the gap of global inequity.

The number of Internet subscribers and ICT usage in Kenya continue to grow daily with current internet penetration standing at 45%, and the mobile penetration standing at 90% (CCK, 2016), despite this growth, most of the ICT usage in Kenya is concentrated in the urban setup which leaves most of the Kenyan rural areas marginalized and lagging behind on the technological scope. Various deliberate efforts have been made in Kenya's rural regions who contribute 79% of the Kenya's total population to help address the digital divide reality. Despite these efforts, the digital divide remains a tall order since there lacks a framework and a common vision. There is therefore a need to develop a framework that can be adopted by policy maker and stakeholder to address the issue of digital divide in Kenya especially in rural areas.

1.3 Objective of the Study

1.3.1 General Objective

To study and analyze on the factor promoting digital divide in rural areas and development and recommend a framework that can be used to promote digital inclusion in Kenya.

1.3.2 Specific Objectives of the Study

1. To study the causal factors of digital divide.
2. To evaluate various frameworks developed and adopted in digital inclusion context.
3. To develop a framework that can be adopted to inform policy and influence practice.
4. To recommend the adoption of the new framework.

1.4 Research Questions

The research seeks to answer the following questions:

1. What are the causal factors of digital divide?
2. What are the various frameworks developed and adopted in digital inclusion context?
3. How can a new framework address the digital divide in Kenya?

1.5 Justification

The digital divide is not a new issue for academics and practitioners, but it remains a fruitful research topic due to its impact on society and on economic development.

Digital inclusion encompasses not only access to the Internet but also the availability of hardware and software; relevant content and services; and training for the digital literacy skills required for effective use of information and communication technologies. The cost of digital exclusion is great. Without access, full participation in nearly every aspect of Kenyan society; from economic success and educational achievement, to positive health outcomes and civic engagement is compromised.

This study outlines the discrepancies that have been in existence for long and the causes of digital divide, and provides an analysis of a possible approach with a common vision to provide a solution.

1.6 Significance of the Study

The findings of this study seek to inform various stake holders in the ICT sector on a current understanding on the digital divide spread in the region of study and point out the factors that contribute growth of digital divide in the scope covered.

The framework developed in this research seek to inform policy and influence practice aimed at promoting digital inclusion. The research work also seeks to provide direction for future research work.

1.7 Scope and Limitation of the Study

Owing to the constraints in time and costs required to conduct a study to the whole Kiambu County, the researcher drew respondents from secondary schools in Kiambu County. The respondents were mainly teachers. The findings of the research provide a comparative basis for rural versus urban statistics on digital divide spread, given that Kiambu county is a semi-urban region in its natural setting.

The study is based on a sample region representing the whole county and hence generalization of the results has been done with great caution.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Over the last decades, the issue of digital divide has received particular attention from international bodies and researchers in Western countries. One of the main reasons for this growing interest is related to the implications that digital inequalities have for social development and particularly in developing countries. Despite the relevance of this issue, there are still few studies on the digital divide in Kenya and even less on digital divide spread in the rural areas. This literature work aims at exploring the digital divide issues among the Kenya's rural population.

The overview of this literature review on digital divide including its meaning, causes, and types of digital divide. This literature explores from other writer's perspectives on social structures that influence the digital divide spread such as gender, age, rural versus urban environment, levels of education, language, autonomy of use. It also reviews the various frameworks geared at bridging this gap.

2.2 Historic Overview

The first decade of the 21st Century has witnessed the rapid diffusion of computers and the Internet across the world. According to the International Telecommunication Union (2011) the Internet penetration on a global level has increased from 18% in 2006 to about 35% in 2011. Among the major regions, Europe leads in broadband connectivity, with fixed and mobile broadband penetration reaching 26% and 54%, respectively, followed by the Americas, Asia & Pacific, and Africa. It is notable that, over the last five years, developing countries have increased their share of the world's total number of Internet users from 44% in 2006, to 62% in 2011.

In Kenya, like other parts of Africa, the Internet was introduced in the early 1990s as a demand-driven technology. That is, Kenyans returning from studies overseas, Western expatriates, and personnel from international governmental organizations and non-governmental organization demanded the Internet and were the first to use it (Muriuki, 2000).

However, compared to other ICTs, the Internet was the least accessed (CCK, 2007). At the end of December 2009, Internet penetration remained low with a penetration rate of 10.2% (CCK, 2010). It also showed very high-density usage (90% of users) in Nairobi and Coast provinces. In terms of economic sectors, the commercial and education sectors accounted for 80% and 1% of Internet users, respectively (CCK, 2007).

A number of factors continue to impede Internet development in Kenya. These include insufficient backbone infrastructure required for Internet development such as fixed line teledensity, commercial power, and PC density of 1%, 8%, and 0.7%, respectively (Muriuki, 2000).

The Digital Divide Overview

Digital divide refers to the gap between those who benefit from digital technology (ICTs) and those who do not (ITU, 2001). At the citizens' level, the digital divide represents the existing gap between citizens who are advantaged or disadvantaged by ICTs (Rogers, 2001; Sukkar, 2004). Rogers, writing on the digital divide within the U.S. states that past definitions of the digital divide have broadly included access to telephones, personal computers, or the Internet based on socio-economic characteristics of the individuals involved: race, gender, age, income, and education. Rogers states that the measure of digital divide is represented conventionally by the latest technology available (i.e., the Internet).

The other form of digital divide is the "within-country" differences in IT access and use among different social groups within a single country. (Rogers, 2001)

2.3 Causes of the Digital Divide

Research on digital disparity can be divided into the study of the global digital divide (the gap between countries) and the domestic digital divide (the gap between groups within countries). Cross-country digital divides result from social and economic inequalities among developed and developing countries.

Access to the Internet by any user is directly related to PC ownership and telephone connection. This means that disparities (or lack thereof) in owning or accessing a PC and a telephone

connection translate directly to disparities (or lack thereof) in access to the Internet (Rogers, 2001).

When considered as a multi-dimensional phenomenon, the digital divide becomes a complex reality with many influential factors (Ranieri, 2009). At the macro level, the main causes of the digital divide include the wealth of a country, availability of infrastructure and costs of Computers and connections, the relationship between politics and the Internet, digital literacy education in school systems, etc. (Binde' et al., 2005). At the micro level, the influential factors include socio-cultural-economic variables such as locations (urban or rural areas), race, gender, age, income levels, educational background, social support (mainly from school and parents), variation of Internet use (leisure use and study use) etc. (Judgeet al., 2006).

2.3.1 Gender

Liu and Wilson (2001) identified a myriad of reasons for pursuing IT skills, among them improved employment opportunities, self-confidence, career prospects, and entrepreneurial opportunities. Liu argues on the need recruit more women into STEM-related educational programs.

According to the International Organization for Migration (World Migration, 2005), Africa has been losing 20,000 professionals each year since 1990. This continuous outflow of skilled labor contributes to a widening gap in science and technology between Africa and other continents, and is one of the greatest obstacles to Africa's development. According to Liu, recruiting more sub-Saharan African women into the IT workforce may help to counter the so-called "brain drain."

Adam et al. (2004) suggests that women tend to consider self-employment in Kenya because entrepreneurship enables them to have careers in the formal economy while avoiding the perceived gender biases of hiring firms. These gendered views on employment suggest that societal structures, rather than intrinsic differences based on biological sex, influence women's perceptions and experiences differently than those of their male counterparts.

2.3.2 Intra-Metropolitan or Urban Digital Divide

Graham (2002) denounces the notion of "death of distance," or the "end of geography" that, on the one hand is founded on a global economic, cultural, and social space that is "one click away" or exemplified by a "cyberspace that is cast as a single, unitary, and intrinsically unifying

electronic space" and on the other, is "unreal". This phenomenon distances the powerful from the less powerful at all scales and is experienced globally and across all aspects of human activity.

Graham articulates evidence that the societal diffusion of ICTs has remained starkly uneven at all scales, but with more pronounced unevenness in cities and other concentrated human settlements.

2.3.3 Inequality and Level of Use.

In efforts to uncover the levels of inequality by different people on internet and digital literacy, DiMaggio and Hargittai's (2001) model of Internet inequality framework helps us to measure the digital divide levels. According to this model, digital inequality includes five dimensions: (1) inequality in technical apparatus, which denotes the availability of appropriate equipment used to access the web, such as high-speed computers, and necessary hardware, software and connections; (2) inequality in autonomy of use, which is understood as the control people exert over the use of the Internet in terms of "when" and "where" one wants to use them, and of course a crucial aspect of this dimension is location of Access (Bimber, 2000); (3) inequality in the availability of social support, which means assistance (even on a technical level) and emotional encouragement from others, including colleagues, teachers, family members, friends and so on; (4) inequality in variation in use, which indicates the different pathways of use of digital media, considering both purposes and activities; (5) inequality in skills, which constitute "the capacity to respond pragmatically and intuitively to challenges and opportunities in a manner that exploits the Internet's potential" (DiMaggio & Hargittai, 2001).

2.3.4 Motivation and Self-efficacy

Bandura (1977) defines self-efficacy as the people's judgment of their capabilities to perform a certain task. Internet self-efficacy stands for the perception that people have of their skills to execute courses of actions through the web (Hsu & Chiu, 2004). This concept does not refer to the individuals' actual skills, but to their perceptions. However, it is important in so far as the subjective representations of our capacities of acting have a strong influence on the actual actions we are able to carry out, as shown by Bandura (1977).

Prior to physical access, comes the wish to have a computer and to be connected to the Internet. Many of those who remain at the 'wrong' side of the digital divide have motivational problems

with regard to digital technology. It appears that there are not only ‘have-nots’, but also ‘wantnots’ (ARD-ZNF, 1999).

In the age of the Internet hype this was a much-neglected phenomenon. Research among non-users and the unconnected is relatively scarce. In the German and American surveys ARD-ZDF (1999) and NTIA (2000) showed that the main reasons for the refusal to use computers and to get connected to the Internet were:(1) No need or significant usage opportunities;(2) No time or liking;(3) Rejection of the medium (the internet and computer games as ‘dangerous’ media); (4) Lack of money; (5) Lack of skills.

The factors explaining motivational access are both of a social or cultural and a mental or psychological nature. A primary social explanation is that ‘‘the Internet does not have appeal for low-income and low-educated people’’ (Katz and Rice, 2002).

2.3.5 Lack of Access

Van Dijk and Hacker (2003) argue that there are four types of barriers to access:

(1) Lack of ‘‘mental access’’ refers to a lack of elementary digital experience. (2) Lack of ‘‘material access’’ means a lack of possession of computers and network connections. (3) Lack of ‘‘skill access’’ is a lack of digital skills. (4) Lack of ‘‘usage access’’ signifies the lack of meaningful usage opportunities.

The concept of material access comprises physical access and other types of access that are required to reach complete disposal and connections such as conditional access (subscriptions, accounts, pay-per-view).

van Dijk (2003) divided the three types of skills in the following order: first a computer user has to acquire operational skills, then s(he) has to develop and apply information skills and finally strategic skills (the capacity to use computer and network sources as means for particular goals in society). Usage access is the final stage and ultimate goal of the process of technological appropriation in the shape of particular applications.

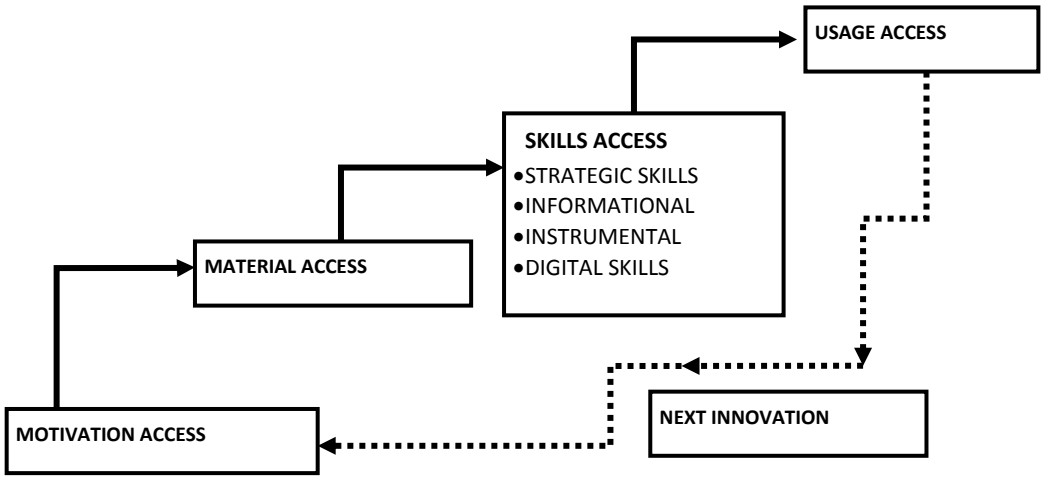


Figure 1 Cumulative and Recursive Model.

Source: van Dijk (2005)

In his recursive model of access to digital technologies, van Dijk explains that technology access should be seen as a process with many social, mental and technological causes and not as a single event of obtaining a particular technology (Bucy and Newhagen, 2004). In this model, material access is preceded by motivational access and succeeded by skills access and usage access. When the full process of technology appropriation is completed, a new innovation arrives and the process starts again, wholly or partly.

2.3.6 Skills Access

After having acquired the motivation to use computers and some kind of physical access to them, one has to learn to manage the hardware and software. Steyaert (2000) and van Dijk (1999, 2003, 2005) introduced the concept of 'digital skills' as a succession of three types of skill. The most basic are 'instrumental skills' (Steyaert, 2000) or 'operational skills' (van Dijk, 2005) the capacities to work with hardware and software. van Dijk proposes a comparable distinction between 'information skills' and 'strategic skills'. Information skills are the skills to search, select, and process information in computer and network sources. Two types of information skills are required: formal information skills (ability to work with the formal characteristics of computers and the Internet, e.g. file and hyperlink structures) and substantial information skills (ability to find, select, process, and evaluate information in specific sources following specific questions) (van Dijk, 2005).

He defines strategic skills as the capacities to use computer and network sources as the means for particular goals and for the general goal of improving one's position in society.
The general impression of these skills investigations, both surveys and tests is (1) that the divides of skills access are bigger than the divides of physical access and (2) that, while physical access gaps are more or less closing in the developed countries, the skills gap (in particular, regarding information skills) tends to grow. A striking result is that those having a high level of traditional literacy also possess a high level of digital information skills (van Dijk et al., 2000; de Haan, 2003). These skills appear to be more important for computer and Internet use than technical knowhow and the capacity to deal with numerical data.

Another striking result from digital skills research is that people learn more of these skills in practice, by trial and error, than in formal educational settings (de Haan and Huysmans, 2002; van Dijk, 2005). The social context and social networking of computer and Internet users appear to be decisive factors in the opportunities they have for learning digital skills.

2.3.7 Poverty

Leavy (2010) suggests that one of the crucial factors that affect the digital divide of countries is poverty. Developing countries suffer greatly from high levels of poverty. Consequently, they are greatly affected by digital divide internally and externally. Leavy indicated that Residents of such countries do not have the necessary finances to afford computers and internet connection. He also argues that digitalization is not important to them when compared to the basic needs of food, shelter and clothing which they hardly fulfill to the maximum. He therefore concludes that its logical that a huge proportion of the population is not able to access internet services due to increasing levels of poverty.

The price of internet connections also encourages the global digital divide. A high majority of households in developed countries such as USA and UK have frequent internet connections. Thus, global digital divide can partly be attributed to the range of prices that make it affordable or not. Most families in the north can afford to have personal internet connections because the prices are low when compared to countries in the south. Furthermore, many families in the world live on income of two dollars a day thus have nothing to spare for luxuries such as the

internet. It is estimated that the price of internet connections in African countries are more when compared to the average income of the majority population (Leavy, 2010).

2.3.8 Poor Governance

To be effectively adopted, ICT requires good governance and appropriation of allocated government funds and foreign aid. In many developing nations lack of ICT policy, poor ICT project management, and corruption has led to ineffective implementation, adoption of different systems and standards, duplication of effort, and waste of technology resources. Efforts are often uncoordinated and initiatives are often in competition with each other rather than complementing each other. In addition, there are many unsustainable ICT programs where schools have computers that do not work as resources that are often redirected and misuse (Ford, 2007; Kessy et al., 2006).

2.4 Frameworks Adopted to Bridge the Digital Divide:

Various researchers have developed, and proposed various frameworks that can be adopted to help reduce the digital divide. A theoretical framework is essential because it acts as a vehicle to define concepts and illustrate how given research fits with and then builds on existing knowledge. Such a framework in Kenyan scenario would help inform and give direction to stakeholders in their endeavor to stem the existing digital divide.

2.4.1 Framework for Inquiry into the Technological Divide

Although the individual consequences of digital exclusion may vary depending on personal, regional, cultural factors and the like, the Framework for Inquiry into the technological divide provides a versatile and comprehensive theoretical framework applicable to various populations at both local and international locations. It is a framework that researchers can use to remotely but nonetheless collaboratively improve etiological knowledge of a technological divide and better inform research and subsequently social interventions at various levels of practice. In light of a social work perspective the net goal is to globally improve the social justice outcomes that are associated with digital exclusion.

The framework itself is divided into three sections.

1. “fifocalVision” – which is adapted from Lee’s (1994) work and represents five elements which are seen to be central to understanding the power relationships which affect different

individuals and groups and wider society. Power is connected to the technological divide because "knowledge about and use of technology is associated with power and blocks to power are imposed and compound to create further disadvantage" (West, 2006). Broadly grounded in the social work perspective and more specifically in the Empowerment Approach to Social Work Practice (Lee, 1994) fifocal vision represents a critical analysis mechanism that performs two vital functions. Firstly, it places the technological divide in its socially constructed context and secondly it helps to locate potential arenas for social interventions that address digital exclusion and remove blocks to power. The lenses of fifocal vision can be applied by international researchers and practitioners to critically analyze power imbalances experienced by specific populations in their specific location and practice context.

The middle third is titled "technological divide framework" and represents measurable concepts that allow disparities in technological utilization to be universally researched and compared between and within groups. Each factor in this column influences the ability of people to fully utilize the capabilities of technology. These factors, viewed collectively, reflect how theorists have evolved notions of digital exclusion from initial conceptualizations based principally on access. The factors comprising the technological divide framework were identified as a result of three separate empirical studies featuring a total of 2345 participants (Irizarry, Downing & West, 2002; Irizarry, West & Downing, 2001; West, 2003a; West, 2003). Understanding that access, knowledge and awareness, learning opportunities and support, and skills all contribute to the successful use of technology performs the dual function of helping researchers to pinpoint appropriate research questions and assisting practitioners at all levels to target social interventions at specific components of a technological divide.

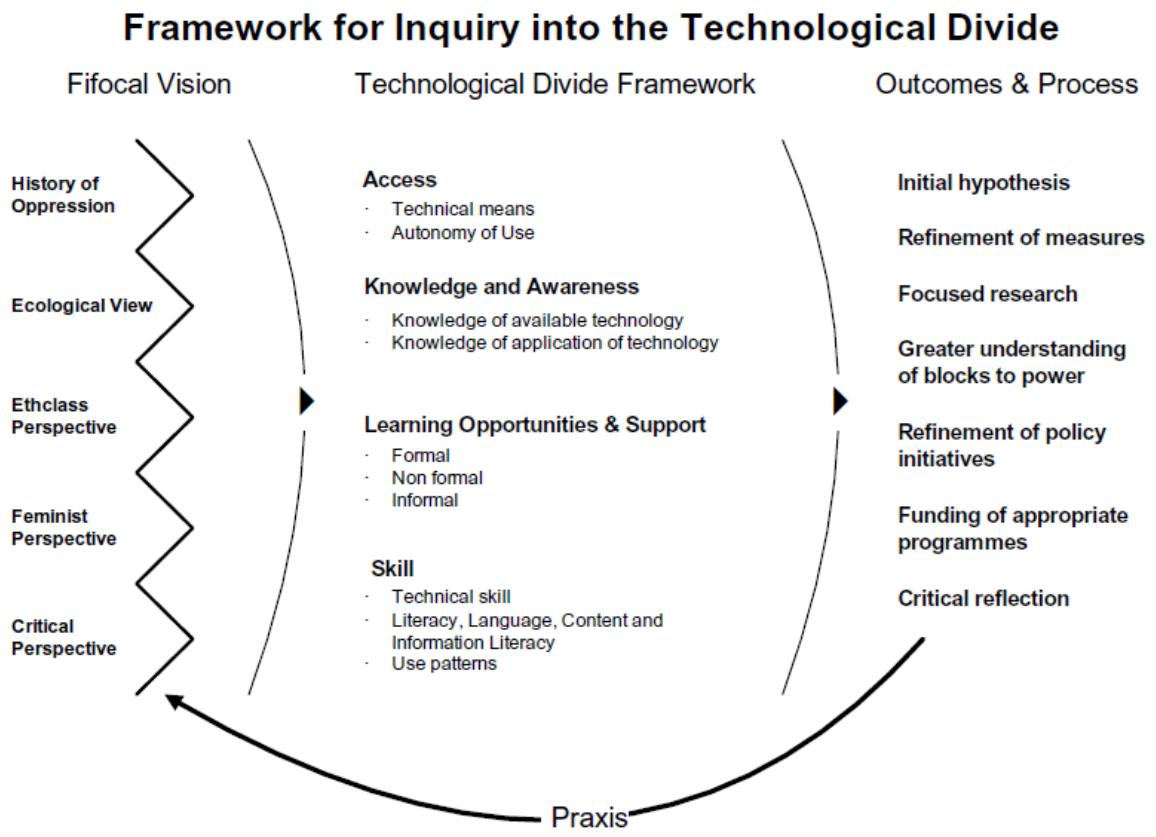


Figure 2 The framework for inquiry into the technological divide.

Source: David & Deborah (2009)

Fifocal vision is a means to analyze why measured disparities exist between certain individuals and groups while the technological divide framework represents an expanded version of the measurable factors that are more traditionally identified in relation to the digital divide.

The right-hand column entitled "outcomes & process" represents the practical application of the framework in the context of the broader goal to globally improve the social justice outcomes associated with digital exclusion. This translates into a sustained, long term process of identifying and intervening to close gaps in the technological access, knowledge, awareness, learning opportunities, support and skills of different people and groups. Derived from an evidence based practice model (Gambrill, 2001; McDonald, 2006) a notable feature of this column is the conceptualization of research, policy, practice and critical evaluation as a process to ameliorate a technological divide. This links intrinsically to prior discussion of the requirement to build on existing knowledge and address digital exclusion via an integrated and collaborative approach.

Additionally, the praxis arrow at the foot of the framework reflects this by highlighting the spiraling nature of the model. Finally, this column also functions to assist individual researchers and practitioners to identify where their activities "fit" in light of the broader drive to close a technological divide.

2.4.2 Consumer Framework for Digital Participation

In 2009, Ofcom Communications Consumer Panel developed the Consumer Framework for Digital Participation aimed at understanding what people needed in order to get the most out of the internet, including helping people evaluate, engage with and understand online content.

This was after the Welsh Assembly Government recognized there was increasingly use of online technologies in its citizens' daily lives. The Government underscored the ability to use these technologies as critical as reading and writing. Individuals, who did not have the skills to get online, or saw it as irrelevant, were likely to become increasingly economically and socially excluded. As more people started to use technologies, and the benefits continued to grow, there was a risk that, for those who were left behind, the exclusion became even more pronounced.

The Government committed itself to achieving digital inclusion of its citizens and made it key to individually and collectively embrace the opportunities and imperatives of the rapidly evolving world.

The Welsh Assembly Government therefore decided to develop a strategic response to the high number of adults who were digitally excluded. The Consumer Framework for digital participation identified those people who are most likely to be digitally excluded, including older people; those who live in social housing; those with lower socio-economic status, on lower income, the unemployed, the economically inactive, and the disabled. It is estimated that they number approximately 785,000 citizens, which is approximately 34% of adults in Wales. There is a recognition that achieving the digital inclusion of people, both as citizens and consumers, is essential to ensure that they can benefit from the rapid pace of technological change. (*Welsh Assembly Government, 2010)*

In order to maximize the impact and reduce the numbers of citizens who are digitally excluded, The Framework recognized the need for:

1. Aligning policies
2. Obtaining ‘buy-in’ from a wide range of stakeholders and
3. Undertaking activities which include:
   i. On the ground digital inclusion delivery through community based approaches
   ii. Engagement through libraries
   iii. Learning through education and lifelong learning, and skills development
   iv. Increased involvement of the private, public and third sectors
   v. Volunteering
   vi. Extending the range of geographical coverage where support is available.

The overall objective of the framework was to promote a digitally inclusive, sustainable society. Empowering all citizens to be able to take advantage of digital technologies to enhance their quality of life.

The overall outcome of the framework was to ensure that all citizens have affordable access, support and the right skills to benefit from the advantages of being online.

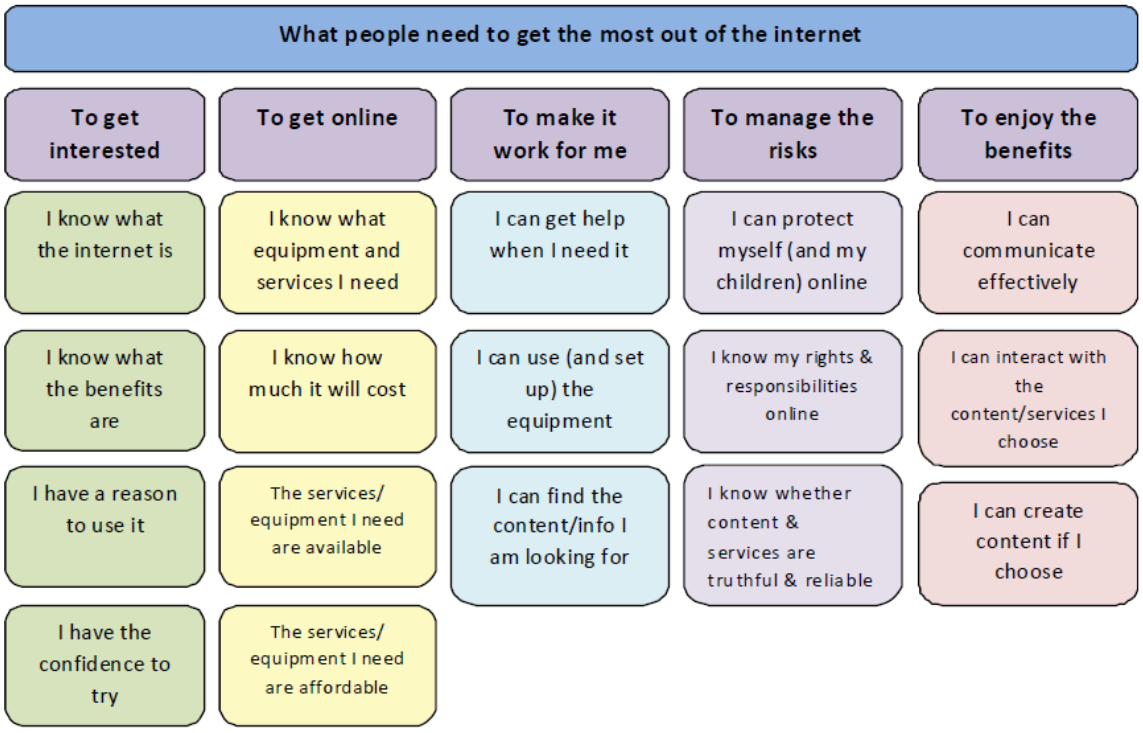


Figure 3 Consumer Framework for Digital Participation.

Source: Welsh Assembly Government (2010)

Framework recognized that:

1. In order to achieve success against the aspiration of getting everyone online in Wales, there will need to be 'buy in' from a wide range of stakeholders;
2. Only a concerted effort by the private, third and public sectors can achieve and sustain digital inclusion and participation of excluded citizens;
3. There has been, and is, a range of piecemeal activity which contributes to the digital inclusion of citizens. However, it has lacked a shared vision and target.

This Framework also sought to identify:

1. Who was missing out on the benefits of the internet?

2. Why this was happening; and

3. What steps could be taken to start addressing the issues.

This Framework sought to fill that gap by identifying a goal to be shared.

The goal needed to be embraced by the many different and complementary areas of activity that encouraged or helped people get online in many different environments. They include, for example:

1. On the ground delivery through community based approaches;
2. Access through libraries;
3. Learning opportunities through education and lifelong learning, and skills development;
4. Social marketing;
5. Volunteering.

A wide range of activities were to be brought together under this framework. The Welsh Assembly Government would provide strategic leadership, working closely with the public, private and third sectors to align plans and coordinate activities towards a common goal. The Framework did not cover the provision of broadband infrastructure, the delivery of public services or the skills agenda.

2.4.3 Digitally Inclusive Communities' Framework

On recognizing the cost to American competitiveness in a global economy, and by understanding that not all members of a community benefitted equally, and some communities have been left out altogether in the digital scope. Congress directed the Federal Communications Commission (FCC) to develop a plan to ensure that every American had "access to broadband capability".

The framework was anchored on the premise of having all people, businesses, and institutions to have access to digital content and technologies that enable them to create and support healthy, prosperous, and cohesive 21st century communities.

The framework aimed at:

1. Creating an understanding on the benefits of advanced information and communication technologies.
2. Fostering an equitable and affordable access to high-speed Internet-connected devices and online content.

3. Ensuring that advantage of the educational, economic, and social opportunities available through these technologies.

The framework on based on Five foundational principles describes how a community supports its members in accessing and using digital technologies and in addition, a set of targeted principles articulate how the foundational principles will be experienced in specific areas of activity and community life.

The five foundation principles are:

1. Availability and Affordability Principle

Communities need reliable and affordable access to broadband technology infrastructure in order to be fully engaged and competitive in today's information-based world.

The principle's goals

a) Access to high speed Internet in every household, business, and community anchor institution at actual download speeds that meet or exceed the service goals and milestones set by the FCC.
b) Pricing structures that enable businesses, institutions, and households to afford access to digital technologies.
c) Uniform Internet Service Provider (ISP) pricing information that is accessible and usable for consumers to compare plans available in the community.
d) Competitive deployment of infrastructure through right-of-way policies that remove barriers to market entry and system upgrades.

2. Public Access Principle

In a world connected by technology, all people, regardless of income, need access to information and communication technologies in order to be fully engaged members of society, both economically and socially.

The principle's goals

a) Sufficient, convenient free access to computers, Internet, wireless networks and other communication technologies to support the needs of residents, workers, and visitors.

b) Public access technology in safe facilities, with adequate levels of privacy, security, and accessibility for people with disabilities.
c) Broad community awareness of the availability of public access technologies.

3. Accessibility for People with Disabilities Principle

Communities should ensure the full participation of all their members, by embedding accessibility to digital technology for people with disabilities throughout their institutions, processes, and public awareness efforts.

The principle's goals

a) Technology managed in ways that ensure access by people with disabilities, including, at a minimum, full compliance with the letter, intent, and spirit of accessibility laws and regulations.
b) Businesses and community-based organizations equipped with the skills and know-how to comply with accessibility standards and design technology-based services using universal design.
c) Assistive technologies available at public access locations.
d) Disabled persons equipped with the skills and assistive devices necessary to access technology and create content.

4. Adoption and Digital Literacy Principle

Beyond having access to technologies, people, businesses, and institutions need to understand digital technologies and how to use them effectively to achieve their educational, economic, and social goals.

The Principle's Goals

a) Digital literacy training needs and assets in the community identified and evaluated.
b) Digital literacy training provided through formal classes and real-time virtual help, as well as through one-to-one assistance for individuals, business, and institutions.
c) Information literacy instruction embedded in all aspects of curriculum for K–12 and higher education, as well as in life-long learning activities.
d) Training and assistance in finding information and evaluating resources, tailored for the needs of a community.

5. Consumer Education and Protection

Consumers — both individual and institutional — need accurate, unbiased information to understand the technology options available to them, including how to buy and maintain equipment and how to safely navigate the digital world.

The Principle's Goals

a) Training for consumers on the purchase, maintenance, and repair/recovery of technology equipment and services.

b) Strategies for training and educating community members about safeguarding personal information, using parental controls, protecting vulnerable populations from cyber-bullying, maintaining systems free from viruses, and protecting against other forms of online abuse.

c) Privacy policies adopted by businesses and government that are visible, easily accessible, and comprehensible to consumers.

d) Local law enforcement agencies equipped with strategies and authority to pursue cybercriminals while protecting individual civil rights.

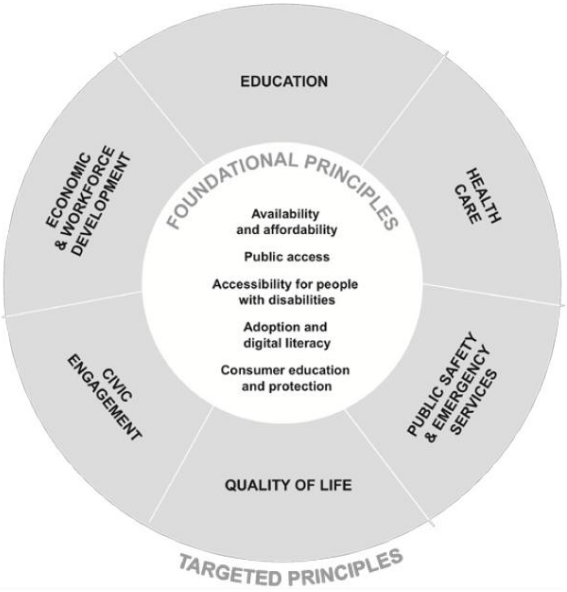


Figure 4 Digitally inclusive communities' framework

Source: Institute of Museum and Library Services, University of Washington Technology & Social Change Group, International City/County Management Association (2011).

The Targeted principles of the framework were:

1 Education Principle

Educational institutions should ensure that students have the digital skills to fill the jobs of today and tomorrow, and to reap the potential rewards of lifelong digital learning.

The Principle's Goals

Sufficient bandwidth to ensure that schools and other educational institutions can support current and future demand for broadband-enabled technology.

a) Technology embedded in curriculum development and instruction, in both formal K-12 and post-secondary institutions and in informal educational activities, to prepare students for 21st century opportunities and challenges.
b) Coordination between schools, libraries, and community-based technology centers to maximize delivery of in-school and out-of-school student learning tools.

2. Economic and Workforce Development Principle

Technology is a powerful engine of innovation and economic growth in today's world. In order for individuals and businesses to succeed in this environment, communities need to foster the mastery of 21st century skills and encourage the use of technology for economic development.

Principle Goals

a) Technology training targeted to employers' requirements and to the needs of the workforce in order to promote economic development and create job opportunities.
b) Public-private partnerships and cross-agency collaborations to make use of workforce training capacity of public libraries and community-based organizations.
c) Development of small businesses and local entrepreneurs by better supporting existing E-Commerce and e-Government tools.

2. **Civic Engagement Principle**

Residents should be easily able to interact electronically with community institutions, government agencies, and one another, to allow them to participate actively in community affairs.

Principle Goals

a) Opportunities for the public to connect directly with each other, as well as with legislators and government agencies, in order to deliberate and make choices together to improve policy and administration.
b) Online access to government services that is appropriate for users of all skill levels, that meets the language needs of the community, and that is available for use on a variety of devices.
c) Technology that enhances government and institutional transparency in decision-making processes and outcomes.
d) Stable and easy-to-use financial and performance data that enhance accountability.

3. Public Safety and Emergency Services Principle

Communities can increase their emergency responsiveness through effective deployment of digital technologies, ensuring the public the best possible emergency preparedness.

Principle Goals

a) Sufficient wireless broadband capacity for emergency responders to support secure, resilient, and redundant networks capable of sustaining emergency services throughout planning, preparing, responding, and recovering from an emergency.
b) Interoperable emergency alert networks with redundancies across mobile, wireless, and wired networks via Common Alerting Protocols.
c) Public libraries, schools, and other community institutions able to provide full digital access to residents or evacuees during emergencies.

4. Health Care Principle

Communities should have the digital technologies necessary to support the health care needs of their populations, especially in areas with limited health care facilities, to afford all their members access to the best possible health care.

Principle Goals

a) Broadband communication available for medical facilities, with sufficient capacity to support bandwidth-intensive telehealth applications.
b) Secure systems for local medical professionals and community-based health clinics to share medical records among health care providers.
c) Patient-centered design that allows patients easy access to online health information systems and medical records.
d) Technology training offered to health care providers and patients to facilitate better health care.

5. Quality of life principle

Individual members of a community should have access to technologies that promote social engagement and the pursuit of productive and creative interests.

Principle Goals

a) Interactive, high-quality multi-cultural content available through public libraries, museums, archives, and other cultural institutions.
b) Programs that encourage vulnerable and diverse populations to develop local content and to participate in social networks.
c) Intergenerational ties strengthened through technology-mediated interaction between youth and older residents.
d) An enhanced sense of community, through encouraging the digital preservation and sharing of local history and contemporary culture that convey belonging and continuity.

2.5 Conceptual Framework

A conceptual Framework is a model of presentation, whereby the researcher presents graphically or diagrammatically the relationship between the variables in the study. The purpose of a conceptual model is to help make visible the proposed relationships. The study helps establish the significance of the proposed relationships. After the study a reduced model may be formulated, excluding those variables and relationships which were not supported by the results (Orodho, 2004)

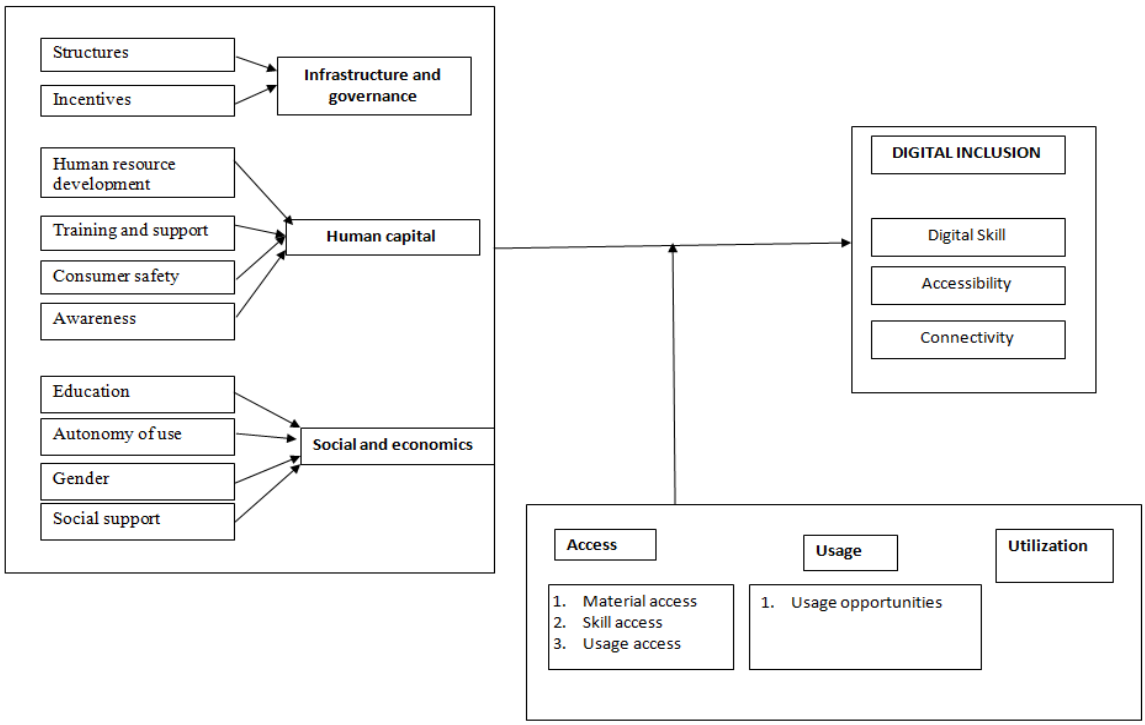


Figure 5 Digital inclusion framework in Kenya

The Digital Inclusion Framework in Kenya would ensure that:

a) All citizens understand the benefits of advanced information and communication technologies through awareness creation.
b) All citizens have equitable and affordable access to high-speed Internet-connected devices and online content.
c) All citizens acquire the necessary skills to access, use and utilize the online resources.
d) All citizens can take advantage of the educational, economic, and social opportunities available through these technologies.

This framework is informed by the premise that not all citizens benefit equally from the digital world, and some regions and especially the rural Kenya have been left out altogether. These excluded individuals and regions risk being deprived of basic needs such as education, employment, commerce, and social interaction that increasingly occurs through the Internet and other advanced communication technologies.

Digital inclusion is a requisite for building healthy and prosperous communities across all important sectors—economic and workforce development, education, health care, public safety and emergency services, civic engagement, and social connections. While each community will have different priorities, the fundamental needs are the same.

Independent Variables:

There are three independent variables in the proposed framework namely: -

1) Infrastructure and governance
2) Human capital
3) Social and economics

Infrastructure and Governance **dimension** plays a critical role in all aspects of community planning and development. It has a core responsibility to develop a digital inclusion plan and provide incentives and resources for its implementation as part of its overall strategy to an economically and socially sustainable digital community. It creates infrastructural structures for access to digital technologies such as Computer hardware and software, Telecommunication and networks (Internet), aligned to conducive Policies and good governance practices.

Human Capital dimension is concerned with human resource development, creation of awareness, training and support. This dimension also ensures that consumer safety is observed through awareness, training and protection from vulnerable population, viruses, intrusion and cybercrimes around the world. Without this dimension, the ICT access cannot realize its desired result of improving the livelihood of the citizens. Utilization of ICT resources is pegged on the user technical and digital skills.

Social and Economic dimension is a core dimension of a democratic society. This dimension has the ability to influence community policies, values, and programs as they express themselves in the political process and can advocate for digital inclusion. Digital inclusion, in turn, has the potential to improve individuals' personal, social, and economic well-being. Partnerships with individuals, 3rd party groups, private sector, libraries will help achieve the common vision. Social and economic dimension have the following metrics: education; (literacy and numeracy), gender; poverty; social support; (motivation), culture.

Moderating Variable

This defines the enabling environment to achieve digital inclusion; it is founded on the premise that digital inclusion is only achievable after there exists the following metrics;
Infrastructure (material) access; skills access and usage access.

Dependent Variable

The dependent variable provides a benchmark for evaluation into whether the digital gap still exists or is closing or even widening. This dependent variable has the following metrics:

i. Digital skills
ii. Accessibility
iii. Connectivity

With the right skills, with the ICT infrastructure and proper government policies and enabling environment, with social construes well aligned digital inclusion can be achieve and the citizens can leap the benefits that digital technology provides.

Conclusion

The rapid development of ICT continues to diminish the socio-economic gap between countries. Although it is too early to claim that ICT development will eliminate the digital divide across countries altogether, ICT is certainly an influential factor that has affected the global economy. The implementation of this framework will aid in promoting digitally connected communities in Kenya and beyond.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area

The study area was Kiambu County which is in Central Province of the Republic of Kenya. Kiambu County has a total population of 1,623,282, 496,244 households and covers an area of 2,543.4 sq. km. The youth population accounts for 29.1% of the total population of Kiambu. The county has a population density of 638 per sq. km. (Kiambu County Government Report, 2014)

Kiambu was a suitable area of this study due to its peri-urban stature with both rural and urban population. This made it suitable for comparative results in analyzing rural versus urban patterns of digital divide. Its proximity to Nairobi capital was of great value since it helped the researcher cut down of time and cost.

3.2 Research Design

The study was conducted through the use of a descriptive survey design. Descriptive research portrays an accurate profile of persons, events, or situations (Kothari, 2000). Therefore, the descriptive research design was deemed to be the best strategy to fulfill the objectives of this study. A research design is the structure of the research, it is the ‘‘glue’’ that holds all the elements in a research project together.

3.3 Population of the Study

Target population in statistics is the specific population from which information is desired. The total population is the entire spectrum of a system or process of interest. With the keen interest of understanding the causal factors of digital divide, the target population of the researcher was the residents of the Kiambu County. The respondents were drawn from the secondary school teachers in Kiambu county.

The researcher's decision to use secondary school’s teachers as the respondents in this research was informed by the fact that they represent of the populations diverse social backgrounds in their natural settings and their ability to answer the required research questions about the population in the region.

3.4 Sampling Design

Sampling involves any procedure that draws conclusions based on measurements of a portion of the entire population. According to a Sample is usually drawn because it is less costly and less time consuming to survey than the population, or it may be impossible to survey the entire population.

To access the respondents, the researcher obtained a list of all the secondary schools in Kiambu county from the county education office, coupled with the population size of each school. This formed the sampling frame of the research work. Given that the target population is heterogeneous due to the nature of the schools in the region, the researcher adopted a clustered random sampling design in identifying the secondary schools to use in the research work. All National, provincial schools, County and Sub-county schools in the county formed a cluster each. The researcher then picked 15% of the schools in each cluster based on a simple random sampling whose respondents formed the sample size of 33 schools from a population of 213 schools, with a total of 70 respondents. This helped to address the social economic demographics in education affordability and also avoided skewed outcome.

According to Mugenda and Mugenda (2003) simple random sampling design is advantageous, in that, it is free of classification error, and it requires minimum advance knowledge of the population.

3.5 Sample Size

According to Mugenda and Mugenda (2003), a good sample should be between 10% to 30% of the entire population. The following sampling formulae was used to compute the sample size:

n=p(1-p){$\frac{z}{d}$}^2

n = required Sample size,

z = the table value (z-value) for level of confidence for instance 95% level of confidence has standard value of 1.96, 90% has a standard value of 1.645

d = margin of error

p = proportion to be estimated

Note: Mugenda and Mugenda (2003) recommends that if the value of p is not known to you, then use p=0.5.

In each school identified, the researcher used simple random sampling design to identify the target respondent.

3.6 Research Instruments

Different data collection methodologies were adopted in order to gain access and capture the required data depending on their suitability. For this research, both primary and secondary data was used. Primary data is data that a researcher collects directly on his/her own for specific purpose. The methods used to collect primary data were by dispensing the questionnaires. Secondary data is data collected by someone other than the user through documentation reviews. In this study, the secondary data was the lists of schools from County Education Offices which informed the number of teachers per school as well as the list of all secondary schools in the County.

3.7 Research Instrument Testing

The study was conducted through questionnaires to collect primary facts. Secondary data was collected by reviewing reports and from County Education Offices about education institutions in the County.

3.7.1 Reliability Testing

The first step in data analysis was to test for reliability and validity of the data collection instruments. While reliability is the consistency of measure, a test is considered reliable if we get similar results reproduced under similar methodology.

3.7.2 Validity Testing

If the validity or trustworthiness can be maximized or tested. Then more “credible and defensible results” may lead to generalizability, therefore, the quality of a research is related to generalizability of the result and thereby to the testing and increasing the validity or trustworthiness of the research.

Table 1 Mapping objectives into deliverables

	Research objectives	Deliverables
1	Study the causal factors of digital divide in Kenya rural areas.	Through personal interviews and questionnaires to teachers.
2	Evaluate various frameworks developed and adopted in digital inclusion context.	Through use of documentation study and review of existing literature
3	Recommend the adoption of the new framework.	A framework tested through data collected and analyzed after research

3.8 Data analysis

Since the raw data from the field cannot be used to derive meaning, it prompts for processing and analyzing for it to make sense of interpretation. After data has been collected from the field, the new data was arranged in a manner that enabled analysis to take place. This involved editing of data to detect errors, omissions, corrections and classification of data in order to come up with meaningful relationships and tabulate the data to facilitate analysis.

Both qualitative and quantitative methods of data analysis was used to analyze the data. Data analysis tools such as Statistical Package for Social Sciences (SPSS) version 20 and spreadsheet tools were used to do the analysis.

3.8.1 Qualitative analysis

Qualitative analysis was used to analyze data that cannot be quantified; these are basically questions where the researcher was interrogating the respondents' opinions on the subject under study. The phrases of words from different respondents were studied to identify similarities and differences to establish a pattern.

3.8.2 Quantitative analysis

These was used to analyze closed-ended questions, these are questions which have multiple choices or pre-defined responses and were assigned numerical values. This made it easier to come up with statistics that assisted in designing distribution of scores.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Descriptive statistics

This study used SPSS (v.20) to perform descriptive statistics and to find correlation coefficient, Exploratory Factor Analysis that informed Confirmatory Factor Analysis. For purposes of Statistical analysis, the following qualitative measures were assigned numerical values in the likert scale used in the research instrument.

4.1.1 Exploratory Factor Analysis

The exploratory factor analysis (EFA) is a statistical method that is used to uncover the underlying structure of a relatively large set of variables(Dimensions). The researcher wanted to identify the underlying relationships between measured variables, and combine them into factors. Variables with a weight score of below .6 and negative were considered insignificant and thereby not considered for further analysis, while variables in the same weight column with a score of above .6 were merged into factors and considered statistically significant.

4.1.2 Regression Analysis

From EFA, the researcher was able to get crucial variables that affect the independent variables and assimilated them into single factors, then the researcher used regression analysis for estimating the relationships among the independent variables that included, infrastructure and governance, human capital, social and economies variables, and utilization with digital inclusion. The researcher was able to understand how the value of the dependent variable (Digital Inclusion) changes when any one of the independent variables is varied, while the other independent variables are held fixed, as explained below.

4.1.3 Correlation Analysis

Correlation analysis is used estimate the strength or weakness of the relationship between the independent variables and moderating variable. The researcher was able to ascertain that the suspected moderating variable did not have a strong or high relationship with either of the independent variable, that result meant that it could not increase or decrease the nature of relationship between the independent variables and dependent variables as a moderating variable

Flow chart

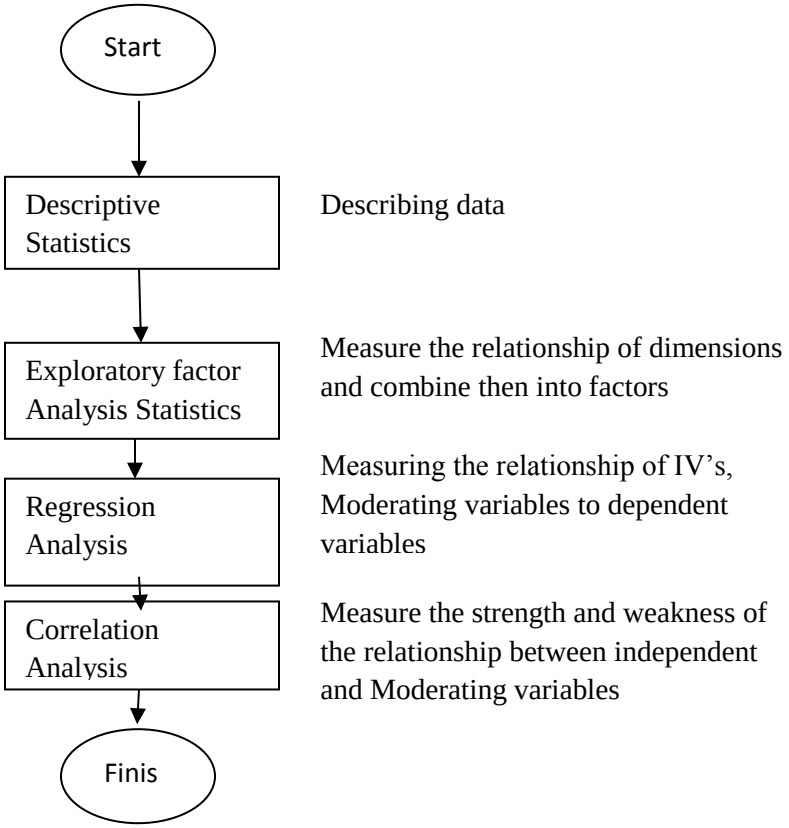


Figure 6 Descriptive research flowchart

4.2 Response rate

The response rate refers to percentage of the sample that returns the questionnaires completed (Bryman and Bell, 2007). The researcher targeted a sample of 70 secondary schools from all the 213 in Kiambu, out of which 67 responses were obtained. This represented 94.4% response rate. According to Babbie (2002) any response of 50% and above is adequate for analysis thus 71% is even better. Mugenda and Mugenda (2003) observed that a 50% response rate is adequate, 60% good, while 70% rated very good.

Table 2 response rate

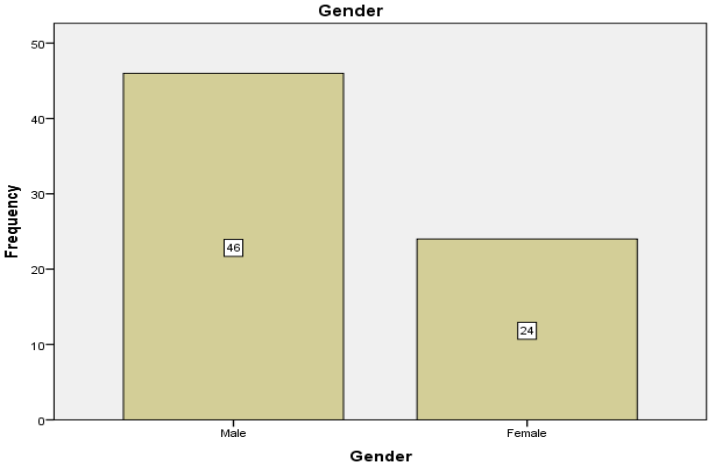
Respondents Response	Frequency	Percentage
Responded	67	94.4%
Did not respond	3	5.6%
Sample size	70	100%

Source, Research Data; 2016

General Information

4.2.1 Gender of the Respondents

Figure 4.1 shows that majority of the respondents were male comprising 66 percent while females were 34 percent.

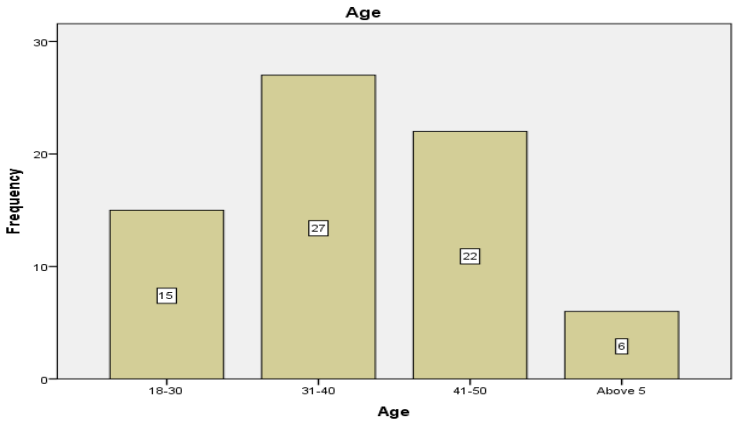


Source Research Data, 2016

Figure 7 Gender

4.2:2 Age of the Respondents

As shown in figure 4.2, 21% of the respondents indicated that they were aged between 18 to 30 years, 38% between 31to40 years, 31% were aged between 41 to 50 years, while 8% were aged above50 years. Therefore, majority of the respondents were aged between 31 to 40 years.

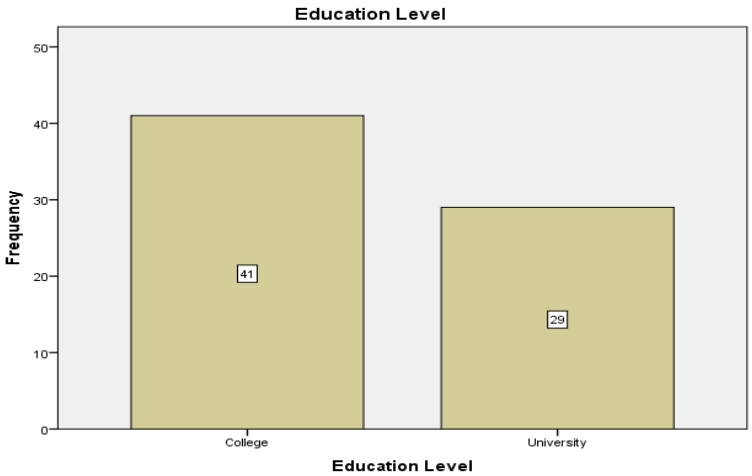


Source Research Data, 2016

Figure 8 Age

4.2.3 Education Level

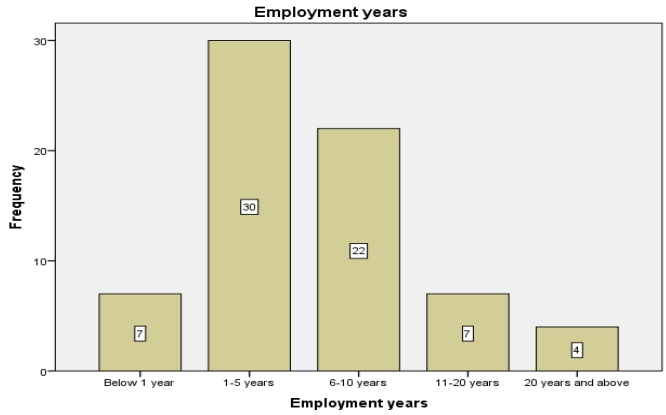
Figure 4.3 shows that the level of education was as follows; 59% had education levels at University while 41% had attended College. The data analyzed indicate that most respondents have attended college and the other group attended university, no respondent indicated otherwise



Source Research Data, 2016

Figure 9 Education Levels

4.2.4 Duration of Service at Current Institution



Source Research Data, 2016

Figure 10 Duration of service

From this research, it was found that 43% of the respondents had been employed at their current institutions for 1-5 years, 31% for 6 - 10 years, 10% for below 1 year and another 10% for 11 - 20 years, while only 5% had worked in their current institution for more than 20 years.

4.3 Infrastructure and governance as a dimension to digital inclusion

4.3.1 Access to ICT Infrastructure

Table 3 Infrastructure Access

I own a desktop computer, laptop, Tablet, ipad					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	32	45.1	45.7	45.7
	Agree	38	53.5	54.3	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

Source Research Data, 2016

98.6% of respondents agreed that they either owned a laptop, desktop, tablet and/or iPad, this shows that access to devices that can connect to the internet has a significant advantage towards digital inclusion.

Thus, from the above findings it is clear that access to devices plays a crucial role towards digital inclusion

4.3.2 Access to ICT Infrastructure II

Table 4 ICT Infrastructure Ownership

Someone in our family owns a computer, laptop, Tablet					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	64	90.1	91.4	91.4
	Neutral	5	7.0	7.1	98.6
	Disagree	1	1.4	1.4	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

Source Research Data, 2016

90% of respondents agreed that a member of their family owned either a laptop computer and or tablet, with this digital device family members have the capability to access internet, these findings clearly highlight that 7% were not sure whether a family member owned any digital device and only 1% confirmed that a family member did not own any.

4.3.3 Access Internet and Web based on Personal Access

Table 5 Internet Access from mobile device

I can access internet from my phone					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	1	1.4	1.4	1.4
	Agree	38	53.5	54.3	55.7
	Neutral	1	1.4	1.4	57.1
	Disagree	30	42.3	42.9	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

Majority of the respondents 54% affirmed that they could access internet from their phones, consequently a significant number of respondents 42% also noted that they could not access internet from their phone, these findings show that connectivity to the internet via phone is enjoyed by half the population, efforts should be made in highlighting the benefits of using a smart phone to the 42% of the population while connecting to the internet.

4.3.3 Access Internet at Institutional Level

Table 6 Institutional Internet subscription

Your institution has subscribed to Internet Service					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	9	12.7	12.9	12.9
	Agree	14	19.7	20.0	32.9
	Neutral	4	5.6	5.7	38.6
	Disagree	27	38.0	38.6	77.1
	Strongly Disagree	16	22.5	22.9	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

60% of the sampled population, indicated that they do not access internet at work places, because their institutions have not subscribed to any internet services, while 23% agreed that their institutions have an active internet subscription, this shows that the bulk of the population is digitally excluded as a result of not accessing internet in schools

4.3.4 Access ICT Infrastructure at Institutional Level

Table 7 Institutional ICT infrastructure access

Your Institution has computers					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	23	32.4	32.9	32.9
	Agree	20	28.2	28.6	61.4
	Disagree	27	38.0	38.6	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

Majority of the respondents 60%, indicated that their institutions had computers while a quarter of the population indicated that they did not have computers in their institutions,

Table 8Government ICT infrastructure Access

4.3.5 Access and availability of ICT infrastructure and internet as provided for by the government.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	21	29.6	30.0	30.0
	Disagree	33	46.5	47.1	77.1
	Strongly Disagree	16	22.5	22.9	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

On establishing whether the government has right ICT infrastructure in place to support the uptake of internet, majority of the respondents 68% felt that the county government did not have the right ICT infrastructure to support the uptake of ICT. The findings show that the county government should endeavor to set up the right infrastructure that would encourage internet uptake.

4.3.6 Internet Affordability and Connectivity

The above bar graph indicates that 33% of the respondents felt that although the subscription might be affordable it is of less significant, this indicates that telecommunication companies should have an affordable and significant plan, that allows users to derive value for money

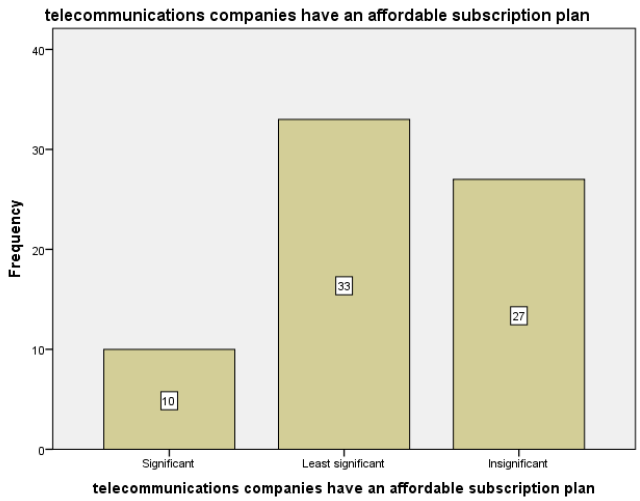


Figure 11 Internet Affordability

62 % of respondents who form the bulk of the population, felt that they were unsure or did not know about the existence of an ICT policy document, or its effect on business operations, there was an even split of 12% of respondents who agreed and another 12% who disagreed that on there being an ICT policy document and its impact on business operations.

4.3.7 ICT Policy at Institution Level

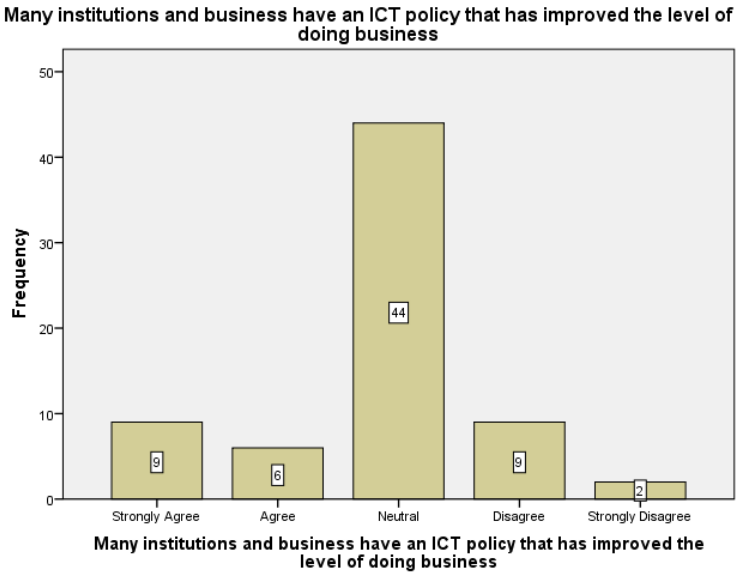


Figure 13 Institutional ICT Policy.

4.4 HUMAN CAPITAL

4.4.1 Respondent's ICT Skills

Awareness (the level of user awareness on the following functionalities/ applications)

Table 9 ICT Skills

Computer Skills		Expert	Professional	Knowledgeable	Limited Knowledge	No Knowledge
Basic concepts:	Knowledge on factors impacting computer performance	21.4	52.9	7.1	18.6	0
	Common software applications and uses	27.1	45.7	17.1	10	0
	Identification of major hardware components	47.1	32.9	20.0	0	0
	TOTAL	**95.6**	**131**	**44.2**	**28.6**	**0**
	AVERAGE	**31.9**	**43.8**	**14.7**	**9.5**	**0**
Office Applications:	Word Processors	30	70	0	0	0
	Spreadsheet Applications	0	37.1	51.4	11.4	0
	Presentation Applications	35.7	64.3	0	0	0
	Microsoft Publisher	0	35.7	64.3	0	0
	Database Applications	0	30	28.6	41.4	0
	TOTAL	**65.7**	**237**	**144**	**52.8**	**0**
	AVERAGE	**13.1**	**47.4**	**28.8**	**10.56**	**0**
File Management:	Creation of directories/folders and sub-directories/sub-folder	80	20	0	0	0
	Understand how an operating system shows drives, folders, files in a hierarchical structure	22.9	50.0	27.1	0	0
	TOTAL	**103**	**70**	**27.1**	**0**	**0**
	AVERAGE	**51.6**	**35**	**13.5**	**0**	**0**
	Familiar with social media and blogs	40	30	30	0	0

Internet and Email access	Ease in working with search engines and web browsers	45.7	35.7	18.6	0	0
	Ease in working with email applications /Gmail / yahoo/	54.3	45.7	0	0	0
	TOTAL	**40**	**30**	**30**	**0**	**0**
	AVERAGE	**45.7**	**35.7**	**18.6**	**0**	**0**
Personal Finance Management Tools and Application	Sage	0	0	17.1	27.1	55.7
	Quick books	0	0	25.7	50.0	27.1
	Pastel	0	0	2.9	11.4	85.7
	Others	0	0	0	0	0
	TOTAL	**0**	**0**	**45.7**	**88.5**	**168.5**
	AVERAGE	**0**	**0**	**11.4**	**22.1**	**42.1**
Simulation and Modeling		0	0	0	28.6	71.4
Programming and Website Development	Html	0	21.4	45.7	32.9	0
	PhP	0	0	0	68.6	31.4
	C++	0	4.3	0	68.6	27.1
	Java	0	0	1.8	10	87.2
	Python	0	0	2.9	0	97.1
	Visual basic .Net	0	0	11.4	10.0	78.6
	Others	0	0	0	0	0
	TOTAL	**0**	**25.7**	**61.8**	**190.1**	**321.4**
	AVERAGE	**0.0**	**4.3**	**10.3**	**31.7**	**53.6**

The above table is a measure of respondent's awareness (skill) level in the mentioned categories. The highest mean score of basic concepts was 43.8, this shows that majority of respondents felt that they were professional on that category, on office applications the highest mean score was 47.4, this indicates that respondent felt very comfortable in working with computer applications, the category on file management recorded the highest mean score in all categories of 51.6, this shows that half of the respondent felt that they were experts in file management of computer system, on internet and email, respondents mean score was at a high of 45.7

No respondent felt the they had limited knowledge in that category, on personal finance management tool, respondents felt that they were not experts in that field thus a majority indicated that they had limited knowledge and recorded a mean score of 22.1.

On simulation and modeling was the worst recorded category by respondents as majority indicated that they did not have any knowledge in that category, 71.4 mean score was the highest in negative response. Programming and web development highest negative mean score was 53.6, indicating that half of the sampled population indicated that they had no knowledge in that area.

4.4.2 Awareness on Various Computer Application Areas.

Table 10 Summary of key application areas

Awareness	**Basic concepts**	**Office applications**	**File management**	**Internet and email**	**Personal finance management tools**	Simulation and Modeling	Programming and Website Development	Concept Mapping and Inspiration
	AVERAGE SCORE							
Expert	**31.9**	**13.1**	**51.6**	**45.7**	**0**	**0**	**0**	**0**
Professional	**43.8**	**47.4**	**35**	**35.7**	**0**	**0**	**4.3**	**0**
Knowledgeable	**14.7**	**28.8**	**13.5**	**18.6**	**11.4**	**0**	**10.3**	**1.4**
Limited knowledge	**9.5**	**10.56**	**0**	**0**	**22.1**	28.6	31.7	7.1
No knowledge	**0**	**0**	**0**	**0**	**42.1**	71.4	**53.6**	**91.4**

4.4.3 Consumer Rights Awareness Consumer Protection

On whether the respondent is aware of consumer protection rights on privacy, e-security, cybercrimes, ethical and moral conduct, copyrights, intellectual property rights and piracy within ICT sector

Table 11 Consumer Rights Protection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	3	4.2	4.3	4.3
	Agree	31	43.7	44.3	48.6
	Neutral	17	23.9	24.3	72.9
	Disagree	18	25.4	25.7	98.6
	Strongly Disagree	1	1.4	1.4	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

The respondent's awareness on Consumer protection rights on issues such as privacy, e-security, cybercrimes, ethical and moral conduct, copyrights, intellectual property rights and piracy within ICT sector, the results indicated that rights awareness weighed heavily on digital inclusion, as 46.6% of respondent agreed that they were aware on digital rights awareness, a significant half of the sampled population felt neutral on their rights awareness (24%) while 25.7% indicated that they were totally now aware on their digital rights. Thus, from the findings we can conclude that for respondents to be aware on their digital rights, awareness campaigns, seminars, conferences and publications should be conducted as this variable is important factor in digital inclusion

4.5 Social and Economics as a Dimension to Digital Inclusion

4.5.1 On respondent's opinion on whether social platforms as means of communication and resource sharing had an impact on improving digital skills.

Table 12 Social platforms impact on digital skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	18	25.4	25.7	25.7
	Agree	28	39.4	40.0	65.7
	Neutral	24	33.8	34.3	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

25.7% of respondent strongly agreed that social platforms that have had a significant impact towards improving their digital skills, 40% of respondents also agreed on the impact felt towards improving their digital skills, only 34.3% of respondents remained neutral, they did not agree nor disagree on the impact of social platforms impact towards improving their digital skills

4.5.2 Social support on ICT

On whether the respondent can access any ICT social support.

Table 13 Social Support

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	19	26.8	27.1	27.1
	Neutral	25	35.2	35.7	62.9
	Disagree	26	36.6	37.1	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

Although the earlier analysis on the impact of social platforms communicating and resource sharing were noted by more than half of the respondents as having a positive impact towards improving their digital skills, 27.1% agreed that they could access the social support, 35.7% of respondents remained neutral while 37.1% felt that they could not access help on ICT on social platforms. This shows that various institutions should focus on ensuring that their employees' students can access assistant from social platforms.

4.5.3 ICT and gender

On respondent's opinion on gender divide, and on whether women and girls enjoy less access to information technology than men and boys.

Table 14 Gender as a player on ICT Access

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	44	62.0	62.9	62.9
	Neutral	12	16.9	17.1	80.0
	Disagree	14	19.7	20.0	100.0
	Total	70	98.6	100.0	
Missing	System	1	1.4		
Total		71	100.0		

62.9% of the sampled population who form the majority of respondents felt that indeed there was a huge gender divide between ICT access by girls and boys, they felt that boys were more likely to access ICT than girls, some of the respondents cited various reasons ranging from, lack of interest, lack of perceived benefits, fear of the unknown, different priorities, less accommodative to technology and cultural barriers favoring boys.

4.6 Correlations

Correlation Analysis

Table 15 Correlation Analysis

Correlations Utilization, Infrastructure and Governance, Social Economies, Human Capital on Digital Inclusion					
		Zscore: Utilization	Zscore: Infrastructure and Governance	Social Economies	Human Capital
Zscore: Utilization	Pearson Correlation	1	.170	-.060	-.065
	Sig. (2-tailed)		.159	.620	.593
	N	70	70	70	70
	Pearson Correlation	.170	1	-.164	-.634**

Zscore: Infrastructure and Governance	Sig. (2-tailed)	.159		.175	.000
	N	70	70	70	70
Social Economies	Pearson Correlation	-.060	-.164	1	.108
	Sig. (2-tailed)	.620	.175		.371
	N	70	70	70	70
Human Capital	Pearson Correlation	-.065	-.634**	.108	1
	Sig. (2-tailed)	.593	.000	.371	
	N	70	70	70	70
**. Correlation is significant at the 0.01 level (2-tailed).					

To ascertain the level of significance of Utilization, Infrastructure and governance, social economies and human capital as the key factors of digital inclusion, correlation analysis was carried out to evaluate the relationship between these variables and their level of significance to digital inclusivity.

The Infrastructure and governance and human capital had negative correlation at r = -01.065 and a high significance levels of p=0.000. Social Economics and infrastructure and governance has a negative correlation at r= -0.164 and a significance level of p=0.175.

4.7 Exploratory Factor Analysis

The main purpose of using factor analysis: was for data reduction-this involved measuring internal reliability and reducing data to a smaller set of summary variables example dimensions influencing Infrastructure and governance, Human Capital, Social Economies with each construct measured using multiple items which was combined in a two factor scores.

Exploratory factor analysis (EFA) was used to determine the number of factors required in a set of three variables and also develop a structure, as opposed to and confirmatory factor analysis (CFA) where the number of factors is predefined so as to test a hypothesis.

The following steps were used in EFA

Sample size <50 bad

General rule, at least three variables

Compute correlations among variables computed (correlation matrix)

Extraction (identify factors in the data)

Rotation matrix

Interpretation

Table 16 Exploratory factor analysis

Investigating correlations	**Recommended**	**Model results**
Visual Inspection: (correlation matrix)	R<.30	.00
Partial correlation & anti-image correlation matrix	P=0.01 <0.05	.00
Bartlett test of sphericity (significant correlations among variables)		3
Measure of sampling adequacy (MSA)	<.50 Unacceptable >.60 average >.70 Middling >.80 Meritorious	.617

4.7.1 Factor Analysis on Infrastructure and governance

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.582
Bartlett's Test of Sphericity	Approx. Chi-Square	8.396
	df	115
	Sig.	.510

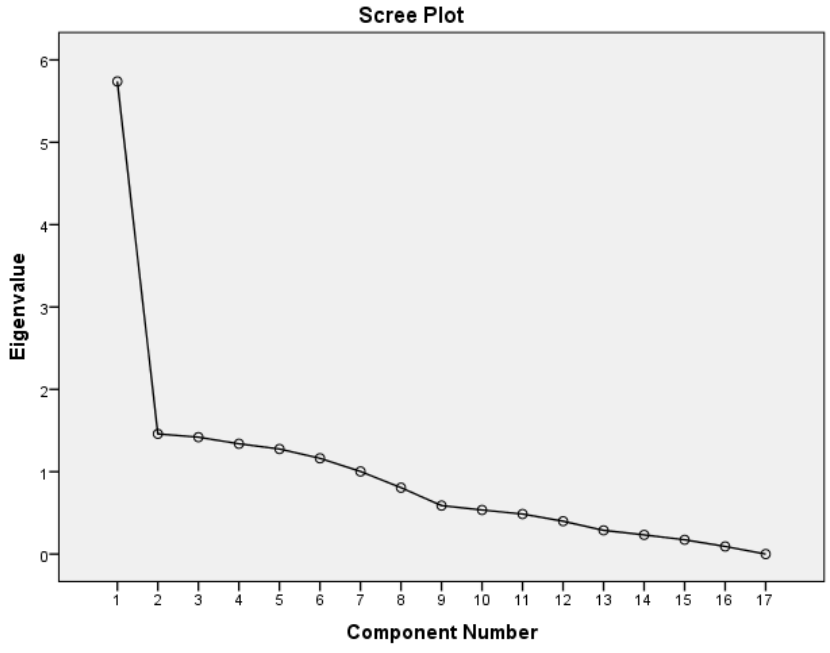


Table 17 Rotated Component Matrixa

	Component			
	1	2	3	4
I own a desktop computer, laptop, Tablet, ipad	.966			
Your institution has a computer Lab for training students	.966			
A family member has subscribed to internet services	.876			
Internet has provided a forum for citizens' participation in National and County Government activities	-.869			
Your Institution has computers	.868			
I can access internet from my phone	.767			
ICT and internet has Improved collaboration between the county government, businesses and learning Institutions.	.543			
Internet has Improved Kiambu's competitiveness in service and products delivery by providing timely information and resources.	.461			
Many institutions and business have an ICT policy that has improved the level of doing business		.684		
Internet has Improved Kiambu's competitiveness in service and products delivery by providing timely information and resources.		.585		.414
Someone in our family owns a computer, laptop, Tablet		.508		
Kiambu County has the right ICT infrastructure and governance in place that support the uptake of Internet? Tick one		.434	.424	
Thought the use of internet most schools and businesses are in the right pathway in achieving the vision 2030			-780	
The ICT master plan provides clear SMART strategies that promote digital literacy			.537	
telecommunications companies have an affordable subscription plan				.678
Your institution has subscribed to Internet Service				.363
Through ICT several multibillion county government projects have sprung up thus in turn improving the life of common man				.245

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table Component Transformation Matrix

Component	1	2	3	4
1	.982	.174	.038	.068
2	-.170	.849	.500	.001
3	.083	-.407	.721	-.555
4	-.025	-.287	.479	.829

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

4.7.2 Factor analysis on Social and Economics

Using the principle component analysis method, we are able to establish that dimensions that are negative and have a score of less than .4 are considered insignificant, thus our new conceptual framework is displayed below.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.682
Bartlett's Test of Sphericity	Approx. Chi-Square	14.206
	df	15
	Sig.	.510

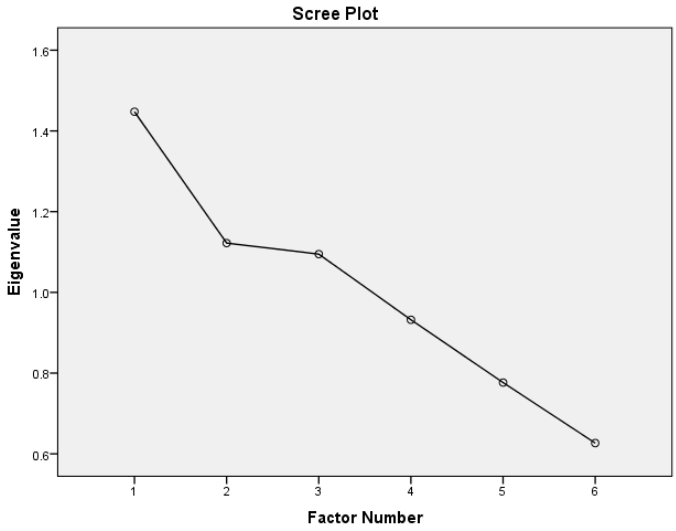


Table 18 Rotated Factor Matrixa Social and Economics

	component		
	1	2	3
Do you think that the social platforms used for communication and resource sharing have had an impact on improving digital skills?	.757		-.245
I can easily access any ICT social support, from supportive social networks, internet, books, teachers, colleagues	-.229		-.144
To what extent does poverty have on access, usage and utilization of ICT's infrastructure at home, business environment and schools?		.620	
Do you believe that literacy levels (ability to read, write, and use arithmetic) have an effect on stimulating interest on the uptake of ICT and internet?		.619	-.117
Do you agree/disagree that including diverse cultural content in new media like the web and video games will make those vital new media resources more effective in encouraging the uptake of ICT 's and Internet inequalities?	-.110	-.324	
Do you agree / disagree that there is a gender divide, with women and girls enjoying less access to information technology than men and boys?			-631
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 4 iterations.			

Factor Transformation Matrix

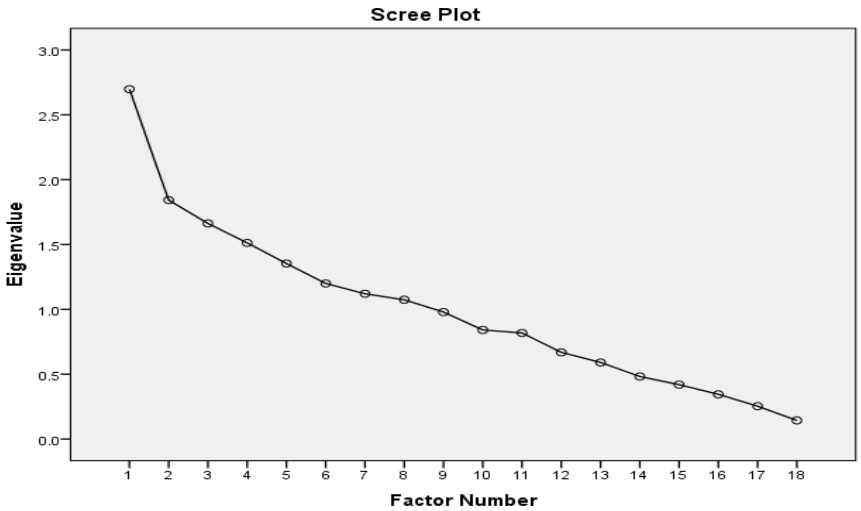
Factor	1	2	3
1	.720	.492	-.489
2	-.513	.852	.102
3	.467	.177	.866

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

4.7.3 Factor analysis on Human Capital

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.568
Bartlett's Test of Sphericity	Approx. Chi-Square	455.571
	df	153
	Sig.	.000



Source Research Data, 2016

Table 19 Rotated Factor Matrixa Human Capital

Rotated Factor Matrix[a]			
	Factor		
	1	2	3
Ease in working with email applications /Gmail / yahoo/	.975		
Database Applications	.669		
Spreadsheet Applications	-.570		
Html			
I am aware of consumer protection rights on privacy, e-security, cybercrimes, ethical and moral conduct, copyrights, intellectual property rights and piracy within ICT sector.		.964	
Common software applications and uses		.411	
Understand how an operating system shows drives, folders, files in a hierarchical structure			
Ease in working with search engines and web browsers			.544

The level of education plays a big role in improving digital literacy	.401		.499
Knowledge on factors impacting computer performance			
Identification of major hardware components			
Research and development training			
Presentation Applications			
Creation of directories/folders and sub-directories/sub-folder			
Simulation			
Microsoft Publisher			
Familiar with social media and blogs			
Word Processors			
Extraction Method: Principal Axis Factoring. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 5 iterations.			

Table 20 Factor Transformation Matrix

Factor Transformation Matrix

Factor	1	2	3
1	.975	.130	-.182
2	-.157	.977	-.144
3	.159	.169	.973

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

4.8 Explanation

Exploratory factor analysis is used to correlate and condense together dimensions that closely correlate with each other into one factor, dimensions that are above weight of .6 are crucial to forming a factor, others that are below .6 are statistically insignificant.

I. In Infrastructure and governance 17 variables were correlated and only three variables were above .6 rotated factor matrix weight
II. In Human Capital 18 variables were correlated and only two variables were above .6 rotated factor matrix weight
III. In Social and economies 6 variables were correlated and only three were above .6 rotated factor matrix weight

The tables below highlight the average weight, and lists the most significant factor which is Human Capital.

1. The screen plot illustrates the level of correlations, the closer the dots the closer the relationship, the distance between dots means independence

2. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy should also be above .5, for adequate sampling, below .5 means that it's inadequate
3. Factor transformation matrix is a measure of correlation, any factor below .2 means that there is no correlation, in our case there is correlation, and factors can correlate despite being statistically insignificant.

Table 21 New conceptual framework

FACTORS	**Average Weight**
Infrastructure & Governance	
Computer hardware and software	.919
Policy	.684
Telecommunication subscription cost	.678
TOTAL AVERAGE	**.760**
Human Capital	
Awareness	.822
Consumer protection	.964
TOTAL AVERAGE	**.893**
Social and Economies	
Social platforms	.757
Poverty	.620
Literacy levels	.619
TOTAL AVERAGE	**.665**

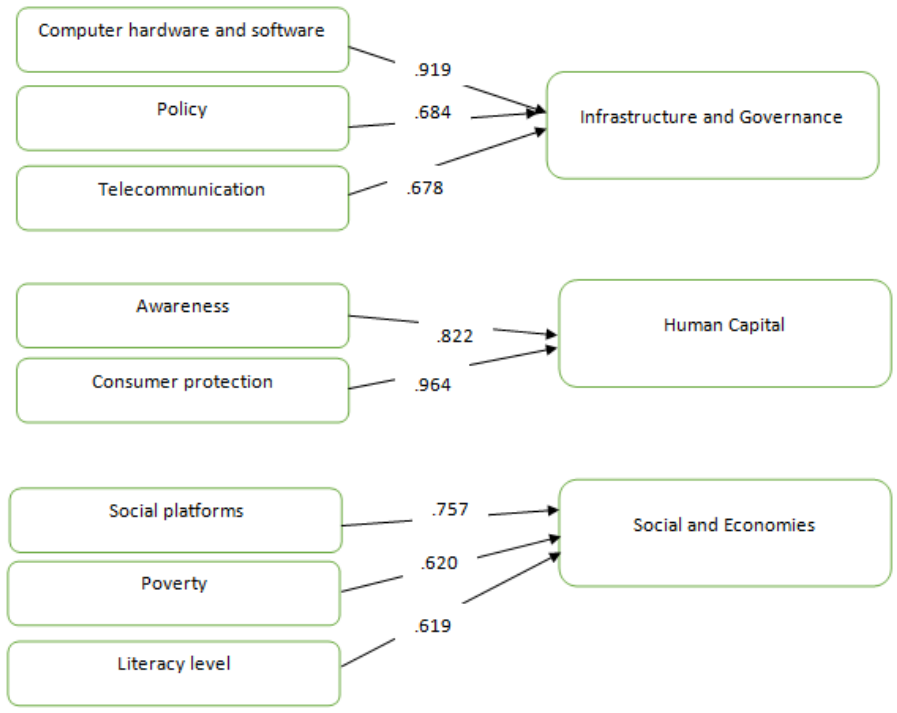


Figure 14 New Conceptual Framework

Standardizing the independent variables first

Data was fit within unity (1), so all data values will take on a value of 0 to 1. (Removing legitimate outliers and ensuring all data analyzed is numeric) Since some models collapse at the value of zero, sometimes an arbitrary range of say 0.1 to 0.9 is chosen instead, but the following equation is what should be used to implement a unity-based normalization:

$$X_{i,\ 0\ \text{to}\ 1} = \frac{X_i - X_{Min}}{X_{Max} - X_{Min}}$$

Where:

X_i = Each data point i

X_{Min} = The minima among all the data points

X_{Max} = The maxima among all the data points

$X_{i,\ 0\ \text{to}\ 1}$ = The data point i normalized between 0 and 1

Descriptive

Table 22 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Utilization	70	24	55296	2920.63	7262.925
Infrastructure and Governance	70	32	1600	496.11	449.471
skills	70	720000000	1824768000000	85211747085.71	235648276953.153
Zscore: Availability and connection	70	64	25600	6005.83	6846.006
Valid N (listwise)	70				

4.8 Regression Analysis

Regression analysis was used for estimating the relationships among variables. When the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). More specifically, regression analysis will help me to understand how the typical value of the dependent variable (or 'criterion variable') changes when any one of the independent variables is varied, while the other independent variables are held fixed.

Regression analysis on Digital inclusion with infrastructure and governance

Table 23 Regression Analysis on Infrastructure

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.643[a]	.413	.405	305723338050621.600

a. Predictors: (Constant), Infrastructure and Governance

b. The adjusted R squared indicate that this model explains 41% variability of response data around the mean

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	44764261062649890000000000000000.000	1	44764261062649890000000000000000.000	47.893	.000[b]
	Residual	635573964115939300000000000000000.000	68	9346675942881461000000000000000.000		

	Total	108321657474243830000000000000000.000	69			

a. Dependent Variable: Digital Inclusion

b. Predictors: (Constant): Zscore: Infrastructure and Governance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	244956750994285.620	36540928017931.310		6.704	.000
	Zscore: Infrastructure and Governance	254707166507947.000	36804764859453.080	.643	6.920	.000

a. Dependent Variable: Digital Inclusion

The significance level in one way Anova and coefficient is less than .05 and very significant, this means that infrastructure and governance has a high effect on digital inclusion. The beta indicates that the percentage of infrastructure and governance is very important in determining digital inclusion.

4.8.1 Regression analysis on Digital inclusion with Human Capital

Table 24 Regression analysis on Digital inclusion with Human Capital

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.335[a]	.112	.099	376062777666484.000

a. Predictors: (Constant), Human Capital

b. The adjusted R squared indicate that this model explains 10% variability of response data around the mean, this is not adequate model

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12153872806806497000000000000000.000	1	12153872806806497000000000000000.000	8.594	.005[b]
	Residual	96167784667437330000000000000000.000	68	14142321274623136000000000000000.000		
	Total	108321657474243830000000000000000.000	69			

a. Dependent Variable: Digital Inclusion

b. Predictors: (Constant), Human Capital

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	499057698735590.100	97639241313890.900		5.111	.000
	Zscore: Human Capital	-20468430773177.570	6982123951149.312	-.335	-2.932	.005

a. Dependent Variable: Digital Inclusion

The significance level in one way Anova and coefficient on human capital is significant at .005, this means that human capital has a direct effect on digital inclusion., the beta indicates that the higher the level of human capital the higher the digital inclusion variable.

4.8.2 Regression analysis on Digital inclusion with Social economies

Table 25 Regression analysis on Digital inclusion with Social economies

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.005[a]	.000	-.015	399114397080366.600

a. Predictors: (Constant), Social Economies

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2892143603114429300000000000.000	1	2892143603114429300000000000.000	.002	.0.05[b]
	Residual	1083187653306407100000000000000.000	68	15929230195682460000000000000.000		
	Total	1083216574742438300000000000000.000	69			

a. Dependent Variable: Digital Inclusion

b. Predictors: (Constant), Social Economies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	247614494929900.060	78524305637373.720		3.153	.002
	Zscore: Social Economies	-534603665209.781	12546407803153.305	-.005	-.043	.0.05

a. Dependent Variable: Digital Inclusion

The significance level in one way Anova and coefficient on Social economies is significant, this means that Social economies is highly related to digital inclusion, the beta indicates that a higher the level of Social economies the higher the digital inclusion.

4.8.3 Regression analysis on Digital inclusion with Utilization

Table 26 Regression analysis on Digital inclusion with Utilization

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.102[a]	.010	-.004	397023004084155.300

a. Predictors: (Constant): Utilization

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113511674927892630000000000000.000	1	113511674927892630000000000000.000	.720	.399[b]
	Residual	1071865407249649000000000000000.000	68	15762726577200720000000000000.000		
	Total	1083216574742438300000000000000.000	69			

a. Dependent Variable: Digital Inclusion

b. Predictors: (Constant): zscore: Utilization

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	244956750994285.720	47453325304526.830		5.162	.000
	: Utilization	40559792135628.710	47795953041345.870	.102	.849	.399

a. Dependent Variable: Digital Inclusion

The significance level in one way Anova and coefficient on Utilization is not significant, this means that utilization is not related to digital inclusion, the beta indicates that a higher the level of utilization does not have an impact on digital inclusion.

4.8.4 Regression analysis on Digital inclusion with all four variables

Table 27 Regression analysis on Digital inclusion with all four variables

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	468346621915484660000000000000.000	4	11708665547887116000000000000000.000	12.378	.000[b]
	Residual	614869952826953600000000000000.000	65	9459537735799286000000000000.000		
	Total	1083216574742438300000000000000.000	69			

a. Dependent Variable: Digital Inclusion

b. Predictors: (Constant), zscore; Social Economies, zscore; Utilization, zscore; Human Capital, zscore; Infrastructure and Governance

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.658[a]	.432	.397	307563615140011.100

a. Predictors: (Constant), Social Economies, Utilization, Human Capital, Infrastructure and Governance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	100328588830109.660	109956709671219.880		.912	.365
	Utilization	-3686536736650.813	37656560731331.610	-.009	-.098	.922
	Infrastructure and Governance	292480032028179.750	48903567567070.690	.738	5.981	.000
	Human Capital	7423257674015.262	7397225268909.646	.121	1.004	.005
	Social Economies	10555058714865.100	9806593828830.570	.102	1.076	.005

a. Dependent Variable: Digital Inclusion

The significance level in the four way Anova and coefficient on all four variables indicates that infrastructure and governance is very significant, and correlates highly with digital inclusion,

beta indicates that a higher level of infrastructure and governance has a positive impact on digital inclusion.

4.8.5 Model on Regression analysis on Digital inclusion with all four variables

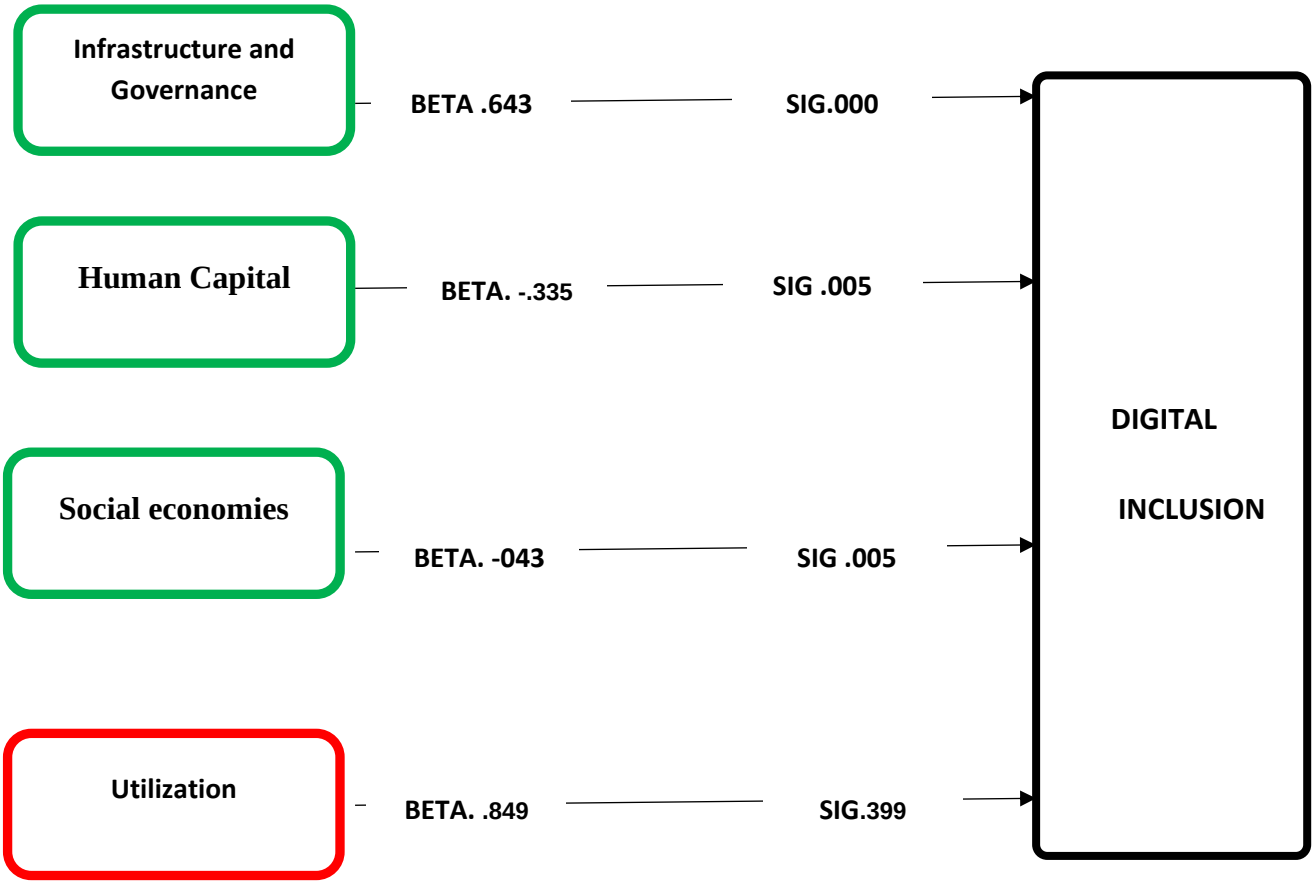


Figure 15 Model on Regression analysis on Digital inclusion with all four variables

Source: Research Data, 2016

4.9 Refined Framework versus other Frameworks

The regression analysis values illustrate the significance levels of all the four variables of digital inclusion, according to the results, infrastructure and governance, human capital and social economics all weighs heavily on digital inclusion, while utilization as a variable do not reflect significance impact on digital inclusion. This can be explained further from the VanDijk's cumulative recursive model that describes social support, access, and skills are pre-requisites of any usage access. This proposes that utilization is a function of the other variables and not a direct variable on digital inclusion.

This notion is also supported by the other frameworks discussed in the study's literature review. Digitally inclusive communities' framework by the Federal Communications Commission anchors availability and affordability, Digital literacy and consumer protection as a foundation principle in its framework, whereas the social economics area illustrated as the targeted principles.

The Consumer Framework for Digital Participation by the Welsh Assembly Government also considers social support in terms of motivation as a key driver to digital inclusion. Access and digital skills are illustrated in the framework as pre-requisites to realizing the benefits of digital inclusion.

The Framework for inquiry into the Technology Divide acknowledges access, knowledge and awareness, learning opportunities and support coupled with skills development as the key indicators of overcoming the social disparities created by the digital divide.

All the discussed frameworks purports to support the findings that for digital inclusion to be realized, motivation, material and skill access are key pre-requisites. This supports the results of the refined framework.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Research Findings and Results

The findings show that as ICT access on infrastructure continues to close gradually, the gap on skill and utilization still exists even within the majority of the citizens who are educated, employed and most of whom have access to ICT infrastructure. This implies that for digital inclusion to become a reality, the human resource must be developed to harness skills, develop content for both use and application of ICT in our region. The government must adopt policies that will endear ICT usage, reduce cost of access and infrastructure, as well as encourage other players to help in promoting connectivity to the remote and rural regions. The need to have a framework, policy guidelines is key to reduce duplication of effort, and address corruption. The government also needs to increase allocation in institutions that offer ICT training to promote human capital development.

The First Objective

To study the current digital divide patterns in Kenya rural areas.

Through literature review and after conducting the study on Kiambu County, the digital spread in Kenya is still a tall order, 60% of the sampled population, indicated that they do not access internet at work places, because their institutions have not subscribed to any internet services, while 23% agreed that their institutions have an active internet subscription, this shows that the bulk of the population is digitally excluded as a result of not accessing internet in schools.

On access to ICT infrastructure, 78% of respondents agreed that a member of their family owned either a laptop computer and or tablet, with this digital device family members have the capability to access internet, these findings clearly highlight that 7% were not sure whether a family member owned any digital device and only 15% confirmed that a family member did not own any.

Majority of the respondents 60%, indicated that their institutions had computers while a quarter of the population indicated that they did not have computers in their institutions,

On affordability of internet access, 33% of the respondents felt that although the subscription might be affordable it is of less significant, this indicates that telecommunication companies should have an affordable and significant plan, that allows users to derive value for money. 62 % of respondents who form the bulk of the population, felt that they were unsure or did not know about the existence of an ICT policy document, or its effect on business operations, there was an even split of 12% of respondents who agreed and another 12% who disagreed that on there being an ICT policy document and its impact on business operations

Most of the respondent indicated that they have little or no knowledge in application areas such as personal financial management tools, at 64.3%. This demonstrates that the material access is closing up in the region but the skill access still existing. The need for government policy and awareness creation was evident as 53.6% indicated they were not aware of cybercrimes, piracy and information theft while online. This is critical with the growing trends towards online business, ecommerce and online banking.

The Second Objective

To evaluate various frameworks developed and adopted in digital inclusion context

From the literature review, various frameworks have been developed and implemented in various parts of the work, and their implementation have yielded results. The Consumer Framework for Digital Participation was developed by the Welsh government to have its people get the most out of the internet, including helping people evaluate, engage with and understand online content. The Welsh government decided to develop a strategic response to the high number of adults who were digitally excluded and with the adoption of the framework, they realized digital inclusion.

On recognizing the cost to American competitiveness in a global economy, and by understanding that not all members of a community benefitted equally, and some communities have been left out altogether in the digital scope. Congress directed the Federal Communications Commission (FCC) to develop a plan to ensure that every American had "access to broadband capability".

The FCC developed the digitally inclusive communities' framework whose core premise was to see all people mutually benefitted from access to internet.

Third Objective

To develop a framework that can be adopted to inform policy and influence practice.
After collecting data and analyzing against the dimensions of the conceptual framework, the refined framework was developed and can be adopted to help bridge the digital divide that exists within our country and developing countries.

5.2 Research Limitations

The research was limited by time and financial resources. The available time and financial resources were very limited thus data could not be collected from each and every institution, and other stakeholders hence the researcher had to assign strata to help out with respondent who were available to participate in the study.

Bureaucracy in these government agencies and ICT regional offices, limited the collection of data, Other were unwilling to avail enough information because of fear of victimization and/or fear of the unknown, some claimed it was not within their jurisdiction to avail sensitive information with regards to institutional ICT policy and ICT infrastructure data.

5.3 Recommendations for Further Studies

Further research can be done on the extent of skill gap in digital inclusion context, and more research can be done in other counties in Kenya to address regional disparities in view of digital divide.

More research can be done on the efficiency and reliability of hardware and software resources used in various organization to ascertain if there is fair playground, when researchers indicate that the digital divide on access is narrowing.

The digital inclusion framework will require to be adopted at given time to be tested on whether it will help address the digital inequality.

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APPENDIX

A FRAMEWORK TOWARDS DIGITAL INCLUSION. A CASE STUDY OF KIAMBU COUNTY:

QUESTIONNAIRE

Introduction :

My name is **Wambugu Naftaly Muriuki** a student at the University of Nairobi undertaking Masters of Science in Information Systems and I present to a self-administered questionnaire concerning a FRAMEWORK TOWARDS DIGITAL INCLUSION. A CASE STUDY OF KIAMBU. The information given is only for research purpose.

Please respond as honestly and spontaneously as possible

Instructions: please tick [√]

SECTION A: PERSONAL INFORMATION:

1. Gender
   a) Male []
   b) Female []
2. Age
   a) 18-30 []
   b) 31-40 []
   c) 41-50 []
   d) Above 51 []
3. Highest Level of Education?
   a) Secondary []
   b) College []
   c) University []
4. For how long have you been engaged with your current employer?
   i. Below 1year []
   ii. 1-5 years []

iii. 6-10 years [ ]

iv. 11-20 years [ ]

v. 20 years and above [ ]

5. Name of the school _____

SECTION B: UNDERSTAND THE CAUSAL FACTORS OF DIGITAL DIVIDE

INFRASTRUCTURE AND GOVERNANCE

1. Please indicate the level which you agree /disagree with the following statements, with regards to your computer hardware, software and internet accessibility.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I own a desktop computer, laptop, Tablet, ipad					
Someone in our family owns a computer, laptop, Tablet					
I can access internet from my phone					
A family member has subscribed to internet services					
Your institution has a computer Lab for training students					
Your institution has subscribed to Internet Service					
Your Institution has computers					
Kiambu County has the right ICT infrastructure and governance in place that support the uptake of Internet? Tick one					

2. Do you agree/disagree that telecommunications companies have an affordable subscription plan that allows you to comfortably subscribe to web browsing services from any internet enabled device?

Highly Significant	Significant	Somehow Significant	Least significant	Insignificant

.

What do you think should be done by telecoms to enable individual comfortably access internet?

……

……

……

3. Please indicate the level which you agree /disagree with the following statements, with regards to your policy and governance.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Many institutions and business have an ICT policy that has improved the level of doing business					
Thought the use of internet most schools and businesses are in the right pathway in achieving the vision 2030					
The ICT master plan provides clear SMART strategies that promote digital literacy					
Internet has Improved Kiambu's competitiveness in service and products delivery by providing timely information and resources.					
ICT and internet has Improved collaboration between the county government, businesses and learning Institutions.					
Through ICT several multibillion county government projects have sprung up thus in turn improving the life of common man					
Internet has provided a forum for citizens' participation in National and County Government activities					

4. From where do you access internet? Tick one

Mobile Device	Commercial Facility e.g. cybercafé	Work	School	Home

5. Please indicate individual reasons that influence you in accessing the internet / browsing

	Always	Frequently	Occasionally	Rarely	Never
Communication					
Interaction with public authorities					
Banking					
Purchasing/ ordering					
Entertainment / news					
Research, blogs					
Media / government services access					
Others					

i) If others, please specify

……

……

SECTION C: TO UNDERSTAND THE LEVEL OF APPLICATION OF ICT BASED ON SKILL AND HUMAN CAPITAL DEVELOPMENT

6. Does your school provide for research and development on the use of ICT and internet? As provided for by the National ICT master plan?

   Yes [ ] No **[**]

   If yes, do you think the level of research and development training was beneficial to you?

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

7. How strongly do you agree/disagree with the following statement?

The level of education plays a big role in improving digital literacy? Tick one

Strongly Agree	Agree	Don't Know	Disagree	Strongly Disagree

i). what could be some of the hindrances to digital literacy?

……

……

8. I am aware of consumer protection rights on privacy, e-security, cybercrimes, ethical and moral conduct, copyrights, intellectual property rights and piracy within ICT sector.

   Yes [ ] No [ ]

   If no, what can be done to improve the awareness on consumer protection rights?.....

9. To what extent would you rate your awareness level of the following aspects relative to your computer skill in computing?

Computer Skills		Expert	Professional	Knowledgeable	Limited Knowled	No Knowled
Basic concepts:	Knowledge on factors impacting computer performance					
	Common software applications and uses					
	Identification of major hardware components					
Office Applications:	Word Processors					
	Spreadsheet Applications					
	Presentation Applications					
	Microsoft Publisher					
	Database Applications					
	Spreadsheets Applications					
File management:	Creation of directories/folders and sub-directories/sub-folder					
	Understand how an operating system shows drives, folders, files in a hierarchical structure					
Internet and Email access	Familiar with social media and blogs					
	Ease in working with search engines and web browsers					
	Ease in working with email applications /Gmail / yahoo/					
Personal Finance Management Tools and Application	Sage					
	Quick books					
	Pastel					
	Others					
Simulation and Modeling						

Programming and Website Development	Html					
	PhP					
	C++					
	Java					
	Python					
	Visual basic .Net					
	Others					
Concept Mapping and Inspiration						

10. Do you think that the government has put in place structures to attract and retain ICT skilled staff to ensure high quality service delivery to students?

    Yes [ ] No [ ]

    (i). If No, what can the government do to attract and retain skilled staff

    ……

    ……

11. To what extent do you agree with the validity of the following statements concerning the attempt by National and County Government to improve on the digital skills of Kiambu residents on adoption and use of ICT's and Internet?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
They have enhanced development of strategies to support research and innovation to improve on the ICT sector					

They have established networks for sharing training resources on ICT and Internet					
It is through these governments that the mechanism for attracting and retaining skilled human resources have been created and also improved.					
They have established significant level of consumer rights awareness campaigns meant to ensure residents are aware of cybercrimes, unfair trade & competition, and dissemination of accurate information in the marketplace in ICT Practices.					
They have developed laws to prevent unfair business practices from unscrupulous entrepreneurs gaining unfair advantage through online platforms.					

SECTION D: UNDERSTAND THE LEVEL OF ICT ECONOMIC VALUE SHAPED BY SOCIAL

1. Do you believe that literacy levels (ability to read, write, and use arithmetic) have an effect on stimulating interest on the uptake of ICT and internet?

   Yes [ ] No [ ]

   In your opinion what are some of the factors that influence literacy levels

   ?.....

   .....

   .....

2. Do you agree / disagree that there is a gender divide, with women and girls enjoying less access to information technology than men and boys?

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

3. As a teacher, do you agree/ disagree that girls perform poorly to ICT related subjects than boys?

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

4. To what extent does poverty have on access, usage and utilization of ICT's infrastructure at home, business environment and schools? Tick one

Highly Significant	Significant	Somehow Significant	Least significant	Insignificant

5. How would you rate the cost of accessing internet in Kiambu County?

Very High	High	Fair	Affordable	Cheap

6. I can easily access any ICT social support, from supportive social networks, internet, books, teachers and colleagues

   Yes [ ] No [ ]

7. Do you agree/disagree that including diverse cultural content in new media like the web and video games will make those vital new media resources more effective in encouraging the uptake of ICT 's and Internet inequalities?

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8. To what extent do you agree/disagree that ICT usage can achieve the following? Tick one option

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Promote access to Government Services					
Promote Job creation among the youth					
Enhance Wealth Creation through Online Jobs					
Improve Democratic processes such as e-voting					
Improve Maternal Care through access to information on healthcare					
Improve access to information on government policies and job opportunities					
Improve educational chances through E-learning					
Promote good governance by easy communication platforms to curb corruption practices.					
Promote agriculture and access to better markets and new markets					
Enhance education methods through simulation applications for easier concept mapping and understanding to learners					

9. To what extend would you agree/disagree on the following statements, with regards to autonomy of use towards digital inclusion and social economic factors?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree

I can easily access any ICT social support, from supportive social networks, internet, books, teachers, colleagues					
I am confident and independent while accessing digital systems for improved employment opportunities, entrepreneurship or otherwise					
I am aware of consumer protection rights on privacy, e-security, cybercrimes, ethical and moral conduct, copyrights, intellectual property rights and piracy within ICT sector.					
Motivation from family members, peers and friends on use of ICT can improve one's view and desire to become digital literate.					
The use of ICT's and internet has improved my efficiency in teaching / Learning					
ICT and internet play a crucial role in the overall performance of my institution					

10. Do you think that the social platforms used for communication and resource sharing have had an impact on improving digital skills?

Strongly agree	Agree	Partially Agree	Disagree	Strongly disagree

7. Do you believe ICT access and usage creates social boundaries and inequalities to those that do not have access and use of ICT infrastructure.

Yes	Partially	Not sure	Don't Know	No

If yes, what measure do u think should be employed to eradicate the social inequalities created by ICT access and use?

……

……