SOCIOCULTURAL FACTORS THAT INFLUENCE PRE-SERVICE TEACHERS' INTENTIONS TO ADOPT COMPUTER-BASED INSTRUCTIONAL TECHNOLOGY IN KENYA

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Abstract:

Although the use of computer technology has transformed the modern society in an unprecedented way, its use has not been evenly adopted across the globe. Kenya is among the African countries where the use of technology in education is in the early stages of integration. Research shows that external factors such as technology costs and inadequate infrastructures alone are not the only causal factors that affect adoption of educational technology (Szabo, 2002). Other factors inherent within individuals can restrict teachers' adoption of education technology (Niederhauser & Perkmen, 2008). Using a mixed-method research design, this study explores the underlying internal beliefs that influence Kenyan pre-service secondary school teachers' intentions to adopt computer-based instructional technology (CBIT) in their future teaching practices. A survey questionnaire with both quantitative and qualitative questions was given to junior and senior year college students enrolled in a bachelor's degree on Education at a public university located in a metropolitan city in Kenya. The findings highlighted several factors that influence adoption of CBIT by pre-service secondary school teachers. These factors include the role of socioeconomic factors such as the job market, local and global competition for technology use, access to computers and Internet, and the availability of proper CBIT training for teachers. The findings also highlighted the inadequacy of teacher training programs to provide appropriate preparation using technology for pre-service secondary school teachers to adopt CBIT in their future teaching practices. Moreover, pre-service secondary school teachers' believed that the facilitating conditions influence their intention to adopt CBIT. Addressing these factors is critical if the integration of technology in education is to be realized in Kenya.

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ACRONYMS

ATTU	Attitude Towards Use
BI	Behavioral Intention
CBIT	Computer Based Instructional Technology
CSE	Computer Self-Efficacy
DTPB	Decomposed Theory of Planned Behavior
FC	Facilitating Conditions
ICT	Information Communication Technology
ITCU	International Telecommunications Union
MOE	Ministry Of Education
OLPC	One Laptop Per Child
PBC	Perceived Behavioral Control
PUC	Perceived Use Complexity
PC	Perceived Compatibility
PSI	Peer Social Influence
PRA	Perceived Relative Advantage
SSI	Superior Social Influence
TAM	Technology Adoption Model

TPB Theory of Planned Behavior

UN United Nations

UNESCO United Nations Education, Scientific & Cultural Organization

SN Subjective Norm

TRA Theory of Reasoned Action

UTAUT Unified Theory of Acceptance and Use of Technology

TERMS AND DEFINITIONS

Attitude towards using computer	Is defined in this study as the positive or negative feelings (evaluative affect) that pre-service secondary school teachers have about using CBIT (Fishbein & Ajzen 1975).
Behavioral intentions	Is the pre-service secondary school teachers' expectancy that is a result of conscious deliberation to use CBIT (Ajzen, 1991; Todd & Taylor 1995).
Computer self-efficacy	Is the degree of confidence to which a pre-service secondary school teacher in Kenya believes he or she has the ability to perform specific classroom instructions using CBIT (Venkatesh, Morris, Davis, & Davis, 2003).
Computer-based instructional technology	Is an overarching concept that encompasses various technologies that are computer mediated, such as instructional software, Web 2.0 tools, and other programs such as those of Microsoft Office.
Facilitating conditions	Is the degree to which pre-service secondary school teacher perceive certain facilitating condition, such as time and resources will, inhibit them to use CBIT in the classroom (Thompson, Higgins, & Howell, 1991).
Perceived behavioral control	Is defined as pre-service secondary school teachers' perception of factors that might facilitate or constrain their use of CBIT in their future teaching practices (Ajzen, 1991, p. 188).
Perceived use compatibility	Is the degree to which pre-service secondary school teacher believe teaching using CBIT is compatible with his or her norm values, teaching philosophy, as well as personal abilities. (Thompson, Higgins, & Howell, 1991).
Perceived use Complexity	Is defined as the degree to which a pre-service secondary school teacher perceives learning how to use CBIT is a difficult task not worth learning (Moore & Benbasat, 1991).

Perceived relative advantage	Is the degree to which a pre-service secondary school teacher believes that using CBIT will enhance their teaching performance, which is advantageous to student learning (Moore & Benbasat, 1991).
Peer social influence	Is the degree to which pre-service secondary school teachers perceive their peers expect them to use CBIT when teaching (Nienderhauser & Perkmen, 2008).
Social outcome expectations	Is the degree to which pre-service teachers expect the use of CBIT to bring respect and recognition from others such as colleagues, bosses, and family members (Nienderhauser & Perkmen, 2008).
Subjective norm	Is the degree to which a pre-service secondary school teacher perceive that people who are important to him or her think he or she should be able to use CBIT when teaching (Ajzen, 1991).
Superior social influences	Is the degree to which pre-service secondary school teachers perceive people superior to them such as professors think they should use CBIT to teach (Nienderhauser & Perkmen, 2008).

CHAPTER I

INTRODUCTION

The period between December 27, 2007 and February 8, 2008 was a dark period that many Kenyans would like to forget. The nation had gone to the polls for a Presidential election that was fiercely contested. The race between incumbent President Mwai Kibaki and opposition leader Raila Odinga was so close with survey polls not favoring either candidate. This made it difficult to tell who was a clear winner. The political atmosphere was very intense to a point that it had polarized the nation. Despite the survey polls not showing a clear winner, and an electoral institution that was tainted with suspicion of rigging votes, incumbent President Mwai Kibaki was declared the winner. The opposition disputed the presidential results and called for its supporters to hold demonstrations. With a country so divided, demonstrations became a recipe for violence that erupted in every major city in the country. Within 45-days the crises had claimed over 1,300 lives and caused over 65,000 people to be internally and externally displaced.

By all measure, this violence was the worst bloodshed the country had ever experienced since the fighting for independence in 1963. The political stalemate was ended by a power sharing agreement between the incumbent and the opposition parties

. The agreement also gave the leaders the task of creating policies that promote social cohesiveness and development for the country. The Kenya Vision 2030 was the flagship project of that agreement. The Kenya Vision 2030 is an economic long-term development blueprint that aims to transform Kenya into a newly industrializing, middle-income country within the period of 2008 to 2030 (Ministry of State Planning, 2008). Given the challenge of social cohesiveness that the nation was facing at the time, the development agenda was dubbed as *Harambee*—a Swahili word that literally means *all pull together*, and it is the official motto of Kenya.

The content of the Kenya Vision 2030 is structured around full embracement of international standards of political systems and economic development, both aided by investment in information technology. That is, the vision requires Kenya to embrace all the aspects of globalization that include advancement of communication technology, investment on infrastructures, and a computer-literate labor force. The Kenya Vision 2030 initiative also recognizes education reform as a significant pillar of development by placing it among the cornerstones that form the social pillar, alongside economic and political pillars (Republic of Kenya 2008).

The decision by Kenyans to place education among the development pillars was not misplaced. Economists, educators, and policy makers generally agree on the proposition that integrating technology in education is the first step toward expediting the much-needed economic growth in developing countries (Collier, 2007). This argument is based on the tenet that a wide adoption and use of educational technology has the capacity to open new ideas needed to address the socioeconomic challenges that face developing countries. In Kenya, the scarce use of educational technology limits its competitiveness in global markets. In the current structure of global market computer mediated technology has become a prerequisite for

producing a workforce with the skills needed to participate in the techno-based global economy (Collier, 2007; Oshikoya, 1998).

Besides potential economic benefits, the use of educational technology has a profound impact on how teachers teach and students learn. For students, the use of educational technology has long been known to enhance their learning through motivation, as well as assist them develop a positive attitude toward information technology that is essential to lifelong interest in learning (Hennessy, Harrison & Wamakote, 2010; Kulik, 1983; Tedla, 2012). For teachers, the use of educational technology in the classroom has numerous benefits, such as reducing the use of blackboards/whiteboards, helping maintaining progress records of students, and aiding in the updating of instructional material. All these benefits translate to teachers having more productive time to engage with the students (Kulik, 1983; Murithi & Indoshi, 2011). The abundance of literature describing the benefits that technology brings to education makes it simple to comprehend why technology is important in education reform and improvement. However, understanding which factors influence teachers to adopt instructional technology is far from simple.

To understand the various factors that influence teachers to adopt technology in their instructional practices, I start by defining the term educational technology and its features focused in this study. The term *educational technology* has wide-ranging definitions and its use in scholarly articles is multifaceted. A myriad of research journals has interchangeably used it to reference things such as an arsenal of tools (i.e., electronic equipment), a system of educational administrative support, as well as the processes of learning using technology (Teo, 2011). This study is concerned with the facet of educational technologies that specifically relate to classroom instruction that is aided by the use of computers. The study will use the term *computer-based*

instructional technology (CBIT) to refer to various computer mediated instructional technologies such as instructional software, Web 2.0 tools, and other computer applications—Microsoft Office and Google Apps for Education—(Roblyer & Doering, 2010).

Research on teachers' adoption of instructional technology shows that the degree to which teachers adopt technologies in their instructional practice depends on many interacting external and internal factors (Brzycki & Dudt, 2005; Ertmer, 1999; Niederhauser & Perkmen, 2008). The external factors include things like availability and accessibility of adequate hardware and appropriate software, reliable infrastructures, technology-skills trainings, time to develop technology-integrated activities, and availability of teacher support, among others (Niederhauser & Perkmen, 2008). These external factors are essential in the adoption of instructional technology mainly because they are the logistical vehicles for delivering technology to be used by teachers. However, research suggests that external factors alone are not the only barriers affecting teachers' adoption of instructional technology. Rather, internal factors also play a critical role toward teachers' adoption of instructional technology (Szabo, 2002).

Internal factors that influence adoption and use of instructional technologies are situated within the individual. Examples of these internal factors internalized by an individual include beliefs about teaching with technology, beliefs about computers, and beliefs about social expectations to adopt technology (Niederhauser & Perkmen, 2008). These internal factors are the most crucial elements that lead teachers to adopt instructional technologies because they are the 'thinking' tools that influence the teachers' actual use of educational technology in the classroom (Niederhauser & Perkmen, 2008).

In the last decade, numerous studies have examined the role of internal factors in teachers' adoption of instructional technology (Davis, 1989; Pajares, 1992; Sadaf, Newby, &

Ertmer, 2012; Taylor & Todd, 1995; Teo, 2009; Venkatesh, et al. 2003). Although these studies have shed light on the phenomenon of internal factors, their findings are engulfed by various constraints. Chief among these constraints is the *one-size fits all* approach that desists to account the context and geographical area where these studies are predominantly conducted. A look at Venkatesh, et al.'s (2003), meta-analysis of studies that explore teachers' use of instructional technology, shows that the majority of these studies have historically examined the phenomenon of internal factors from educational environments of the Western world, which is considerably different from that of developing countries such as Kenya. Precisely, people in developed countries regard computer use an integral part of their everyday lives, compared to developing countries, where computer use is still regarded as an extravagant luxury.

Further, findings from the few studies that focus on developing countries also encounter constraints related to the very difficult nature of generalizing belief concept, which is place-specific. As observed by Vygotsky (1978), factors of contextual social settings play a prominent role in shaping individual beliefs and attitude. In this regard, contextual social settings that influence teachers in Nigeria would be very different from social settings that influence teachers in Kenya. This is because there are specific historical and sociocultural factors that govern each society.

The overall objective of this research was to examine internal factors that influence pre-service teachers' intention to adopt instructional technology in their future teaching practices. It addressed the constraint of geographic area by contextualizing the study in Kenya, and by accounting for the intricate interplay of the social system that shape teachers' beliefs toward instructional technology. In other words, as opposed to perceiving teacher's beliefs toward education as simply governed by the characters of an individual, this study recognizes that

history, socioeconomic, sociocultural, sociopolitical, and teacher education programs, altogether are dynamics that influence teachers' beliefs toward using CBIT in the classroom. These factors of social systems in Kenya are discussed in depth in chapter two.

Present State of Technology Use in Kenya

To understand the context and rationale of this study, it is important to introduce the current state of instructional technology in Kenya. First and foremost, many sectors, such as communication, banking, and education in Kenya, are in their beginning stages of adopting information technology. This denotes that the interaction with technology by the majority of the population in Kenya, including teachers, is a relatively new experience.

The factors that impede the adoption and subsequent use of instructional technology in Kenya correspond to the domain of internal and external factors discussed above. The internal factors are pre-service teachers' beliefs about instructional technology, such as their attitude toward computers, their perceived advantage of using instructional technology, and their perceived social expectations to adopt instructional technology. The external factors refer to infrastructures and other resources that can be quantified. Historically, the external factors have been mired by the challenges of affordability, and have been pointed as the greatest challenge facing integration of instructional technology to education in Kenyan, and in other African countries (Kinuthia, 2009; Liverpool, 2002). Although this factor remains true for some educational institutions in Kenya, there has been a great deal of improvement in the last decade. This progress has raised Kenya to be among the African countries where availability of computer-based instructional technology is expanding quickly.

Kenya has taken a huge 'technological leap' as a result of investment on technology initiatives that partners the government, private sector, and non-government organization. To understand the current situation of instructional technology in the context of Kenya, it is appropriate to highlight some of the technology initiatives that have impacted education specifically in the last decade. For instance, between 2009 and 2012 the government of Kenya partnered with the private sector to fund the construction of four undersea fiber-optic cables that deliver high-speed Internet connectivity in Kenya from South Africa (Miyungu, 2012). The arrival of high-speed broadband Internet in Kenya was a technology leap for education due to the ease of accessing and sharing information at a faster pace. This is in comparison to the expensive dial-up and satellite Internet connections that are slow as a dead snail and also unaffordable for many public institutions in Kenyans. In addition to availability of faster Internet, the Kenyan government is also facilitating the availability of computers in the classroom. On its 2011/2012 budget, the government allocated 680 million Kenya shillings for the purchase of computers for public education in Kenya (Republic of Kenya 2011/2012 Budget Statement).

The umbrella of international community has also contributed to the increased accessibility of computer technology in Kenya. For instance, the One Laptop Per Child organization, a subsidiary of the UN, has had impactful initiatives that have provided computer access to over 5000 students in poverty-stricken areas, such as West Pokot in Kenya (http://one.laptop.org/stories/kenya-joyful-collaboration). Further, the United Nations Education, Scientific, and Cultural Organization (UNESCO) has promoted the Open Educational Resources (OERs) initiative, an open source project that allows educators to access educational materials that are either already in the public domain, or are produced with an open license (Unesco.org).

The major benefit of OERs is that it legally allows educators to contribute, as well as have free access to online educational materials (OER Africa).

Early childhood education has also benefited from technology initiatives geared toward education. The promise for this young generation, (tech-generation), is manifested in the Kenya 2013/2014 budget that allocated 52.3 billion Kenya Shillings to purchase a laptop computer for every child joining first grade in Kenya starting January 2015 (Republic of Kenya 2013/2014 Budget Statement). This initiative is part of Kenya Vision 2030—a long-term economic development agenda that aims to transform Kenyan into a globally competitive and prosperous nation by 2030 (Kenya Vision 2030).

Although the implementation of free laptop for first graders has hit contractual delays, there is an exciting technology initiative of reforming secondary education in Kenya that is currently being implemented. The initiative involves the plan by the Ministry of Education in Kenyan to digitize secondary school curriculum by the end of 2015 (MOES&T, 2012). The initiative to digitize secondary school curriculum has inspired this study for two reasons. One, the project directly impacts secondary education and has the potential to transform the entire education system in Kenya by paving the way for digitalization of all education curriculums. Second, despite the terrorism threats that have wreaked havoc on the Kenyan economy, the groundwork of this initiative, such as creating content of the digital curriculum, has commenced. Communications from policy makers also hint to the government's resolve to expedite the implementation of this initiative. As announced on August 23rd, 2012, by the then Minister of Education, the late Mutula Kilonzo, implementing this initiative is the Ministry's main priority (Yulu, 2012).

The success of this initiative will be a major achievement for Kenya. Not only does the project unlock integration of technology in secondary education, but also will serve as a foundation in which Kenya can acquire the status of knowledge economy (MOES&T Sessional Paper, 2004). Essentially, knowledge economy is an economy in which growth depends on the ability of the country to produce workers with adequate technological knowledge needed to compete in the global market. Prioritizing on integrating technology in secondary education has great potential to supplement Kenya's ambitious dream of economic growth. In particular, **c**ompared to the yet another project of providing one laptop for each first grader that will take 14 years to graduate the first class, implementing this initiative in secondary education will cost less and will take only 4 years to produce the first labor force that can compete in the current global market.

Gauging from the various initiatives outlined above, it is evident that to transform secondary education to produce skills needed in the 21st century, the government has indeed invested heavily on external factors such as infrastructures. However, a closer look at the implementation framework of this program shows a gap on the critical elements of diffusing new innovations. In particular, a blueprint strategic report titled *ICT Implementation Strategic Plan of 2012,* seems not to consider the internal factors that influence secondary school teachers to adopt instructional technology. It is one thing to acquire technologies but yet another to implement the use of those technologies in the classroom. The significant effort by Kenya to invest in technology in education as part of school reforms is surely commendable; nonetheless, Szabo (2002) warned that most implementation of educational technologies fail to succeed because much effort is placed on quantifiable external factors such as infrastructure, while less attention is given to the major component of the reform, such as the process of changing peoples'

behavior. In the context of Kenya, teachers' behavioral change encompasses restructuring the learning environment into non-traditional ways, as well as changing their teaching approach to incorporate new pedagogies that embrace technology.

Problem Statement

Kenya is heading in the right direction by focusing its attention toward investing in technology that can be used education. The ambition to digitize secondary school curriculum by 2016 is a promising approach toward raising the standards of secondary education in Kenya to meet the skills necessary to attain Vision 2030. Although this is an optimistic goal, its implementation framework is mired by problems of balancing internal and external factors. A look into a report by the Kenya Ministry of Education titled, *ICT Implementation Strategic Plan of 2012*, offers an assumption of, *build it and they will come* (in this case, buy it and instructors will instinctively adopt it). This conjecture is drawn from the straightforward strategies outlined in that report. For instance, the report details the factors considered in the implementation process to include providing digital content, creating policies, and providing infrastructural capacity (Kenya Ministry of Education, ICT Implementation Strategic Plan of 2012).

Based on the earlier discussion of internal and external factors that influence teachers to adopt instructional technology, it is clear that the list of strategies outlined by the Ministry of Education in Kenya only address external factors. The document fails to provide any empirical studies conducted on Kenyan teachers regarding their dispositions to adopt instructional technology. It also fails to provide any clear mechanisms it will use to address normative factors. Normative factors are internal elements that are derived from interaction dynamics of social systems (Kennedy, 1987).

Robertson et al (1996), observed the following broadband normative factors that lead teachers to resist using computer technology.

- Teachers' perceptions
- Resistance to organizational change
- Resistance to outside interventions
- Personal and psychological factors

In the context of implementing digital curriculum for secondary education in Kenya, consideration of normative elements would include researching the internal factors that shape secondary school teachers' perception of instructional technology, examining teachers' beliefs about their role in relation to implementing instructional technology, and analyzing teachers' beliefs of educational policies that guide the use of instructional technology.

Uncoordinated implementation of digital curriculum in secondary educational could prevent an effective integration of instructional technology in Kenya. As noted by Anderson (2008), formal introductions of new programs and practices, whether mandated or voluntary does not mean that school personnel would actually change what they were already doing. This is because local educators can modify those programs from their original design to an extent that virtually little change is made to the existing practices and student learning outcomes (Anderson, 2008). Educational policy makers in Kenya seem to overlook the normative factors when creating strategies for implementing instructional technology in secondary education. This is depicted not only by the absence of sufficient empirical understanding of beliefs held by secondary school teachers in Kenya, but also a lack of understanding on how those beliefs influence integration of technology in their instructional practices**.**

Higgs (1997) observed that most reforms in schools fail because of flawed implementation (cited in Kipsoi, 2012). In this respect, it is already known that teachers in Kenya

use less than 40% of all available infrastructure of instructional technology (Kenya Ministry of Education, 2006). The alarm of this problem is also raised by other studies that show teachers' reluctances to adopt instructional technology. For instance, a study that investigated teachers' and administrators' perceptions of computer use in classroom, pointed to a significant number of teachers in Kenyan secondary school reported feeling apprehensive to use instructional technology because they were not accustomed to using it (Wabuyele 2006). Muriithi & Indosh (2011) reinforced this view on their research that examined attitude of teachers and students toward the use of computer in teaching Computer Studies curriculum in Kenyan secondary schools. Their findings point that secondary school teachers are ill-equipped to effectively use Information and Communication Technology (ICT) in Kenya.

As mentioned earlier, a widespread use of technology both in education, as well as in other socioeconomic sectors in Kenya, is relatively new. This means that most teachers lack the experience that results from an extended interaction with technology. Research on teachers' adoption of technology shows that the adoption of new instructional technology is a 'notoriously' difficult process that requires changing teachers' attitude and beliefs about teaching and learning (Davis, 1989; Niederhauser & Perkmen, 2008; Szabo, 2002; Pajares, 1992). A successful implementation of digital curriculum and other instructional technologies by the Ministry of Education in Kenya must therefore address this challenge. A failure of the project to digitize secondary school curriculum could have a damaging effect to the various initiatives geared toward integrating instructional technology in Kenya. Given the importance of the normative strategy in implementing technology innovations in education, there is an urgent need to explore and identify the internal factors that influence teachers' dispositions toward adopting and using technology in their instructional practices.

Purpose of the Study

The purpose of this research was to identify internal factors that influence adoption of CBIT by pre-service teachers in Kenya. This aim was realized by examining pre-service teachers' beliefs toward instructional technology, and how those beliefs influence their intention to adopt CBIT in their future teaching practices. An explanatory sequential mixed-method research design was used. This type of research design is typically used in research in which qualitative and quantitative data are simultaneously collected within one study with the aim of using qualitative data to further explain quantitative results (Creswell, 2013). In this study, the qualitative data were collected using Decomposed Theory of Planned Behavior (Taylor & Todd, 1995) that suggest the dependent variable of behavioral intention (BI) is predicted by attitudinal factors, normative factors, and control factors. The qualitative data explored the sociocultural factors that shape pre-service secondary school teachers' salient beliefs toward CBIT. The rationale for using both qualitative and quantitative data was to capture a wider view of internal factors that influence behavioral intention of pre-service secondary school teaches to adopt CBIT in their future teaching practices

Justification of the Study

The question of what factors influence teachers' decisions to adopt educational technology has been explored in a range of different technologies (Christensen, 2002; Ford, 2007; Kinuthia, 2009; Niederhauser & Perkmen, 2008; Sadaf, Newby & Ertmer, 2012). However, most of these studies have been limited to developed countries where technology is widely used both at home and in school environments. In addition, these studies often assume a sweeping generalization of belief concept by attributing less emphasis of the contextual social

elements that are specific to communities, such as social economic, sociocultural, and social political. The missing gap of these contextual factors renders the concept of beliefs factors to be misunderstood as simply governed by the dimension of an individual. Yet, social systems and the tools commonly used in the society both play a significant role in shaping internalized beliefs of an individual (Vygotsky 1981).

This study simultaneously attained two objectives. One, as opposed to perceiving pre-service teachers' beliefs as monolithic and governed simply by intrapersonal dimension of an individual, this study used Decomposed Theory of Planned Behavior (Taylor &Todd, 1995) as a guide to explore internal belief factors that influence pre-service teachers in Kenya to adopt CBIT in their future teaching practices. Second, and perhaps the most important objective, the findings of this research brings a firsthand understanding of the socioeconomic, sociocultural and sociopolitical factors that shape Kenyan pre-service teachers' beliefs toward adopting CBIT in their future teaching practices. The findings of this study aimed to identify the factors that contribute to the gap between technology availability in classrooms, and the actual usage of that technology by secondary school teachers in Kenya. Policy makers and other educational stakeholders can then use this understanding to promote strategies that maximize the use of technology by secondary school teachers. The strategies include reforming teacher training programs, and addressing the systematic and sociocultural factors

Research Questions

The primary question explored by this research is, what are the underlying belief factors that influence high school teachers in Kenya to use CBIT? This central question will be addressed through the following sub-questions:

Quantitative:

1. What is the relationship between factors in the decomposed theory of planned behavior (DTPB) model that predict pre-service teachers' intention to adopt CBIT in Kenya?

2. What is the relationship between the factors of regression fit-model that predict pre-service teachers' intention to adopt CBIT in Kenya?

3. What are the zero order correlations on constructs that directly predict pre-service teachers' intention to use CBIT to teach?

4. How does cultural capital (Bourdieu, 2007), provided by the three-tier hierarchy ranking of secondary school system in Kenya, influence pre-service teachers' beliefs toward using CBIT?

Qualitative:

5. What are pre-service secondary school teachers' perceptions of social outcome expectations held by the Kenyan society in regard to teachers' use of technology to teach?

6. What role does the social normative of supervisors' expectations play in pre-service secondary school teachers' intentions to adopt CBIT to teach in their future teaching practices?

7. What role does the social normative of peer social interaction play in pre-service secondary school teachers' behavioral intention to adopt CBIT?

8. What are pre-service secondary school teacher's beliefs about technology and student learning?

9. What do pre-service teachers perceive as the greatest challenge facing Kenya in regard to integrating CBIT in secondary education?

10. What are pre-service secondary school teachers' beliefs on the adequacy of teacher training programs in providing the skills to use technology to teach?

Hypotheses

Hypothesis 1: Pre-service secondary school teachers' attitude toward computers is a direct determinant of their behavioral intention to use CBIT.

Hypothesis 2: Pre-service secondary school teachers' perceived relative advantage of using CBIT contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

Hypothesis 3: Pre-service secondary school teachers' perceived complexity of using CBIT contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

Hypothesis 4: Pre-service secondary school teachers' perceived compatibility of using CBIT contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

Hypothesis 5: Pre-service secondary school teachers' subjective norm is a direct determinant of their behavioral intention to use CBIT (Sadaf et. al., 2012).

Hypothesis 6: Pre-service secondary school teachers' beliefs of superior social influences contributes to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

Hypothesis 7: Pre-service secondary school teachers' beliefs of peer social influences contributes to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

Hypothesis 8: Pre-service secondary school teachers' beliefs of social outcome expectations contribute to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

Hypothesis 9: Pre-service secondary school teachers' perceived behavioral control is a direct determinant of their behavioral intention to use CBIT.

Hypothesis 10: Pre-service secondary school teachers' self-efficacy of using computer contributes to their behavioral intention to adopt CBIT through the mediating variable of perceived behavioral control.

Hypothesis 11: Pre-service secondary school teachers' perception of facilitating conditions contributes to their behavioral intention to adopt CBIT through the mediating variable of perceived control.

Hypothesis 12: Pre-service secondary school teachers' perception computer anxiety has a negative relationship with their behavioral intention to adopt CBIT through mediating variable of perceived control.

Assumptions

The main assumption of this study was that the sampled pre-service secondary school teachers had similar characteristics as other teachers intending to teach secondary schools in Kenya. Another assumption is that the demographic makeup of the sample had a normal statistical distribution in relation to the population of pre-service teachers in Kenya.

Limitations

There are several limitations to this study. First and foremost, the data analyzed were self-reported and might not reflect objective reality of pre-service teachers' actual future use of CBIT. This limitation, therefore, caused the study to make inferences on the relationship of measured variables only, and not the judgment of causal-comparative, which alleges cause and effect of the behavior being investigated. Second, although the participants of the proposed study are students enrolled in a bachelors of Education degree, these students specialize in different academic subjects within the teacher-training program. Their varied specializations might have caused their beliefs toward CBIT to differ based on the discipline they intend to teach in the future. In addition, gender, age, and marital status also could have affected social normative influences. For instance, married, older, male participants might have had a different social pressure to use CBIT compared to unmarried, young, females.

CHAPTER II

REVIEW OF LITERATURE

The Effect of Social Systems and the Foundations of Secondary Education in Kenya

The inquiry on pre-service teachers' intention to adopt computer-based instructional technology (CBIT) requires understanding the dynamics of social systems in Kenya, and the effects they have in shaping beliefs of teaching using technology. In an effort to provide a comprehensive review of contextual factors that shape pre-service teachers' intentions of adopting CBIT, this chapter briefly introduces various elements that shape the education system and practice in Kenya. These elements are: the historical role of a teacher in Kenya, the development of secondary education, the policies that govern education matters in Kenya, and the structure of teacher training in Kenya. The discussion of these elements is followed by an analysis of existing literature related to adoption of technology to teach.

According to the 2009 population and Housing Census, Kenya has a population of 40 million people (Republic of Kenya, Population and Housing Census, 2009). At the time of independence from the British in 1963, the Kenyan economy heavily relied on agriculture, mainly coffee and tea, for export (Kinuthia 2009). Today, agriculture remains the main conduit of the Kenyan economy, accounting for 70% of the labor force (CIA World Factsbook, 2013).

With a budget of $7.87 billion, Kenya had an economic growth rate of 5.1 percent in the 2013/2014 fiscal-year (CIA World Facts-book, 2013). Kenya has done considerably well in terms of funding the education sector compared to other countries in the East African region. In the fiscal year 2010/2011, the Kenyan government allocated 23.7% of its budget expenditure to education, 27% of that being delegated to secondary education (UNESCO, Education in Kenya Facts, 2012).

In regard to literacy, Kenya leads other East African countries (Tanzania, Uganda, Rwanda, Burundi) with an adult literacy rate of 86.5 percent in 2008 (UNESCO, Education in Kenya Facts, 2012). This increased literacy has been a result of a Free Primary Education program that was implemented in 2003 as part the United Nations' 2015 Millennium Development Goals. The Free Primary Education program had a great impact on the advancement of literacy in the country. A 2012 Education Sector Report by the Ministry of Education in Kenya indicated that primary school enrollment was 94 percent in 2011, and transition from primary to secondary school was 73.3 percent during the same period (Republic of Kenya: Education Sector Report FY 2013-2014). Kenya has an education model commonly referred to as 8-4-4 system that was adopted in 1985 (Wanjohi, 2011). In contrast to the U.S high school grades that begin at 6th grade to 12th grade, under the 8-4-4 system learners complete eight years of primary schooling, followed by four years of secondary education, and four years of a bachelor's degree.

Historical Role of Teacher in Kenya

Teachers are considered mentors in many African societies. As Affe (1991) observed, historically, teachers have played the most crucial role in the functioning of many societies in

Africa. Even before Western education surfaced in Kenya, there were teachers who taught indigenous education (Ngugi wa Thiong'o, 1986). The role of these teachers was not only to mentor, but also to train individuals to become valuable social members by learning useful knowledge and values relevant to the society (Eshiwani, 1993). The instructional tools during that period were mainly narrative storytelling and practices of customary rituals (Ngugi wa Thiong'o, 1986). This story telling was not simply rhetorical, but rather it provided a positive insight to everyday experiences of the African society (Bunyi, 1999).

Institutionalized education arrived in Kenya with the British in the mid-nineteenth century. The objective of this Western education was to spread *literacy*—the ability to read and write in English (Bunyi, 1999). The role of teachers, who were mostly missionaries, was largely to teach Africans how to read the Bible, with the goal of creating more converts that were later used as interpreters during colonial rule (Wamagatta, 2008). The education setting at the time was face-to-face, and the most cost-effective and convenient instructional tool was a blackboard with chalk. This instructional tool has remained to this day as the primary tool of instruction for a majority of schools in Kenya.

The continual use of age-old blackboard and chalk as the primary tool for instruction has influential implications on teachers' perceptions, as well as knowledge of using other instructional tools, including CBIT. This influence occurs through a phenomenon referred to as *semiotic mediation*. Popularized by Vygotsky (1981), semiotic mediation is the use of "signs" as facets to develop individuals' internal beliefs and thoughts (p.137). In other words, internalized beliefs of an individual are shaped by the tools and instrument they use. This concept of semiotic mediation is significant in conceptualizing the extent to which the continual use of blackboard and chalk shapes pre-service teachers' beliefs about using technology to teach. As enculturation

theory suggests, the environment in which an individual grows up influences "how they think and what they think about" (Vygotsky, 1978, p.87). In this regard, pre-service teachers who were educated in a secondary school that did not use CBIT are likely to retreat to instructional tools that reflect their own learning experiences, thus shaping their beliefs and concerns about using education technology. In addition, Joseph Jubers (1754-1824) observed, "to teach is to learn twice", therefore, there is a need to recognize that substantial learning by teachers takes place during the process of teaching students (Hennessy, Harrison & Wamakote, 2010).

The Development of Secondary Education in Kenya

An examination of sociocultural factors that influence secondary school teachers' beliefs about instructional technology cannot be complete without the discussion of the historical development of secondary schooling in Kenya and the foundation of the values placed on education by the Kenyan society. The horrendous worldwide events of Second World War (WWII) had a huge impact on the development of secondary education in Kenya. Prior to WWII, there was no local opposition to the colonial policy that limited native Kenyans from accessing secondary education. This was mainly because institutionalized education was a new concept for the locals, and native Africans did not place much value on their colonizers, education (Lillis, 1985).

Historians of education in Kenya believe that the impetus to value formal secondary education in Kenya came after WWII when the African solders came in contact with the outside world (Kafu, 2011; Wamagatta, 2008). This is evidenced by the rise of groups[1] that expressed concern regarding the lack of access to secondary education by indigenous Kenyans after WWII.

[1] Groups such as the Kikuyu Association and Local Natives Councils, which constantly advocate to further secondary schooling access for indigenous Kenyans (Wamagatta, 2008).

The colonial rule had, however, placed a tight grip on denying native Kenyans access to secondary education. The existing secondary schools were racially segregated in three-tiers—The Whites schools, Asians schools, and the Missionary schools, which confined Africans to religious education. Strangely, there still exists a similar system that classifies secondary school into three tiers of National schools, Provincial schools and District schools. The official policy for enrollment to each tier is governed by academic achievements. However, social class status overwhelmingly dictates enrollment to each tier because academic achievement is highly correlated to social class. I discuss the effects of tiered Kenyan secondary education later in this chapter.

In 1925, 30 years after Kenya became a British colony, there were no secondary schools for Africans in the colony (Wamagatta, 2008). By the time of independence in 1963, Kenya had only 90 secondary schools (Lillis, 1985). Although there was an apparent high demand for secondary schools[2] to fill the qualified manpower for economic development, the government lacked enough resources to build them (Eshiwani, 1993). In the spirit of unity that had sprouted from the liberation war and embodied in the value for secondary education, communities across Kenya addressed the shortage of secondary schools by endowing time, labor, and money to build *Harambee* (self-help) schools. *Harambee* is a Swahili term, which literally means *let's pull together*. In this scheme, communities across the country organized themselves not only to construct secondary schools around the country, but also to serve as board members in those schools. Primarily, these schools provided a growing edge to the Kenyan educational system, making it the best in the East African region (Kinuthia, 2009).

[2] See Ominde Educational Commission Report of 1964: The report suggested the support of secondary education in order to develop Kenya into a modern economy, and to change people's attitude toward Western education (Rharade, 1997).

The concept of *Harambee* schools draws heavily on socioeconomic approaches (Parsons & Smelser, 1956) that focus on how relevant combination of social cooperation and resources are assembled to meet a given economic challenge (Woolcock, 1998). It also points to the character of Kenyan society as a collective society. According to Hofstede's (1991) framework of cultural dimension, collective society is one that, among many other communal characteristics, considers implications of individual action for wider collective benefit of the society. These cultures have a core associated with tradition and cohesive social groups (Minkov & Hofstede, 2012). As a society characterized by the culture of collectivism in education and development matters, there are socially defined expectations placed on the teaching profession, which have the potential to shape teachers' beliefs about applying instructional technology in their teaching practices.

When discussing socioeconomic elements that shape teachers' beliefs toward instructional technology, the role played by the wide gap of equity between social classes in Kenya cannot be overlooked. Precisely, the discussion of the three-tier secondary school system that has been around in Kenya since the colonial era is of particular interest when observing the way in which social capital shapes teachers' beliefs toward instructional technology. Social capital holds the premise that social networks have value (Bourdieu, 2007). The value of social networks is manifested on the three-tier system in numerous ways. In the three-tier system, the top-tier is National schools (formally white schools). These elite schools attract learners from an affluent social class. The the second tier is Provisional schools (formally Asian schools), which are dominated by middle class, and District schools, which now include *Harambee* schools, serve the lower social class. The majority of Kenyans belong to the *Harambee*, or lower social class. The current funding for secondary education follows the same structure, with top-tier

schools receiving the biggest share of funding compared to the other two tiers. The extra funding for the top-tier schools has given them the ability to stay ahead in terms of availability of educational technology in their institutions.

Looking from the lens of social cultural theory, there are clear advantages gained by students who attend these elite schools before choosing to pursue a teaching profession. Social cultural theory suggests that some unequal academic achievements are a result of different social classes from which individuals originate (Bourdieu, 2007). In this study, the cultural capital is specified as access to technology equipment and school environment that uses education technology. The top-tier National schools receive more funding to purchase electronic equipment than the other two-tier school systems. Somekh (2008) observed that exposure to classroom environments that use technology has the potential to influence future teachers' beliefs about the value and complexity of using instructional technology on their own teaching practices. These influences included establishing classroom norms that reflect the use of technology, the dynamics of teacher interactions with learners, and managing utilization of space.

Political and Policy Matters in Secondary Education in Kenya

Education in Kenya is highly influenced by the government policies and sociopolitical trends (Kinuthia, 2009). Government regulations, special interest groups, the political environment, and policy matters have the capacity to shape teachers' beliefs about instructional technology (Watson, 2001). As Somekh, (2008) observed, "legislative frameworks and organizational structures of schooling often make it impossible for technology tools to be explored and appropriated pedagogically" (p.450). In particular, the autocratic and coercive strategy of implementing policies related to educational reform can serve as barriers rather than

facilitators (Kennedy, 1987). In Kenya, politicians have the tendency to legislate education policies based on a premise that they be followed as directed without giving teachers the autonomy to fit the curriculum based on the needs of their students. In a study that looked at barriers of ICT on teaching and learning in East Africa, Tedla (2012) reported rigid policies as part of inhibitors that prevented the adoption of technology by teachers in Kenya. The same study also resolved that regulating a teacher on how to use technology instead of letting her/him imagine new ways of using it does not always lead to an effective use of that technology (Tedla, 2012). In the context of Kenya, a teacher who is skilled already in basic Internet tools might discover other ways to incorporate social media in his/her teaching practice. However, rigid policy restrictions and standards might inhibit his/her use of this creativity. When focusing on sociopolitical factors, this study examines whether teachers' perception of overarching regulations of integrating computer-based instructional technologies (CBIT), shaped their beliefs toward adopting those technologies.

Teacher Education in Kenya

Before the arrival of Western-based formal education in Kenya, there existed an elaborate teacher education system that produced teachers who were competent to sustain indigenous traditional education system (Kenyatta, 1963). The arrival of Western-based education established formal institutions for training teachers in Kenya. Currently, there are over 22 public universities in Kenya that offer teacher education programs ranging from Early Childhood Development, to Primary School Education, and Secondary School Education (Kafu, 2011). The bachelor of education degree has many study areas that include B. Ed. (Arts), B. Ed. (Sc.), B. Ed. (Technology), B. Ed (Guidance and Counseling), B. Ed. (Early Childhood and Primary

Education). This is in addition to post-bachelor diplomas offered by other universities in Kenya[3] (Namunga & Otunga, 2012). A 2014 Statistical Report by the Ministry of Education in Kenya indicated that there were 118,608 active secondary school teachers who taught at 8,734 public and private secondary schools around the country (2014 Statistical Booklet, KMOE). The Teacher Service Commission (TSC)—the de-facto government institution mandated with hiring teachers in Kenyan public schools—lists the qualifications to teach in secondary schools as having a bachelor's degree in an Education field (TSC recruitment guidelines, 2013).

This study uses the term pre-service teachers to refer to college students who are training to become secondary school teachers. The general process of completing a teacher education program includes completing a curriculum respective to the subject area the pre-service teacher intends to teach. At a minimum, each pre-service teacher is required to take two technology related courses: a general computer course, and an introduction to education technology course. The general computer course, as the name suggests, introduces pre-service teachers to basic computer software and systems, such as Microsoft Office, emailing, and Internet. This course has for a long time focused on training on an entry-level of how to use computers. This approach has been necessitated by pre-service teachers' lack of prior experience using computers (Dr. Mugo, personal communication, April 28, 2014).

The introduction to educational technology course is perhaps the only required course intended to prepare pre-service secondary school teachers to teach using technology. This course has, however, not been very effective in training pre-service teachers how to use instructional technology. As stated by one instructor, the course emphasizes on learning about technology instead of learning with technology through hands on. As a result, training to use essential CBIT

[3] See Namunga & Otunga (2012) for a complete analysis of teacher education degree structure offered by universities in Kenya.

tools such as wikis, blogs, social media, etc. is limited in this introductory to educational technology course (Dr. Mugo, personal communication, April 28, 2014)

Curriculum of the various teacher education programs offered by public and private universities in Kenya requires a mandatory completion of teaching practice (practicum) that must be passed in order to receive a bachelor degree in education (Namunga & Otunga, 2012). The length of practice varies based on particular area of interest in which the pre-service intends to specialize, such as B. Ed (technology). Teaching practice is a crucial time for pre-service teachers to get an opportunity to practice using CBIT before starting their teaching careers. However, many public schools in Kenya underutilize the available education technology. As shown in a 2006 report by the Ministry of Education in Kenya, less than 40% of all available educational technology infrastructures are used to deliver educational curriculum (MOES &T, 2006, p. 8). Examining all the causes for 60% under-usage of available technology in Kenyan public secondary schools is an extensive topic that goes beyond the scope of this study. Nonetheless, its effect on pre-service teachers during practicum should not be overlooked. At minimum, it limits their hands-on exposure of using technology to teach. This hands-on experience is integral in pre-service teachers' future use of technology to teach (Hennessy, Harrison & Wamakote, 2010).

To prepare teachers' effective use of technology in their instructional practices, the Society for Information Technology and Teacher Education (SITE, 2002) highlights three principles:

- *Technology should be infused into the entire teacher education program.*
- *Technology should be introduced in context.*
- *Students should experience innovation technology-supported learning environments in their teacher education program.*

The design of curriculum in various training programs for secondary school teachers in Kenya fails to meet these three principles that are essential for teachers' preparedness to use CBIT. In

particular, the three principles (SITE, 2002) highlight that one mandatory course that engages pre-service teachers with using technology is not sufficient enough to prepare them to use technology in their future teaching practice. In a study that investigated teachers' and administrators' perception of computer use in the classroom, Wabuyele (2006) pointed to a significant number of teachers who reported feeling unprepared by teacher training programs to use computers in the classroom. Murithi & Indoshi (2011) also report the same alarming outlook that teacher-training programs are ill-equipped to train teachers to use Information and Communication Technology (ICT) in Kenya.

There are many challenges that contribute to teachers' unpreparedness to use computer technology for instruction. Two challenges that stand out are: the status given to ICT in teacher training programs, and funding for technology access at the teachers training level. In regard to the status given to ICT, many teacher-training programs treat ICT as a separate subject contained in the academic area of Information Technology (Hennessy, Harrison & Wamakote, 2010). As a result, although pre-service teachers are required to take at least one course that prepares them to use instructional technology, emphasis is placed on teaching basic skill of software use and information gathering, whereas research suggests integrating technology use into subject learning is more effective for students (Hennessy, et al., 2010). In other words, instead of teacher education programs emphasizing the importance of integrating technology in all subjects, they have largely emphasized training teachers based on long-established pedagogical models that heavily rely on commonly available instructional tools such as blackboard and white chalk. The sensible assumption for not emphasizing integration of education technology is that the mass availability of instructional computer technology in Kenya is considerably new.

The second challenge is that teacher preparation programs have not been prioritized in terms of funding, both by the government and the university administrations. Clearly, if pre-serve teachers don't have access to instructional technology in their teacher training programs, they will lack the skills needed to use this technology in their future teaching practices. Kafu (2011) observed that the government has prioritized education development on primary and secondary education while marginalizing teacher education programs. The scarcity in funding for teacher education has had an impact on teachers' beliefs and subsequent use of computer technology in future instructional practices. Mainly, it reduces the optimal resources needed to effectively equip teachers with skill needed to integrate technology in future instruction. The process in which individuals adopt technology involves developing necessary skills through exploratory play. As Somekh (2008) pointed out, even skilled users of ICT describe themselves as self-taught through trial and error. Insufficient funding, therefore, reduces both the scope of technologies that pre-service teachers can explore, and the length of period they can explore them.

The above nature of teacher training programs in Kenya has the potential to shape teachers' beliefs about the use of instructional technology. In particular, the limited exposure to computers can shape their beliefs about the perceived difficulty of integrating CBIT in their future teaching practices (Kinuthia, 2009). This study, in part, examined whether the amount of time pre-service teachers spent on computers correlates with negative beliefs toward integrating CBIT in their future teaching practices. This study also explored the ways pre-service teachers' perceptions of CBIT use in the classroom informed their intentions to incorporate its use.

Pre-Service Teachers' Intentions to Use Technology

Predicting teachers' intentions to adopt information technology has been examined from various contexts in the last decade (Choy, Wong & Gao, 2010; Ertmer, 1999; Luan & Teo, 2011; Ma, Andersson, & Streith, 2005; Newby, & Ertmer, 2012; Niederhauser & Perkmen 2008; Pajares, 1992; Richadson 2003; Sadaf, Teo, 2009; Smarkola, 2007; Teo, et al., 2009; Yuen & Ma, 2002). These studies have reported 'intention' as a significant factor for predicting teachers' actual use of technology for instruction. Intention is defined as an anticipated outcome a person expects by performing an action (Ajzen, 1991; Taylor & Todd 1995). In other words, intention can be conceived as the "expectancy that is a result of conscious process that requires deliberation and focuses on the consequences of taking a certain action" (Loewenstein, Weber, Hsee, & Welch, 2001, p.62).

Although a great deal of research has focused on intention as a significant factor that predicts teachers' actual use of computer technology, most of the studies have reported different propositions on the antecedent factors that determine teachers' intentions to adopt those technologies. Some studies have pointed to computer self-efficacy as a significant factor that explains teachers' intentions to adopt computer technology (Anderson & Maninger, 2007; Chen, 2009; Giallamas & Nikolopoulou, 2010; Niederhauser & Perkmen, 2008; Pajares, 1992; Sadaf et al., 2012; Teo, 2009). In a study of factors that influence pre-service teachers' intention to adopt Web 2.0 technologies, Sadaf et al. (2012) observed that computer self-efficacy was an important motivational factor of student teachers' intention to use technology for instruction in the future. The importance of computer self-efficacy is consistent with Pajares' (1992) suggestion that computer confidence influenced pre-service teachers' decision to integrate computer technology in their future teaching practices.

Other studies have highlighted the belief factor of 'attitude' toward computer as the most significant factor that predicts pre-service teachers' intention to adopt computer technology in their classroom. For instance, Pynoo et al. (2010), in a study of factors that influence teachers' acceptance of digital learning environments, reported that about one-half of the variance of actual use was predicted by attitude toward technology.

Numerous other studies have also noted 'perceived ease of use'[4] and 'perceived usefulness'[5] as the main factors that influence pre-service teachers, intention to adopt computer technology (Ma, Andersson, & Streith, 2005; Sadaf, Newby, & Ertmer, 2012; Smarkola, 2007; Teo, 2011; Yuen & Ma, 2002). Specifically, Teo (2011) observed that, the most dominant determinant of behavioral intention is perceived usefulness. In addition, Teo (2009) reported 'subjective norm' (which is an individual's belief that people important to them expect them to perform a particular behavior) and 'facilitating conditions' (i.e., resources available) as significant in predicting pre-service teachers' intentions to adopt computer technology.

Although these studies have shed light on various factors that influence pre-service teachers' intention to instructional technology, the present study found few research studies that examined factors that influence pre-service teachers to adopt technology in the context of a developing country where the use of CBIT is relatively new. In particular, there lack adequate studies that have explored these issues in the African continent.

The current investment in technology infrastructures in Kenya has rapidly changed the aspect of technology use education. Nonetheless, although availability of educational technology continues to increase, one cannot conclude that developed and less developed countries

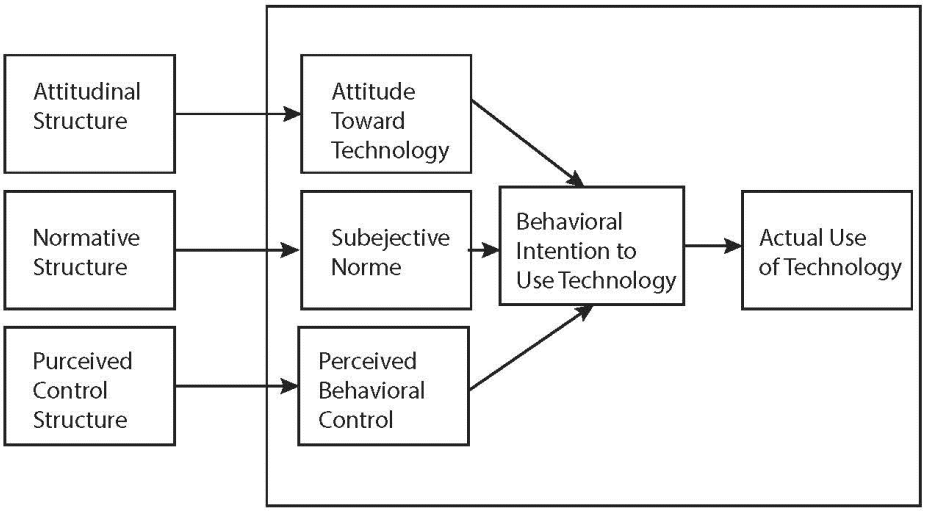
[4] Many research of technology acceptance use *perceived ease of use* interchangeably with *perceived use complexity* (Davis, 1989; Taylor & Todd, 1995; Teo, 2011; Smarkola, 2011)
[5] Many Research of technology acceptance use *perceived usefulness* interchangeably with *perceived relative advantage* (Davis, 1989; Taylor & Todd, 1995; Teo, 2011; Smarkola, 2011).

encounter similar challenges related to teachers' use of CBIT. This is because individuals may respond to technology differently based on underlying issues, such as how widely the specific technology is used, as well as the beliefs and attitudes toward the technology that are sometimes shaped by social and cultural factors (Agarwal, 1999).

Theoretical Model and Lens

Predicting pre-service teachers' future intentions to adopt CBIT and to use that technology in the classroom is an important issue in the field of education technology. This study adopted the Decomposed Theory of Planned Behavior (Taylor & Todd, 1995) as the theoretical framework to explore behavioral factors that influence pre-service secondary school teachers' intention to adopt and use CBIT (see theoretical model on figure 2.1).

Figure 2.1: Theoretical model of Decomposed Theory of Planned Behavior



Notes: *Adopted from (Taylor & Todd, 1995).*

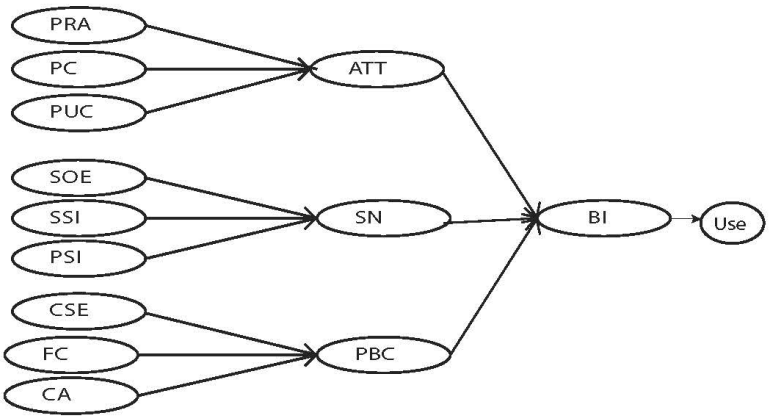
Decomposed Theory of Planned Behavior (DTPB) is a hybrid model that combines Theory of Planned Behavior (Ajzen 1991) and Technology Acceptance Model (Davis, et al. 1989). The Theory of Planned Behavior (TPB) is a social psychology cognitive model of human behavior that suggests behavioral intention is a result of individuals' beliefs factors that include attitude, subjective norm, and their perceived behavioral control (Ajzen, 1991). The Technology Acceptance Model (TAM) also is a social psychology cognitive model of human behavior popular in the field of Information System (IS). The TAM model suggests that the construct of 'attitude' mediates the construct of 'perceived relative advantage'[6] and 'perceived use complexity'[7] with the dependent variable of behavioral intention (Davis et al., 1989). DTPB extends the three constructs found in (TPB) by mending them with those from TAM to create multidimensional model that include, perceived relative advantage, perceived user compatibility, perceived user complexity, normative beliefs, self-efficacy, and facilitating conditions (Taylor & Todd, 1995).

The rationale for componentizing TBP by combining it with TAM belief factors can generally be conceptualized as an effort to provide a more explanatory power to help better understand belief structures that influence intention. Taylor and Todd (1995) provide several benefits of decomposing TPB. One benefit is that the existing literature of TBP is characterized by beliefs structures that are too monolithic to consistently represent a variety of beliefs that are antecedents of intention. Decomposing those beliefs, therefore, provides a relationship of factors that is clearer and easier to understand. Another benefit of DTPB is that the model identifies specific salient beliefs factors that influence adoption and usage of technology. Taylor & Todd (1995) observe that, although data exist on belief variables that influence behavioral intention,

[6] Davis et al. (1989) use the term "perceived usefulness"
[7] Davis et al. (1989) use the term "perceived ease of use"

these data have not been collected simultaneously but rather individually. In particular, DTPB was found to have better predicting power of behavioral intention when TBP and TAM models were each analyzed individually and the results were compared (Taylor & Todd, 1995). While indeed the data from these models when used alone shade light on various behavioral factors, their analysis of belief factors as single units is problematic. Shimp and Kavas (1984) pointed out that cognitive components of belief are more complex to be organized in a single conceptual or cognitive unit. As show in Figure 2.2, the DTPB offered this study the advantage of collecting data that simultaneously captures the various belief factors that influence pre-service secondary school teachers' intention to adopt and use CBIT.

Figure 2.2: Decomposed structural model that explored pre-service secondary school teacher's intention to use CBIT.



Notes: Att-attitude toward using computer. PRA-perceived relative advantage of using computer. PC- perceived compatibility of using computer. PUC- Perceived use complexity. SN-subjective norm. SOE-social outcome expectations. SSI-superior social influence. PSI-peer social influence. PBC. Perceived behavioral control. CSE-computer self-efficacy. FC-facilitating conditions. CA-computer anxiety.

Constructs that Explored Intention to Use CBIT in Kenya

Attitude Toward Use (ATT)

Fishbein and Ajzen (1975) defined 'attitude' toward use (ATT) as "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (p. 216). The conceptual framework of attitude theory is built on extensive literature that link several aspects of human behavior. This literature owes much of its conceptual development and empirical refinement to more than two decades of research by Ajzen, Fishbein, and their colleagues. In the book *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research,* Fishbein and Ajzen (1975) developed various theories related to human behavior such as Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TBP). They postulate attitude as "a learned predisposition to respond in a consistent favorable or unfavorable manner with respect to a given object" (Fishbein & Ajzen 1975, p. 6). To understand the concept of attitude, it is necessary to make a distinction between attitude, belief, behavioral intention, and behavior itself. The best approach to making this distinction is by outlining the causal linkages of these four factors. Fishbein and Ajzen (1975) posited that a person's 'attitude' toward an object follows upon their 'beliefs' about the object, which in turn, yields 'intentions' and, ultimately causes them to perform the 'behavior'. Indeed, this linkage of factors underlies the rationale for decomposing the attitude factor in DTPB in an effort to accommodate various beliefs factors, such as a person's perceived relative advantage (PRA), perceived compatibility (PC), and perceived use complexity (PUC) all which lead to performing a behavior.

Diffusion of Innovation Theory

The use of PRA, PC, and PUC is consistent with Everett Rogers' (1995) Diffusion of Innovations Theory (DOI). The DOI theory seeks to explain how over time an idea, or product gains momentum and diffuses (spreads) through a specific population or social system (Rogers, 1995; 2010). DOI proposes relative advantage, perceived complexity, and compatibility as the main characteristics that influence an individual's decision to adopt a particular innovation (Moore & Benbasat 1991; Rogers, 1983; Taylor & Todd, 1995; Tornatzky & Klein, 1982).

An innovation is therefore an idea, behavior, or object that is perceived as new by its audience. Given that the decisions to adopt a technology do not occur simultaneously across the social system, each member of the society creates his/her own resolve to adopt an innovation. According to Rogers (1995), there are five stages by which a person adopts an innovation (p. 162).

1. Knowledge – person becomes aware of an innovation and has some idea of how it functions,
2. Persuasion – person forms a favorable or unfavorable attitude toward the innovation,
3. Decision – person engages in activities that lead to a choice to adopt or reject the innovation,
4. Implementation – person puts an innovation into use,
5. Confirmation – person evaluates the results of an innovation-decision already made.

The first stage of *knowledge* can be perceived as the awareness that an individual has about an innovation. This awareness is usually influenced by a combination of personal characteristics (i.e. general attitude towards change, perceived need for change, etc.), and variables within the social system (i.e. affordability/accessibility of the innovations, social norms, etc.) (Rogers, 1995). The second stage of *persuasion* is usually influenced by an individual's perceived

characteristics of a particular innovation tool, such as relative advantage, compatibility with his/her social values, complexity of using the tool, trainability of the tool, and observability (Rogers, 1995). The third stage of *decision* is when an individual intends either to adopt a certain innovation, and therefore engages in activities that position them to be able to use that innovation. The fourth *implementation* stage is when an individual puts an innovation to actual use. The fifth *confirmation stage* is an evaluation stage where an individual evaluates the results of using a certain innovation tool. The results could lead to continued adoption of the innovation tool or the results could bring disenchantment of using the tool, completely abandon using it or replace it (Rogers, 1995).

According to Rogers (1995), the introduction stage is a very critical stage in the society's adoption of an innovation tool. The theory suggests that, even though there are various paths that various societies take when adopting a new innovation tool, there are three conditions that have to be met for a society to adopt an innovation tool. One, they must perceive the tool to have a relative advantage of enhancing their performance. Second, they must perceive the tool as easy to use. This is important because, even when potential users of a technology believe that a given technology application is useful, they may choose not to use it if they perceive the effort of learning how to use it outweighs the effort of using the application (Rogers, 1995). Third, they must perceive the tool to be compatible with their existing cultural norms and values (Shih & Fang, 2004). These three factors are central in the attitudinal belief structure of perceived relative advantage, perceived use complexity and, perceived compatibility.

In this study, ATT was used to measure pre-service secondary school teachers' positive or negative feelings about adopting and using CBIT. In particular, because it was a mediating variable of attitudinal beliefs structure in DTPB model, ATT tested the following hypothesis:

Hypothesis 1: Pre-service secondary school teachers' attitude toward computer is a direct determinant of their behavioral intention to use CBIT.

Decomposed Attitudinal Beliefs Structure:

Perceived Relative Advantage (PRA): In regard to adopting technology, the attitude factor, as a determinant of intention to use technology, has mainly been concentrated in the field of Information Systems. In fact, the factors of perceived relative advantage (PRA) and perceived use complexity (PUC) used by Taylor and Todd (1995) to decompose the attitudinal belief structure in DTPB are rooted in Technology Acceptance Model (TAM) (Davis, 1989). The TAM model suggests that the attitude belief factor mediates perceived relative advantage and perceived complexity with respect to behavioral intention (Davis et al., 1989; Venkatesh, 2000). Davis (1989) was among the early pioneers of the TAM model. He defined perceived relative advantage (or what he called perceived usefulness) as the "degree to which a person believes that using a particular system would enhance his or her job performance" (p. 24).

In this study, PRA measured the degree to which a pre-service secondary school teacher believed that using CBIT enhances his or her teaching performance, and that the use of CBIT is advantageous to learning. The premise was that, if teachers perceive using CBIT to teach as advantageous, such that it enhances their teaching experience and students learning, they are more likely to adopt this technology. This variable tested the following hypothesis:

Hypothesis 2: Pre-service secondary school teachers' perceived relative advantage of using computers contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

Perceived Use Complexity **(PUC):** The decision to adopt new technology is related to the amount of knowledge one has regarding how to use that technology appropriately (Rogers,

1995). Even when potential users of a technology believe that a given technology application is useful, they may choose not to use it if they perceive it to be too difficult to use, to an extent that the effort of learning how to use it outweighs the effort of using the application. In this regard, perceived use complexity, (or what Davis calls perceived ease of use), was defined in this study as the degree to which an innovation is perceived to be too difficult to understand, learn, or operate (Rogers, 1983). Although there is an aspect of learning to use any technology, users might opt not to adopt a technology if they perceive learning how to use that technology as great effort (Davis, 1989). In a study involving teachers acceptance of technology use, Pynoo et al. (2011) reported effort expectancy[8] as significant predictor of attitude, and hence intention to use. Perceived relative advantage and perceived use complexity belief factors have also been examined in the contexts of technology adoption, both in and outside of education, and have consistently shown to predict the intention to use various educational technologies. (Duyck et al., 2008; Hu et al., 2011; Luan & Teo, 2011; Pynoo et al., 2011; Smarkola, 2011; Teo, 2011). In a study that applied TAM model to investigate pre-service teachers' beliefs and intentions to use computers in classroom, Smarkola (2011) reported that both perceived ease of use (perceived use complexity) and perceived usefulness (perceived relative advantage) significantly predicted the use of computer by pre-service teachers when teaching lessons to their students.

In this study, the factor of PUC measured the degree to which pre-service secondary school teachers perceive learning to use CBIT as a complex task that is not worth their effort and time. This construct tested the following hypothesis:

Hypothesis 3: Pre-service secondary school teachers' perceived complexity of using computers contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

[8] Pynoo et al. (2011) referred *perceived use complexity* as 'effort expectancy' on their study.

***Perceived Compatibility* (PC) *of Using Computers*:** Cultural norms and values can act as barriers for individuals adopting a new technology. In particular, a technology is likely to be adopted if it does not violate an individual's cultural or social norms (Shih & Fang, 2004). In this regard, perceived use compatibility (PC) is defined as "the degree to which the innovation fits with the potential adopter's existing values, previous experiences, and current needs" (Rogers, 1983 P.250). In a meta-analysis of innovation characteristics and adoption implementations, Tornatzkey and Klein (1982) observed that certain technology innovations are more likely to be adopted if they are compatible with job responsibilities and the value system of the individual. Various studies have found compatibility as an important predictor of technology adoption (Chen, 2011; Hardgrave, Davis, & Riemenschneider, 2003; Lai, Wang, & Lei, 2012; Liao & Lu, 2008). In a study of factors that predict college students' use of technology for learning, Lai, Wang, & Lei (2012) found when students felt educational technology "fit with their learning styles and compatible with their beliefs about learning, they were more likely to perceive technology to be useful for learning." These observations were consistent with Chen's (2011) findings that compatibility was a major determinant of students' behavioral intention to adoption computer-based educational technology in Taiwan University.

The present study measured PC in relation to the degree in which pre-service secondary school teacher believed that teaching using CBIT aligned with his or her teaching philosophy, as well as whether CBIT was compatible with their values of learning. The construct tested the following hypothesis:

Hypothesis 4: Pre-service secondary school teachers' perceived compatibility of using computers contributes to their behavioral intention to adopt CBIT through the mediating variable of attitude toward computer use.

Subjective Norm (SN)

Subjective Norm is generally concerned with the individuals' social environment in relation to the intention to perform a given behavior. Its importance depends on an individual's motivation to comply with others who they consider important. In this regard, subjective norm was perceived in this study, as the degree to which an individual believes referent people important to them expects them to perform a particular behavior (Ajzen, 1991). The construct of SN has been applied widely in educational settings by studies that examine adoption of education technology (Pynoo et al., 2011; Sadaf et al., 2012; Taylor & Todd, 1995). These studies have found normative beliefs to have a significant impact on the intention to use educational technology. On a study of teachers' acceptance of digital learning environment, Pynoo et al. (2011) noted that subjective norm significantly predicted teachers' intention to use Smartschool. On another study of pre-service teachers' beliefs about Web 2.0, Sadaf et al., (2012), reported subjective norm to be significant in predicting pre-service teachers' intention to adopt Web 2.0 tools. Their survey showed that 45% of the respondents were one way or the other influenced by this variable making it the most frequent reported influence on pre-service teachers' intention to use Web 2.0 in their study.

The importance of SN beliefs depends on an individual's motivation to comply with others who they considered as important to them. Many studies that observe the role of SN fail to address the specific contingent factors of subjective norm that influence an individual to perform a given behavior. That is, the social pressure to perform a certain behavior can be experienced in many forms depending on the behavior at hand (Ajzen, 1991). For instance, teachers' normative beliefs to adopt CBIT can have three influences—peer social influence, superior social influence, and influences from cultural social outcome expectations. These three normative believes can

vary on how they influence teachers' intention to adopt CBIT. For example, teachers' adoption of CBIT can be influenced by their peers who think using technology to teach is time consuming compared to using the traditional chalk and board teach, and therefore they do not have a positive opinion toward using technology to teach. School principals, on the other hand, can influence teachers to adopt CBIT when teaching because they believe educational technology improves learning processes. As technology continues to transform social relations in Kenya, the social change process is expected to assign expectations to the teaching profession that include expecting teachers to have the ability to teach using technology. Given the possibility of these divergent views, Taylor and Todd (1995) proposed the construct of SN to serves as a mediating construct of normative beliefs in order to capture possible divergent opinion among referent groups. The normative belief structure examined in this study included peer social influence, superior social influence, and social outcome expectations. The construct of SN served in this study as a mediating variable of normative belief structure, and tested the following hypothesis:

Hypothesis 5: Pre-service secondary school teachers' subjective norm is a direct determinant of their behavioral intention to use CBIT. (Sadaf, et. al. 2012)

Decomposed Normative Beliefs Structure*:*

This exploratory study involving pre-service teachers in Kenya examined three normative belief factors—superior normative influence (SSI), peer social influence (PSI), and social outcome expectations (SOE). Superior social influences (SSI) was perceived in this study as the degree to which pre-service secondary school teachers intend to use CBIT because they perceive people superior to them in the teaching environment think they should use CBIT to teach. The construct of peer Social Influence (PSI) was perceived in this study as the degree to which pre-service secondary school teachers believed the importance they attributed to their

peers' opinion influences their intention to use CBIT when teaching. The construct of Social outcome expectations (SOE) was perceived in this study as the degree to which pre-service secondary school teachers intend to use CBIT in order to bring social cultural respect and recognition bestowed no them by the Kenyan society. These three normative factors tested the following hypotheses:

Hypothesis 6: Pre-service secondary school teachers' beliefs of superior social influences contributes to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

Hypothesis 7: Pre-service secondary school teachers' beliefs of peer social influences contributes to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

Hypothesis 8: Pre-service secondary school teachers' beliefs of social outcome expectations contributes to their behavioral intention to adopt CBIT through the mediating variable of general subjective norm.

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Perceived Behavioral Control

The construct of perceived behavioral control (PBC) relates to the constraints that affect computer usage (Taylor & Todd, 1995). This construct originates from Ajzen's (1991) discussion of intentions and perceived behavioral control. He argues that an individual has stronger intentions to engage in a given behavior if they can decide at will to perform or not to perform the particular behavior. The perception of control, which predicts intention to perform a behavior, can be in the form of internal, as well as external constraints (Ajzen, 1991). Internal constraints refer to factors such as lack of computer self-efficacy, or the feeling of anxiety when using computers. On the other hand, external constraints of PBC relate to factors within the environment that individuals feel they are unable to control. It is the interaction effects between these internal and external factors that produce behavioral achievement (Ajzen, 1991).

The use of PBC construct on this study followed the internal and external principle discussed by Ajzen (1991), which suggests control belief structures to include computer self-efficacy, facilitating condition, and computer anxiety. As a mediating variable of control belief structure in the DTPB, the construct of PBC tested the following hypothesis:

Hypothesis 9: Pre-service secondary school teachers' perceived control is a direct determinant of their behavioral intention to use CBIT.

Decomposed Perceived Behavioral Control Belief Structure:

Computer Self-Efficacy **(CSE):** The concept of self-efficacy lies at the center of Albert Bandura's social cognitive theory (1986). Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). He added that computer self-efficacy "is concerned not with the skills one has, but with judgments of what one can do with whatever skills he or she possesses (Bandura, 1986, p. 391). Self-efficacy encompasses many dimensions of one's self-system, such as a person's attitude, beliefs, and cognitive skills (Bandura, 1977). Self-efficacy has many dimensions, which CSE is just one of them. Agarwal, Sambamurthy & Stair (2000) notes these dimensions by observing that, there is a difference between general self-efficacy and task-specific self-efficacy. An example of this distinction is a teacher who might have a strong conviction about their teaching abilities, but has anxiety when using technology to teach.

This study is concerned with an individual conviction of their abilities to use CBIT. In this regard, (CSE) was defined as "an individual's judgment of efficacy across multiple computer application domains" (Marakas, Mun, & Johnson, 1998). In addition, although CSE is an individual's belief, just like the construct of perceived ease of use, it was treated in this study as a distinct construct because perceived ease of use is an individual's judgment about the qualities of

a technology, while CSE is a judgment about the abilities of an individual to perform a certain task using a computer (Straub, 2009).

The relationship of CSE to the PBC construct is rooted in the individual's perception of their ability to control the process of using CBIT. Compeau and Higgins (1995) observed that individuals who have a weak sense of computer self-efficacy are likely to be frustrated easily by obstacles that affect their performance, and will respond by lowering their perceptions of own capabilities to use technology. In contrast, individuals with a strong sense of computer self-efficacy do not easily become deterred by difficult problems, and will persist with their efforts, rendering them to be more likely to overcome whatever obstacle was present.

Significant amounts of research in the area of technology adoption have examined the relationship between CSE in respect to using computer in a wide range of educational contexts (Hu & Hui, 2011; Niederhauser & Perkmen, 2008; Teo, 2011). In a study of factors that influence pre-service teachers' technology acceptance in Singapore, Teo (2011) found a direct relationship between computer self-efficacy and pre-service teachers' technology acceptance. A direct relationship between CSE and motivation to use technology-mediated learning is also observed by Hu & Hui (2011) on their study of factors that influence learning using technology. Further, Gong, Xu, and Yu (2004), in a study of pre-service teachers in Hong Kong, reported that CSE had substantial influence on the teachers' technology acceptance.

The proposed study examined the degree to which CSE influences pre-service secondary school teachers' behavioral intention to use CBIT in the classroom. This construct tested the following hypothesis:

Hypothesis 10: Pre-service secondary school teachers' self-efficacy of using computer contribute to their behavioral intention to adopt CBIT through the mediating variable of perceived control.

***Facilitating Conditions* (FC):** For teachers to have an intention to use CBIT, there must be a strong belief that facilitating conditions exist to help them integrate technology in their teaching (Hadley & Sheingold, 1993). In this regard, FC refers to the environmental factors that make an act easy to accomplish (Callava, 2007). In contrast to internal barriers such as CSE, FC is an external barrier that is shaped by an individual's perception of conditions that can inhibit him/her from performing a given behavior. The resources available to a person must, to some extent, dictate the likelihood of behavioral achievement. This control is more psychological based than actual control (Ajzen, 1991).

In regard to the adoption of Informational Technology, the construct of FC is perceived to have two dimensions on the construct of behavioral control. One dimension examines inhibiting factors such as time and support, while the second dimension is related to external facilitating factors that constrain technology use, such as infrastructures (Taylor & Todd, 1995). In the context of pre-service secondary school teachers in Kenya, constraints such as pre-service teachers' perception of unavailability of educational technology in Kenya might have an effect on their intention to use CBIT in their future classrooms. For instance, a teacher might have positive beliefs about teaching using CBIT but he or she knows his or her chances of teaching in a classroom with computers is very slim. This might affect their strong belief of adopting CBIT.

This study examined FC in the context of pre-service teachers' perception of existing technology infrastructure, and whether that perception influenced their behavioral intention to adopt CBIT in their future teaching practices. The factor of FC tested the following hypothesis:

Hypothesis 11: Pre-service secondary school teachers' perception of facilitating conditions contributes to their behavioral intention to adopt CBIT through the mediating variable of perceived control.

Computer Anxiety **(CA):** Technological advances in Kenya within the last decade have brought a proliferation of computer usage by many new users. Studies have long predicted that, the more people use computers in their daily lives, the higher number of people will face difficulties related to anxiety feelings toward computers (Beckers & Schmidt, 2001; Saade & Kira, 2007; Simsek, 2011). Simsek (2011) observed these difficulties to include frustration when learning to use computers, intimidations when using computer, and flat-out apprehension to use computer due to worries that one will be embarrassed, look stupid, and even damage the equipment.

The concept of computer anxiety is very broad, such that there is no clear-cut definition of it. Studies of anxiety related to computer use have predominately conceptualized computer anxiety as a three-dimensional construct inherent within the areas of psychological dimension, operational dimension, and sociological dimensions of an individual. When discussing these dimensions, Simsek (2011) reportd that:

> Psychological dimension includes attitudes toward computers, self-efficacy, personality types, avoidance, and self-perceptions. Operational dimension usually results from computer courses, teachers, nature of computers, the extent of experiences with the computer, and owning a personal computer. Sociological dimension is related to factors of age, gender, nationality, socio-economic status, and the field of study (p. 178)

Although the study of computer anxiety can take any of these dimensions, the most relevant to this study was the examination of operational dimension of anxiety that is related to the teachers' fear of using CBIT due to inadequate competence needed to effectively use CBIT. In other words, this study observes CA in the context of apprehension to use CBIT as a result of negative emotional states aroused by interaction with computer itself due to lack of computer literacy.

Teachers' feeling of anxiety toward using computers can be a barrier on their learning to use CBIT. Research has long tended to support the idea that the more users have experiences with computers, the less the level of anxiety they exhibit. For example, in the findings from a study that examined the relationship between computer anxiety and computer self-efficacy, Simsek (2011) observed that computer users with high computer anxiety also tended to have low self-efficacy of using computer. The findings of that study led to its proposition that computer anxiety is an important factor in learning computer skills and employing them effectively. Beckers and Schmidt (2001) broadened this insight by observing that operational dimension of CA seems to be part of a process for cumulating experiences; and the magnitude of it can be manipulated by altering the conditions under which these experiences are acquired.

Given that the diffusion of computer use in Kenya is at the early stage, it is fair to say that many users have not gained experience that is prerequisite to developing strong computer self-efficacy. This study examines whether participants level of CA affects their behavioral intention to adopt CBIT. The examination of CA factor is guided by this hypothesis:

Hypothesis 12: Pre-service secondary school teachers' perception of computer anxiety has a negative relationship with their behavioral intention to adopt CBIT through mediating variable of perceived control.

This chapter has so far discussed the factors being examined in this study. The literature has shown that these factors have been de-componentized in the DTPB theoretical model in order to gain a clearer and deeper understanding of internal factors that influence pre-service teachers' intention to adopt CBIT. The hypotheses discussed above were tested using the design methodologies discussed in the next chapter.

CHAPTER III

METHODOLOGY

The purpose of this study was to determine internal factors that influence adoption of CBIT by secondary school teachers in Kenya. This aim was realized by examining pre-service secondary school teachers' beliefs toward instructional technology and how those beliefs influence their intention to adopt, and consequently use computer-based instructional technology (CBIT) in their future teaching practices. The participants of this study were college students enrolled in an Education degree at a large university located at a metropolitan city in Kenya. Qualitative and quantitative data were collected from these participants to answer the following research questions:

Quantitative:

1. How well does the decomposed theory of planned behavior (DTPB) model predict pre-service secondary school teachers' behavioral intention to adopt CBIT in Kenya?

2. What regression model best predicts the factors that influence pre-service secondary school teachers' use of CBIT?

3. What are the zero order correlations on constructs that directly predict pre-service secondary school teachers' intention to use computer-based instructional technology CBIT to teach?

4. How does cultural capital (Bourdieu, 2007), provided by the three-tier hierarchy ranking of secondary school system in Kenya, influence pre-service teachers' beliefs toward using CBIT?

Qualitative:

5. What are pre-service secondary school teachers' perceptions of social outcome expectations held by the Kenyan society in regard to teachers' use of technology to teach?

6. What role does the social normative of supervisors' expectations play in pre-service secondary school teachers' intentions to adopt CBIT to teach in their future teaching practices?

7. What role does the social normative of peer social interaction play in pre-service secondary school teachers' behavioral intention to adopt CBIT?

8. What are pre-service secondary school teacher's beliefs about technology and student learning?

9. What do pre-service teachers perceive as the greatest challenge facing Kenya in regard to integrating CBIT in secondary education?

10. What are pre-service secondary school teachers' beliefs on the adequacy of teacher training programs in providing the skills to use technology to teach?

Theoretical Paradigm

Mertens (2005) states that a paradigm is a theoretical framework that directs philosophical assumptions on the way of looking at the world. This mixed-method research study was designed to explore belief factors that influence pre-service secondary school teacher's intention to adopt CBIT in their future teaching practices. Cameron (2011) observed that methodological choice does not exist without philosophical stance; and that it is particularly important for a researcher using mixed-method to make explicit philosophical stance they are using because mixed-methods typically uses both quantitative and qualitative paradigms to collects data. Mixed-method can be conceived as a third methodological approach following quantitative and qualitative approaches (Tashakkori & Teddlie, 2003). This study is anchored on the pragmatism philosophical stance, in which reasoning moves back and forth between induction/deduction and subjectivity/objectivity (Evans et al., 2011). Pragmatism focuses on exploring phenomenon in its

social and historical context, where qualitative and quantitative approaches accommodate each other (Evans et al., 2011). All research is interpretive (Cameron, 2011), and the wider a study can net the data, the more understanding of the phenomenon can be achieved.

Mixed-Methods Research Design

An explanatory sequential mixed-method research design was used in this study to explore belief factors that influence pre-service teachers to adopt CBIT in their future teaching practices. Johnson et al. (2007) defined an explanatory sequential mixed-method research, as a study that strategically combines methods of different types (qualitative and quantitative) to provide a more elaborate understanding of the phenomenon of interest (including its context), as well as gain greater confidence in the conclusions generated by the study. Historically, objective systematic interpretations of social science studies show conflicting opinions about the reliability of quantitative research design to interpret social phenomenon (Graneheim & Lundman, 2007). The source of conflict according to Cresswell (2003) is because the use of a questionnaire to explore sociocultural factors has its own limitations, in particular since sociocultural factors tend to be so wide such that predefined survey responses fail to capture the whole phenomenon of interest. In this regard, the exploratory nature of this study necessitated capturing a wider net of information beyond the predefined responses that were collected for quantitative analysis.

Rationale for Mixed-method Research Design

The use of mixed-method was not necessarily a matter of choice; rather, it was directed by the exploratory nature of this study. The selection of mix-method design for this study was informed by two key elements—research questions and exploratory nature of the study. For the

research questions, the use of this design was advantageous because collecting qualitative data enhanced understanding of the research problem by capturing individual experiences from participants that are shaped by sociocultural factors. As reflected in the discussion chapter, the mixed-method design gave this study the ability to broaden the interpretability of quantitative findings through triangulating the results with emerging themes generated from the qualitative data.

Another rationale for the use of a mixed-method research design was to explore the applicability of decomposed theory of the planned behavior (DTPB) model in the Kenyan context. Only a few literature reviews exist on studies that have used the DTPB model in a Kenyan setting. Given this scarcity, this study, therefore, sought to explore the praxis of the DTBP theoretical framework in the context of Kenyan education.

In this chapter, I provide details on the sample, instruments used to collect data, the approach of a mixed-methods research design, data collection procedures, the credibility of the scale used in this study, and lastly the process used to analyze quantitative and qualitative data.

Criteria for Selecting the Sample

The data for this study were collected at a public university located in a metropolitan city in Kenya. This university was selected because it has a diverse body of students who come from all 47 counties of Kenya. In addition to a diverse demographic of students, this university has an enrollment of over 2500 students who are training to become teachers in Kenya. The Department of Education at this institution offers various degrees related to Education such as B. Ed. (Arts) B. Ed. (Science.) B. Ed. (Technology), B. Ed (Guidance and Counseling), and B. Ed. (Early Childhood and Primary Education), among other areas of study. Not all students enrolled in a

bachelor's degree in Education subsequently pursue a career in teaching at secondary school, as it is certainly common to pursue this degree for other purposes. Nonetheless, the Teacher Service Commission (TSC), the de-facto government institution mandated with hiring teachers in Kenyan public schools, lists the qualifications to teach in secondary schools as having a bachelor's degree in an education field (TSC recruitment guidelines, 2013). To ensure the study reached the specific sample of students planning to teach in secondary school, the first question on the survey questionnaire instructed the participants not to continue with the survey if they had responded that they do not intend to teach in secondary school. The participants of the focus group interview were each also asked and responded that they intend to pursue a career in teaching secondary school.

A survey instrument was distributed to male and female students enrolled in a bachelor's degree in Education (BED) at the selected university. Six faculties that taught courses in the Department of Education at the selected institution assisted by distributing to their students an advert (see Appendix A) with a call to participate in this study. To reach the targeted participants, the faculties only provided the advert flyers to students that appeared in instructor's record as 3rd and 4th year. The advert message also stipulated the that the participants had to be 3rd and 4th year students. During a period of eight weeks, I met right after the class with the participants who had responded to the advert and provided them the instructions necessary to complete the paper and pencil questionnaire. Most of the participants completed the survey on the spot then handed it to me, while some took the survey with them and handed it to their instructor at a later time. To encourage participation, an incentive of 150 Kenya shillings ($1.50) was given to the subjects for completing the study.

The respondents (n=522) were 266 females and 256 males. The selected university had an approximately 1100 Junior and Senior students pursuing bachelors of Education degree. The study targeted the Junior and Senior college students because at that level in the bachelors of Education degree they usually have already taken the courses geared toward using technology to teach. In addition, the sampled population was suitable for this research because the study seeks to examine a wide-range of belief factors associated with the teaching profession where the participants were training to enter within one and two years. Out of the 700 surveys distributed to respondents, 576 were collected (response rate 82%). Only 522 (90.63%) of the collected surveys were used for analysis. The other 54 surveys were discarded due to participants not matching the eligible criteria for the study, or because the student answered less than 20% of the survey.

Data Collection Procedures

The survey questionnaire (see Appendix B) consisted of 54 questions that were divided into three sections. The first section required the participants to provide contextual and demographic information such as, age gender, program of study, highest degree completed, approximate hours spent on a computer each week, computer ownership, and year of study. The first item on the survey questionnaire instructed the participants not to proceed with the survey if they were not a Junior or a Seniors.

The second section instructed the respondents to rate their level of agreement or disagreement on various statements based on a 1-5 summated scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree). The third section of the survey questionnaire consisted of open-ended questions that participants were instructed to write down their responses (See Appendix B for survey).

Ethical Considerations

Appropriate procedures were taken to ensure the data collection adhered to the ethical practices of conducting research. In particular, the principle researcher observed the standards of conduct outlined by Institutional Review Board (IRB) at Oklahoma State University. In addition, another authorization to collect data was obtained from the Vice Chancellor of Research at the selected university. Strict measures were taken to protect the rights of the participants. This included informing the participants about their rights to participate in the study, as well as requiring them to sign a consent form (see Appendix A) acknowledging that they were above 18 years old and were voluntarily participating in the study. No identifying information was collected that could reveal the identity of participants, and the data were stored on a password protected office computer.

Instrument For Collecting Quantitative Data

The survey instrument for the proposed research was created using existing scales validated in other studies that investigated the relationship between individuals' beliefs and their utilization of innovation technologies (Agarwal & Prasad, 1999; Moore & Benbasat, 1991; Nienderhauser, & Perkmen 2008; Venkatesh et al., 2003; Taylor & Todd, 1995; Thompson, Higgins, & Howell, 1991). Face and content considerations informed the rationale for generating survey items from existing studies that have used the various constructs employed in this study. This technique of developing research scales is common in studies that examined behavioral factors that influence adoption of computer technology (Nienderhauser & Perkmen 2008; Taylor & Todd, 1995; Venkatesh et al., 2003). Table 3.1 shows the Cronbach's Alpha of the original items adopted for this study.

Table 3.1 Summary of scale sources and the associated internal consistency

Source	Variable name	Label	Number of items	Internal consistency
(Fishbein & Ajzen 1975, p.216). Taylor & Todd, 1995)	Attitude	ATT	4	.77
Venkatesh, et al., 2003	Perceived Relative Advantage	PRA	6	.91
Venkatesh, et al., 2003	Perceived Compatibility	PC	3	
Venkatesh, et al., 2003	Perceived Use Complexity	PUC	5	.90
Taylor & Todd, 1995	Subjective Norm	SN	2	
Perkmen & Nienderhauser, 2008	Social Outcome Expectations	SOE	3	.69
Taylor & Todd, 1995	Superior Social Influence	SSI	2	.70
Taylor & Todd, 1995	Peer Social Influence	PSI	2	.73
Taylor & Todd, 1995	Perceived Behavioral Control	PBC	3	.90
Perkmen & Nienderhauser, 2008	Computer Self-Efficacy	CSE	2	.89
Thompson, et al.,1991	Facilitating Conditions	FC	3	.83
Venkatesh, et al., 2003	Computer Anxiety	CA	4	.79

Notes: Att-attitude toward using computer. PRA-perceived relative advantage of using computer. PC- perceived compatibility of using computer. PUC- Perceived use complexity. SN-subjective norm. SOE-social outcome expectations. SSI-superior social influence. PSI-peer social influence. PBC. Perceived behavioral control. CSE-computer self-efficacy. FC-facilitating conditions. CA-computer anxiety.

A multitude of the scales that were used in this study had been compiled and reviewed by Venkatesh et al. (2003) on a study that explores the validity of various theoretical models that study user acceptance of new technologies. Since the objective of this research was to explore the belief factors that influences pre-service secondary school teachers' behavioral intention to adopt CBIT, the scales for perceived relative advantage (PRA), perceived ease of use (PEU), and

facilitating conditions (FC), were adopted from the review provided by Venkatesh et al. (2003). Some of the items were reworded to fit the context of the targeted population, as suggested by Ajzen (1991).

Foundations of Variables in the DTPB Theoretical Model

As observed in chapter 2, the DTPB is a theoretical framework that brings together various models that investigate individuals' adoption of technologies. The purpose of bringing these models together is to create a cohesive model that best represents the factors that influence people to use certain technology. Given that the factors in DTPB model are aggregated in nature, their origin can be traced from other models that investigate adoption of technology. This section presents the origin source of factors used in this study, and their associated reliability of internal consistency.

Attitudinal Belief Structure

Attitude toward use is an evaluative effect of positive or negative feelings individuals have about performing a target behavior such as using CBIT to teach. The four-item scale used in this study to measure the *attitude* (ATT) construct was developed based on the standard guidelines provided by Ajzen (1985, 1991) and Ajzen and Fishbein (1980). Prior studies, such as Taylor and Todd (1995), had reported a reliability of internal .77 on the four items used to measure (ATT).

The decomposed items for the attitudinal construct are *perceived relative advantage* (PRA), *perceived use complexity* (PUC), and *perceived compatibility* (PC). The items for PRA and PUC were generated based on characteristics of innovation adoption scale developed

originally by Davis (1989) and revised by Moore and Benbasat (1991). The six-item scale of PRA measures the degree to which a person believes adopting a particular innovation enhances his or her job performance, and the five item-item scale of PC measures the perception of effort involved in learning and using computer technology. Venkatesh et al. (2003) validated the PRA and PUC factors and reported an internal consistency of .90 and .84, respectively.

The three-item scale of (PC) was adopted from Thompson et al. (1991). This PC scale is based on innovation adoption theory (Rogers, 1983), and measures the degree to which innovation fits with potential adopters existing values. Thompson et al. (1991) reported a reliability of internal consistency .84 on this scale.

Subjective Normative Structure

The two-item scale for the mediator construct of *subjective norm* (SN) were generated based on the characteristics of individual's motivation to engage in certain behaviors due to social pressure from others they consider important to them (Ajzen, 1991; Taylor & Todd, 1995). The two items of SN used on this study were adopted from Taylor and Todd (1995), whom had reported internal consistency reliability of .86.

The decomposed constructs of normative belief structure are *superior social influence* (SSI), *peer social influence* (PSI), and *social outcome expectations* (SOE). The scales for SSI and PSI are both adopted from Taylor and Todd (1995). The two-item scale of SSI is based on attributes that influence individuals' intention to adopt innovation because they perceive people superior to them think they should adopt that technology. The two-item scale for PSI is based on characteristics that show peers' opinion can influence an individual to engage in certain behaviors. Taylor and Todd (1995) reported an internal consistency reliability of .70 and α.73 on

SSI and PSI respectively. The three items for (SOE) were adopted from Niederhauser and Perkmen (2008), and are based on a scale that measure individuals' internalization of reference group's subjective culture. Niederhauser and Perkmen (2008), reported an internal consistency reliability of .69 on the SOE scale used on this study.

Perceived behavioral control structure

The items for the mediator construct of *perceived behavioral control* (PBC) are generated according to the three-item scale that measures individual's perception of control when intending to perform a behavior (Ajzen, 1991). Taylor and Todd, (1995) reported an internal consistency reliability of .90 on the SN scale used for this study.

The decomposed structure of behavioral control variable consists of *computer self-efficacy* (CSE), *facilitating condition* (FC), and *computer anxiety* (CA). The four-item scale for CSE was adopted from Niederhauser and Perkmen (2008) who reported an internal consistency reliability of .89. This scale is based on various elements that influence people's perception of confidence to perform a given behavior. These items were reworded in order to relate specifically to self-efficacy of using computer-based instructional technology. The three-item that measure FC were adopted from Thompson et al. (1991) who reported an internal consistency reliability of .83. The FC scale measured objective factors in the environment that individuals perceived as prohibitive barriers to use a given technology (Thompson et al., 1991). The four items on the *computer anxiety* (CA) scale were adopted from Venkatesh et al. (2003). The scale is based on characteristics that invoke anxious or emotional reaction when it comes to performing a behavior such as using CBIT to teach. Venkatesh et al. (2003) validated this scale and reported an internal consistency reliability of .70

Behavioral Intention to Use

The two items for the *behavioral intention* to use (BI) scale were adopted from the Math and Science Goal/Intention scale developed by Fouad, Smith, and Enochs (1997). Niederhauser and Perkmen (2008) reported a Cronbach's alpha of α.70 on this scale that measures the intention, commitment, and determination an individual has toward integrating technology in their future teaching practices.

Questions On The Contextual and Demographic Data

The contextual data for this study was collected using a series of three questions that aimed to capture important information that conceptualizes the study in the context of Kenya. The respondents were provided with pre-configured multiple-choice questions (see Appendix B). The first question, "what type of secondary school did you attend?" aimed to explore social capital, (Bourdieu, 2007) factors imbedded on the three-tier secondary school system in Kenya and determine in what ways these factors influence pre-service teachers' beliefs toward CBIT. The preconfigured multiple choices were: 1. National; 2. Provincial; 3. District; 4. Private; 5. Other.

The second question examined dispersion of computer ownership by asking participants to indicate whether they owned a computer. The preconfigured multiple-choice questions for responses were: 1. Yes, and 2. No. The third question examined whether extensive use of computer by pre-service teachers attending college plays a role in shaping their beliefs toward technology (Park, 2004). This question asked the participants to indicate "approximately how

many hours do you spend on a computer each week?" The preconfigured responses were broken down into a range of 5 hours (0-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, 40+).

The fourth question examined respondents' proficiency levels of using computers. The participants were asked to first read the provided description of computer use proficiency levels, then rate themselves by selecting the computer proficient level that they believed best suited them. The preconfigured multiple choices for computer proficiency were: 1. Unfamiliar (I have no experience with using computer technology). 2. Newcomer (I have attempted to use computer technologies but I still require help on a regular basis.). 3. Beginner (I am able to perform basic functions in a limited number of computer applications). 4. Average (I demonstrate general competency in a number of computer applications). 5. Advanced (I have acquired the ability to competently use a broad spectrum of computer technologies). 6. Expert (I am extremely proficient in using a wide variety of computer technologies). The data collected on this question was used to assess the general computer proficiency level for the selected sample.

In addition to contextual data, the questionnaire also consisted of other background items, such as demographic questions. The participants were asked to state their gender, and their age category, which was categorized on intervals of five years ranging from 18 years to 55+ years. In addition, the participants were asked to select academic subjects they intended to teach in their future teaching practices. A list of courses approved for secondary education was provided and categorized according to the area of studies (humanities, social sciences, natural sciences, formal sciences, and applied sciences); Lastly, the participants were instructed to write down the highest educational degree they have completed, as well as the degree they are currently pursuing—B. Ed. (Arts) B. Ed. (Sc.) B. Ed. (Technology), B. Ed (Guidance and Counseling).

Qualitative Data Collection: Open-Ended Survey Questions

Even though the quantitative data collected using the above instrument was important to this study, Hofstede (1991) states that quantitative data alone has a limitation in capturing social experiences because it is rare that any individual would answer each question exactly by the mean score of an entire sample. Two methods were used to collect qualitative data for this study. One method was using open-ended survey questions, and the second method was a focus group interview with ten secondary school pre-service teachers. The open-ended questions embedded on the survey consisted of five questions (see Appendix D). In this study, the scope of qualitative data mainly explored the link between sociocultural dynamics and the belief factors that shaped pre-service secondary school teachers' beliefs toward CBIT. As reflected in discussion in chapter 5, content analysis of qualitative data unearthed salient beliefs underlying pre-service teachers' behavioral intention to adopt CBIT in their future teaching practices.

Qualitative Data Collection: Focus Group Interviews

The second method of collecting qualitative data was interviewing a focus group of 10 pre-service secondary school teachers. The purpose of collecting this data was to examine the foundational social dynamics that influence secondary school teachers to adopt CBIT in their teaching practices. The participants for the focus group interview were 10 senior year college student enrolled in a bachelor's degree in Education at the same university where the survey for this study was distributed. The pre-service teachers that participated in the focus group interview did not participate on the survey used for this study. These participants were reached through a 'snowballing' contact method. A professor at the selected university assisted with the

recruitment of participants by informing her senior year students about my study. She also assisted in reserving the room where I interviewed the participants.

When I met with the participants, I outlined to them their rights as research participants. The overview of participants' rights included obtaining consent to audio record the interview. In an effort to mitigate issues of privacy and confidentiality, I assigned each participant an alphabet letter that was called out each time a particular participant responded to a question. The assignment of the alphabetical letter was particularly helpful when playing back the audio, as it served as an identifier of what was said by each participant.

The interview involved a series of six questions that were asked consecutively (see Appendix E). These questions investigated various factors that literature has show to have an impact on users intention to adopt CBIT. Among the issues investigated was participants perceptions regarding their future supervisors and how those perceptions impacted their intention to adopt CBIT. The rationale for this investigation emanated from literature that indicated individuals' perception of their superiors has an effect on their disposition to perform a given behavior (Taylor and Todd, 1995). For instance, in a study that examined intrapersonal factors that influence pre-service teachers to adopt the use of computers to teach, Taylor and Todd (1995) observed that an individual's perception that their superiors will expect them to perform a certain behavior affects their intention to perform that behavior in the future.

Another factor that was examined in the interview was whether competition from peers exerted pressure on the participants' intention to adopt CBIT. The effects of peer pressure are hardly a new phenomenon (Niederhauser & Perkmen, 2008; Taylor & Todd, 1995). In a study that examined IT usage among pre-service teachers Taylor and Todd (1995), observed that peers' opinions significantly influenced pre-service teachers' intention to use IT.

Other factors examined in the focus group interview included, the role of social outcome expectations, participants' perceptions of teacher education programs in relation to preparing them to use CBIT in the future, and participants' beliefs that the use of technology has on student learning

Survey Questionnaire Validation Procedure

The survey questionnaire items used to collect quantitative data were compiled from existing scales as described above. They were then combined into a single scale with a common five-point summated scale rating (strongly disagree, disagree, neutral, agree, strongly agree); with *strongly disagree* on the negative side and *strongly agree* on the positive side. Bohrnstedt (1970) pointed to the importance of validating research scale to ensure that the scale used represents the concept about which generalization will be made. In this study, a multistep process was used to gain validity of the instrument. This validation process included consulting with experts from Oklahoma State University who were knowledgeable in the academic areas of educational technology, educational research methods, the social foundations of education. I also consulted with three faculty members who taught courses on Informational Communication Technology at the institution where the data were collected.

The process started with identifying questions from existing literature. These were then reworded to fit the context of Kenya and shared with each expert faculty members in relevant fields at Oklahoma State University and the selected university. Faculty from educational technology provided feedback regarding the soundness of the instrument in relation to educational technology. The other faculty with the knowledge in the area of social foundations of education provided advice on the appropriateness of the questions in examining the educational phenomenon in sociocultural context. The faculty in educational research methods provided

advice on the questionnaire's structure, as well as guidance on analysis of internal consistency of it. After revising recommendation provided by these experts, I verified the validity of the questions by consulting three faculty members at the institution where the data were collected. These faculty members were consulted not only because they are knowledgeable in the area of technology use in Kenyan education, but they also had the same field experience as the population that was being studied. Their suggestions focused mainly on the rewording of some questions to fit better the context of population being studied.

Table 3.2: Internal consistency coefficients

Variable name	Label	Number of items	Internal consistency
Attitude	ATT	4	.77
Perceived Relative Advantage	PRA	6	.76
Perceived Compatibility	PC	3	.77
Perceived Use Complexity	PUC	5	.79
Subjective Norm	SN	2	.76
Social Outcome Expectations	SOE	3	.75
Superior Social Influence	SSI	2	.78
Peer Social Influence	PSI	2	.76
Perceived Behavioral Control	PBC	3	.76
Computer Self-Efficacy	CSE	2	.76
Facilitating Conditions	FC	3	.81
Computer Anxiety	CA	4	.79

Notes: coefficients based on Cronbach's alpha

Table 3.2 shows reliability of items used in this study. Generally, a high Cronbach's alpha reflects a positive strength of the scale (Cronbach, 1951). Given the exploratory nature of this study, multiple methods of collecting data were used in order to ensure greater validity of the results. This included open-ended questions embedded on the survey (n=522), and interview data from ten participants.

Regression and correlation analysis were used to analyze quantitative data for this study. The use of regression analysis requires diagnostic of 'model fit' before coefficient predictors can be regressed. Wilson (2003) provides four diagnostic tools to test fit-model—linear relationship, multi-collinearity, Durbin Watson, and homoscedasticity (p. 319). This conditions were tested in order to ascertain the soundness of using regression analysis for this study. A test of Linear Relationship was performed to examine whether a linear relationship exist between independent and dependent variables being examined. Pearson matrix was used to test multi-collinearity, to ensure that none of the factors used were highly correlated. A Durbin Watson analysis was performed to test that there was no auto-correlation between the variables used in this study. Homoscedasticity analysis was performed to test that the error terms along the regression line were equal.

Limitations

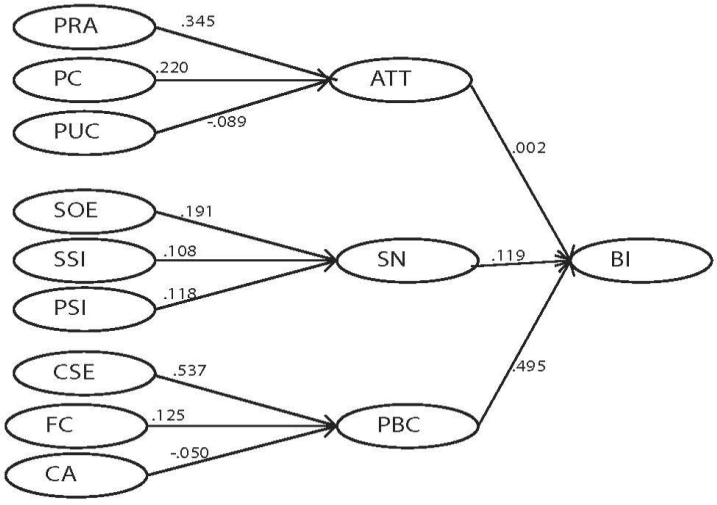
Two limitations constrain the methodology used in this study. One, little research exists on this topic in the context of Kenya. This limitation made it a challenge to find the frames of references to model the methodology used this study. As a result, this lack of prior research constrained the nature of this study to exploratory inductive theoretical research. Second, this study was an ad hoc research that targeted pre-service teachers enrolled in a bachelor's degree of

Education at a single university. Even though the particular university had a diverse body of student from all 47 counties in Kenya, the methodology used in this study would benefit from studies carried in other universities to ascertain the consistency of its findings.

Quantitative data analysis procedures: Statistical analysis

The qualitative data for this study was analyzed using Statistical Package for the Social Sciences (SPSS) program. In particular, multiple regression and correlation analyses were performed. The procedure for identifying the fit model for this study involved performing a path regression analysis on the full model, and reduced model-of-fit in order to determine the relationship that each predictor factor has on the criterion of *behavioral intention*. Figure 3.1 shows the standardized Beta (β) coefficients that were obtained through path regression analysis of the full model. The error (*e)* values for the criterion variables on path analysis were computer as $e = \sqrt{((1-R^2)}$.

Figure 3.1: Standardized Beta coefficients for the DTPB full model



Notes: weights reflect standardized Beta coefficients

The Beta weights results from the path analysis informed the selection of variables used in reduced fit-model. Out of the original eleven original variables of DTBP model, six were selected for the fit-model based on their added statistical significance to the fit-model. The variables that added statistically significant direct influence to behavioral intention were: superior social influences (SSI), peer social influence, (PSI), perceived behavioral control (PBC), computer self-efficacy (CSE), facilitating conditions (FC), and computer anxiety (CA).

Apart from the analysis of multiple regressions, other statistical analyses were conducted on the quantitative study. This analyses included correlation analysis on the fit-model, percentages on contextual data, and cross-tabulations on the on other quantitative data collected on the survey. The cross-tabulation were performed to examine the relationships between the type of secondary school attended and the self-assessed computer proficiency level. Another cross-tabulation was analyzed to investigate the relationship between self-reported computer self-efficacy and self-assessed computer proficiency level.

Procedures for analyzing qualitative data: Open-ended survey data and focus group interview data

The qualitative data, both from open-ended survey questions and the focus group interview responses, were analyzed using QDA miner—a computer software that aids in analyzing qualitative data. The software allows the researcher to code data and synthesize emerging themes. The software also produces descriptive frequencies that are reported in chapter 4.

The process of analyzing qualitative text from the survey involved a three-step procedure suggested by Graneheim and Lundman, (2003). On the first step, the researcher condensed sentences and coded them into a meaningful unit. 'Meaningful unit', as the name suggests, is the "constellation of words or statement that relate to the same central meaning" (Graneheim and Lundman, 2003). The procedure of creating these meaningful units involved shortening statements, while still preserving the core meaning. To achieve this, the researcher read the text and noted commonality in statements written by participants. These statements were then coded based on the commonality of underlying meanings that was recorded by the researcher. The second step involved the researcher analyzing the codes, both by observation and through computing frequencies using QDA miner, and grouped the codes into various categories. On the third step, the researcher examined the categories and noted the emerging themes based on the literature and the general understanding of the data. These three steps were repeated for each of the five open-ended survey questions that collected qualitative data

The process of analyzing interview data was similar to that used to analyze data from open-ended questions using QDA miner. Since the interviews were audio recorded, the analysis stated by transcribing the audio and then uploading the transcripts on the QDA miner software. The rest of the process followed the same steps discussed above.

This chapter has addressed the research design that informed this study. This has included description of the sample, methodology, and development of instruments used to collect data. The subsequent chapter four discusses the analysis of data and the findings that emerged from this study.

CHAPTER IV

FINDINGS

This chapter describes the findings of the study. This discussion includes the analysis of data on demographics of respondents, regression analysis on the full model of decomposed theory of planned behavior (DTPB), regression analysis on the reduced fit-model, testing of the hypothesis, and findings from qualitative data.

Demographic description

A survey instrument was distributed to 700 junior and senior year students enrolled for a bachelor's degree in Education at a university located in a metropolitan city in Kenya. Out of the 700 surveys distributed to respondents, 576 were collected (response rate 82%). Only 522 (90.63%) of the collected surveys were used for analysis. The other 54 surveys were discarded due to participants not matching the eligible criteria for the study, or because the student answered less than 20% of the survey.

The respondents (n=522) were 266 females and 256 males. The range of age among respondents aged 18-22 was 32%, 49% for ages 23-27, 10% for ages 28-32, 6.1% for ages 33-37, 1.3% for ages 38-42, .2% for ages 43-47, and .2% for ages 48 and above.

Participants were instructed to indicate the courses they intended to teach when they started their teaching careers. Results from the responses showed that 283 participants would be teaching at least one course in humanities, 260 in social sciences, 260 formal sciences, and 181 applied sciences.

The total responses were greater than (n=522) because some participants indicated that they would be teaching a course in more than one area of study.

The results on ownership of computer (table 4.1), showed that 57% of the respondents owned a computer, while 42% did not own a computer. The average hours of computer use each week by the participants illustrated that 16.7% spend between 1-5 hours, 27.4% spent 6-10 hours, 24.7% spent 11-20 hours, 14.9% spent 21-30 hours, 7.7% spent 31-40 hour and 7.1% responded that they spent more than 40 hours on a computer every week (table, 4.2). Respondents were asked to rate their computer proficiency level. As shown in table 4.3, 3.4% of the participants reported that they were unfamiliar with using computers, while 6.1% were new comers, 20.7% were beginners, 33.9% were average users, 21.1% were advanced, and 12.1% considered themselves as expert in using computer.

The survey asked the participants to indicate the type of secondary school they attended before joining college. Table 4.4 shows that 16.3% of the respondents indicated that they attended National schools, 40% Provincial schools, 23.6% District schools, 14.4% Private schools, and 1.3% attended other types of secondary schools.

Table 4.1: Self-reported computer ownership (n=522)

Do you own a computer?	Percentages
Yes	57%
No	42%

Table 4.2: Self-reported hours spent on computer each week (n=522)

Hours Spent per week	Percentages
0-5	16.70%
6-10	27.40%
11-20	24.70%
21-30	14.90%
31-40	7.70%
40+	7.10%

Table 4.3: Self-reported computer proficiency level (n=522)

Proficiency level	Percentage
Unfamiliar: I have no experience with using computer technology	3.40%
Newcomer: I have attempted to use computer technologies but I still require help on a regular basis.	6.10%
Beginner: I am able to perform basic functions in a limited number of computer applications	20.70%
Average: I demonstrate general competency in a number of computer applications	33.90%
Advanced: I have acquired the ability to competently use a broad spectrum of computer technologies	21.10%
Experts: I am extremely proficient in using a wide variety of computer technologies.	12.10%

Table 4.4: Type of secondary school attended before joining college

Type of school	Percentages
National schools	16.3%
Provincial schools	40%
District schools	23.6
Private schools	14.4%
Other types of schools	1.3

Statistical Analysis: Multiple Regression Analysis

The quantitative data collected for this study was analyzed using Statistical Package for the Social Sciences (SPSS) program. Multiple regression and correlation analysis were performed on the full model and on the reduced fit-model to examine factors that predict pre-service secondary school teachers' behavioral intention to adopt computer-based educational technology (CBIT). The items were based on participants' responses that were weighted on a 1-5 Likert scale (1=strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=strongly agree).

Variables abbreviation

ATT – Attitude toward computer use
PRA –Perceived relative advantage
PC – Perceived computer compatibility
PUC – Perceived use complexity
SOE – Social outcome expectations
SSI – Superior social influence
PSI – Peer social influence
CSE – Computer self-efficacy
FC – Perceived behavioral control
CA – Computer anxiety
FC – Facilitating conditions
BI – Behavioral intention

The aim of analyzing the full model was to examine the relationship that each predictor had on the criterion of behavioral intention based on the decomposed theory of planned behavior model. On this token, the purpose of the reduced fit-model was to examine which factors had significant direct prediction on the criterion of behavioral intention. The procedure for identifying the fit-model for this study involved performing a path regression analysis on the full model, then conducting a regression analysis on a fit-model using constructs regarded to have a significant direct influenced behavioral intention.

Results for regression analysis: Full model

The regression analysis of the full model targeted to answer the research question of: how well does the decomposed theory of planned behavior (DTPB) model predict pre-service secondary school teachers' behavioral intention to adopt computer-based instructional technology (CBIT)? A series of four path regression analyses were conducted to predict the overall relationship that the criterion of behavioral intention has with the underlying predictors of (DTPB). Table 4.5 shows the impacts of standardized Beta coefficients associated with each factor represented in the DTPB.

The first multiple linear regression predicted pre-service secondary school teachers' attitude (ATT) toward computer-based instructional technology based on predictors of attitudinal structures (PRA, PC, & PUC). A significant regression equation was found ($F (3, 517) = 55.743$, $p<.01$). The multiple correlation coefficient for the sampled factors was ($r = .494$) and an ($r^2 =.24$). This coefficient suggested that approximately 24% of variance in pre-service teacher's attitude toward CBIT was contributed by a combination of their perceived relative advantage

(PRA) of using CBIT, the compatibility of their values with using educational technology (PC), and their perceived complexity (PUC) of using CBIT.

A second multiple linear regression analysis was conducted on subjective norm (SN) being predicted by social outcome expectations (SOE), superior social influence (SSI), and peer social influence (PSI). The regression results indicated the three factors (SOE, SSI, & PSI) significantly predicted pre service teachers' perception of subjective norm ($F (3, 518) = 58.877$, $p<.01$). The multiple correlation coefficient was ($r = .504$) and an ($r^2 = .25$), indicating that 25% of pre-service secondary school teacher's perception of subjective norm was attributed to their perception of social outcome expectations, superior social influence, and peer social influence.

The third multiple linear regression analysis was performed to evaluate how well pre-service secondary school teachers' perceived behavioral control (PBC) was predicted by the factors of computer self-efficacy, perception of facilitating conditions (FC) and their computer anxiety (CA). A significant regression equation was found ($F (3, 518) = 110.787$, $p<.001$). The coefficient results for multiple correlations was ($r = .625$) and an ($r^2 = .39$); indicating that the factors of computer self-efficacy and perception of facilitating conditions predicted 39% of variance in pre-service teachers' perception of behavioral control to use computer based educational technology. The individual coefficient for computer anxiety did not show to contribute significantly to this particular regression analysis ($p>.005$).

The fourth multiple regression analysis evaluated how mediating variables of decomposed theory of planned behavior model, (attitude, subjective norm, and perceived behavioral control), predicted behavioral intention, when controlling for all the other independent factors. The regression analysis was significant ($F (2, 519) = 106.643$, $p<.001$). The analysis produced a multiple correlation coefficient of ($r = .540$) and an ($r^2 = .30$). This

coefficient implied that approximately 30% of variance in pre-service teachers' behavioral intention was predicted by subjective norm (SN), and perceived behavioral control (PBC). The individual coefficient of attitude did not show to contribute significantly to this particular regression analysis (p> .05).

Table 4.5: Impact analysis of Beta coefficients on the full model

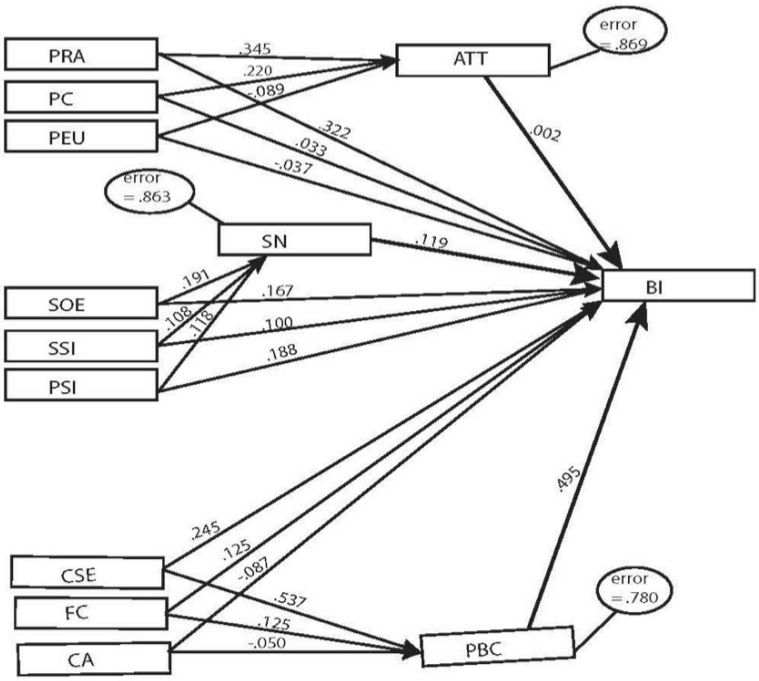
Outcome	**Determinant**	**Standardized estimates**
		β
Behavioral Intention	ATT	.002
(R^2 = .303)	SN	.119
	PBC	.495
Attitude toward computer usage (R^2 = .244)	PRA	.345
	PC	.220
	PEU	-.089
Behavioral Intention	PRA	.322
(R^2 = .116)	PC	.033
	PEU	-.037
Subjective Norm	SOE	.191
(R^2 = .254	SSI	.108
	PSI	.330
Behavioral Intention	SOE	.167
(R^2 = .127)	SSI	.100
	PSI	.188
Perceived behavioral control (R^2 = .391)	CSE	.537
	FC	.185
	CA	-.050
Behavioral Intention	CSE	.426
(R^2 = .286)	FC	.188
	CA	-.104

Notes: $^{**}p<.001$ $^{*}p<.05$

Significance And Hypothesis Testing

Figure 4.1 shows the standardized Beta coefficients and path relationship that each constructs had toward criterion of behavioral intention. A coefficients linking one variable to another in the path model represents an indirect effect of that independent variable on the criterion variable of BI through mediating variables (attitude, subjective norm, and perceived behavioral control).

Figure 4.1: Multiple regression path relationship on the full model



Notes: The coefficients are standardized Beta

Significance of effects on a given predictor are interpreted in the present study based on the recommendations by Cohen (1988), with Beta coefficient values greater 0.5 considered large, those with less than 0.3 medium, and values less than 0.1 considered as small effects. The negative effects also follow the same structure (-0.1 small negative effect, -0.3 medium negative effect, and those over -0.5 having a large negative effect). Table 4.6 shows that, overall, ten out

of the twelve hypothesis tested were supported by the data. The two predictors on the model that did not support the hypothesis were attitude toward CBIT and computer anxiety. Although the construct of attitude toward computer did not yield significant prediction to behavioral intention, the path analysis indicated that the construct itself was significantly predicted by its determinants of perceived relative advantage, (β =.345, t =8.15, p<.001), perceived compatibility, β =.220, t =5.12, p<.001), and perceived use complexity, β = —.089, t = —2.33, p<.001). The bivariate correlation for perceived use complexity and computer anxiety were negative as expected, while the other ten predictors were positively correlated to the determinants associated with them.

Results of independent variables regressing on mediating variables indicate that, computer self-efficacy (β =.537, t =7.459, p<.001), was the strongest predictor of perceived behavioral control, and peer social influence (β=.330, t =8.15, p<.001) was the strongest predictor of subjective norm. In addition, when controlling for all the independent variables, the results indicated that perceived behavioral control, (β =.495, t =12.188, p<.001), was the dominant predictor of behavioral intention.

Table 4.6: Hypothesis testing

Hypothesis	*Path*	*Path coefficient (β)*	*t-value*	*Results*
H1	PRA → ATT	.345**	8.015	Supported
H2	PC → ATT	.220**	5.121	Supported
H3	PUC → ATT	-.089*	2.020	Supported
H4	SOE → SN	.191**	4.321	Supported
H5	SSI → SN	.108**	2.622	Supported
H6	PSI → SN	.330**	7.459	Supported
H7	CSE → PBC	.537**	14.697	Supported
H8	FC → PBC	.185**	5.104	Supported
H9	CA → PBC	-.050	-1.431	Not supported
H10	ATT → BI	.002	.044	Not supported
H11	SN → BI	.119*	2.968	Supported
H12	PBC → BI	.495**	12.188	Supported

Notes: $^{**}p<.001$ $^{*}p<.05$

Results for Regression Analysis: Reduced Fit-Model

The analysis of the full model provided important insight to the development of a reduced model that best fitted the quantitative data that was collected. The aim of the fit-model was to address the research question of: what predictor model best fits the factors that influence pre-service secondary school teachers' use of computer-based instructional technology (CBIT)? To

address this question, the fit-model evaluated a selection of constructs that had shown to carry significant contribution on direct prediction to the criterion of behavioral intention to adopt CBIT. A multiple regression analysis was used to predict behavioral intention (BI) using six predictors: subjective norm, superior social influence, perceived behavioral control, computer self-efficacy, facilitating conditions, and computer anxiety.

Results from the fit-model found a significant regression, ($F(6, 515) = 51.401$, $p<.001$). In addition, examination of the multiple correlation showed the correlation coefficient of the model was (r .61) and ($r^2 = .37$). This coefficient reflected that 37% of variance in pre-service teachers' behavioral intention to adopt computer based educational technology is contributed by subjective norm ($\beta = .088$, $t = 2.258$, $p<.005$), superior social influence ($\beta = .094$, $t = 2.529$, $p<.05$), computer self-efficacy, ($\beta = .239$, $t = 5.404$, $p<.001$), perceived behavioral control ($\beta = .293$, $t = 6.271$, $p<.001$), facilitating conditions ($\beta = .114$, $t = 2.991$, $p<.001$), and computer anxiety ($\beta = -.103$, $t = -2.867$, $p<.001$). With exception of the computer anxiety factor, all the other five constructs had positive relationships with behavioral intention. The inverse relationship of computer anxiety and behavioral intention was expected, since the less feeling of anxiety an individual has toward using computer, the more likely they are to adopt the use of it.

Zero Order Correlations of factors in the fit-model

The quest to understand the zero order correlations of factors that influence pre-service secondary school teachers to adopt CBIT was represented by one of the research question of: what are the zero order correlations on constructs that directly predict pre-service secondary school teachers' intention to use CBIT to teach? Table 4.7 shows the correlation matrix and strength for every variable used in the fit-model. This results point out that some variables had a

significant zero-order correlation with behavioral intention, while others had moderate correlations. The results indicated that perceived behavioral control and computer self-efficacy dominated the prediction of pre-service secondary school teachers' behavioral intention to adopt CBIT with correlation coefficients of .539 and .498 respectively. Computer anxiety had a negative correlation as expected, while all the other five variables had positive correlations with behavioral intention.

The analysis of qualitative and quantitative data resulted to a plethora of knowledge for this study, as well as a share of surprises. The next chapter will discuss the interpretations of these results and their implications to the effort integrating educational technology in the Kenyan secondary schools.

Table: 4.7 Zero order correlations

Construct	BI	SN	SSI	PBC	CSE	FC	CA
BI	1.00	.302	.217	.539	.498	.308	-.152
SN		1.00	.278	.369	.216	.250	.003
SSI			1.00	.214	.159	.008	.116
PBC				1.00	.600	.342	-.114
CSE					1.00	.299	-.147
FC						1.00	.080
CA							1.00

Notes: Pearson Correlations

Findings from Qualitative Data: Open-Ended Survey Questions

Qualitative data collected as open-ended questions embedded on the survey were analyzed using QDA miner—a computer software program that aids in analyzing qualitative data. As discussed on chapter 3, the purpose of the four open-ended questions was to explore the sociocultural dynamics that influence pre-service secondary school teachers to adopt CBIT in

their future teaching practices. The results are presented on this section based on the themes that emerged for each open-ended survey questions. Table 4.8 shows the frequency for each of the themes reported below. It is worth noting here that some frequencies were greater than the total (n = 522) because some of the participants' responses were applicable to more than one theme.

The first open-ended survey question asked the participants to describe what they believed could be done to equip them better with the skills of using computer based technology. The aim of this question was to capture participants' views on what they perceive as lacking in regard to gaining the knowledge of using CBIT. The themes that emerged from this question were: *professional development, access to technology*, and *availability of support team*.

***Professional development*:** This theme emerged from responses given by 225 participants who insinuated that availability of mechanisms to advance their skills of using computers would equip them better with the knowledge of using CBIT. The key items in this category included statements such as "provide more training", "provide places to practice in-depth how to use CBIT", "introduce more college courses on the use of CBIT", and "use of simulations to learn how to use CBIT to teach". All these statements had a core suggestion that professional development initiatives would better equip participants with the knowledge of using CBIT.

Access to technology: This theme represented responses from 329 participants who indicated that some form of physical access to technology resources would better equip them with the knowledge needed to use CBIT to teach. The participants made common references related to access to technology. For instance, one participant observed that "access to Internet would equip me better with the skills to use CBIT". Another participant also wrote that "… I think if I had access to computers here at school, this would give me opportunity to learn various

ways to teach using technology". These views were echoed by another participant who asserted that "technology availability in the classroom is particularly helpful to teachers that want to use it". These statements, among others, reflected participants' beliefs that access to technology enhances the skills to use CBIT.

Availability of technical assistance: This theme emerged from a pattern of statements made by 232 participants who regarded the unavailability of technology support network as a barrier that prevented the use of CBIT when teaching. The responses were characterized by statements such as, "availability of technology helplines", and "availability of onsite computer support team", among other provisions of availability of technical assistance would assist participants to attain the need skills to use CBIT.

The second open-ended survey question asked the participant to indicate what effect they believed the use of computers to teach has on student learning. The intent of this question was to examine the participants' beliefs about the effects that technology has on students' academic outcomes. The participants were instructed to first choose whether these effects were positive or negative, and then explain why they believed that way. The two themes that emerged were *positive role* and *negative role*.

Positive role: This theme represented responses from 448 participants who expressed a favorable view that using CBIT to teach enhances student learning. Majority of these views were characterized by statements reflecting the positive benefits that technology has on learning. These statements emphasized on the access to a wider net of information and the benefits of interactive and virtual collaboration among students.

Negative role: This theme represented responses from 380 participants that indicated some reservation in using CBIT to teach by pointing out to various shortfalls of introducing

technology in education. The most common mention was the concern of ethical and immorality issues that can be generated by the misuse of technology. The commonly referenced issues were "accessing adult sites" and "Googling for answers". Other negative statements pointed to the distraction from learning, such as "playing games", "wasting learning time on social media", and simply students "becoming lazy". In addition, some of the participants also pointed that the use of CBIT to teach has a negative effect because it makes teachers to underperform on their teaching duties as they automate their teaching duties, consequently distancing their interactions with the students.

The third open-ended survey question asked the participants to indicate what they perceived as the greatest challenges facing Kenya's nitration of CBIT in secondary education. The purpose for this question was to capture the participants' views on what they perceived as barriers that hold back integration of CBIT in Kenyan secondary schools. The themes that emerged were: *infrastructure, personnel skills*, and *socioeconomic challenges*.

***Qualified personnel*:** This theme emerged from responses made by 335 participants who referenced to low capacity of personnel with computer skills a big challenge facing Kenya's effort to integrate technology in secondary schools. The theme captured statements related to the need for teachers to be provided with the necessary skills to use computer technology. As summed up by a participant, "…most teachers simply don't know how to use computers, and that is a challenge if they are expected to teach using computers." Another challenge that was often mentioned was the inadequate number of expertise available at teachers' training colleges. As posed by one participant, "the biggest challenge is to get instructors in teacher training colleges that can teach how to use technology." The general view from these statements was that

lack of qualified personnel contributed to the many challenges that Kenya face in regard to integrating CBIT in secondary education.

Social economic: The responses from 411 participants suggested that social economic factors were among the greatest challenge facing Kenya in regard to integrating CBIT secondary education. This theme represented an umbrella of multipart statements related to, both social political challenges and social economic problems reported by participants. For instance, it was repeatedly mentioned that the Kenyan politicians lack the political will to prioritize funding for educational technology when making key policies such as national budgets. The aspect of social problems was also characterized by other frequently mentioned issues such as corruption and social resistance to change from the traditional ways of doing things. The concern for resistance to social change was particularly directed to those communities that live in small isolated enclaves.

The economic aspect of this theme was characterized by statements related to the difficulties of accessing education technology due to the socioeconomic realities that exist in Kenya. For instance, affordability of computers by the average family in Kenya was repeatedly mentioned as a barrier to integrating education technology in Kenyan secondary education. In particular, access to technology by people living in hardship areas—hardship areas usually refer far-flung rural areas that lack certain amenities such as roads, or areas where people still live in small communities that are sustained by small-scale farming. Some participants also recurrently highlighted that, given other existing social problems such as overwhelming level of poverty and, recurring epidemics of deadly diseases, the government simply does not have the resources to fund the latest educational technology.

Infrastructure: This theme emerged from response given by 81 participants who implied that infrastructure was the greatest challenge facing Kenya's effort to integrate technology in secondary school education. This theme of infrastructure represented an umbrella of statements that reflected a deficit on the existing major infrastructures such as, availability of electricity at rural schools, and availability of high-speed Internet in all Kenyan secondary schools. Other commonly mentioned challenges were "availability of computer labs", and "availability of computers for students".

The fourth open-ended survey question asked the participants to indicate the expectations they believed the Kenyan society has on teachers in their capacity to teach using CBIT. The aim of this question was to investigate the participants' perceptions of the social expectations they believe the Kenyan society has on them when they start their teaching careers. Three themes emerged from participants' responses: *the society expects teachers to be computer literate, the teachers under-perform when they rely on technology to teach*, and *the majority of society does not care whether or not teachers use technology to teach*.

Society expects teachers to be computer literate: This theme emerged from responses made by 350 participants that inferred that they believed the Kenyan society expects teachers to be computer literate. This theme captured statements that pointed to the way society has become conscious of technology use in the recent years. In particular, the rapidly growing influx of Internet use in many government and business sectors in Kenya were commonly mentioned.

Teachers under-perform when they rely on technology to teach: 261 participants gave statements referencing that majority of Kenyan society believes that teachers underperform when they rely on technology to teach. This theme consisted of various negative views about teachers'

use of computer technology to teach. In particular, the issue of teachers relegating their duties of effective teaching to computers, and therefore under-performing.

The majority in the society does not care whether public school teachers use technology to teach: 187 participants responded with statements that indicated disconnection between the Kenyan society and public education. This theme emerged from statements that were mentioned frequently highlighting the view that most parents are less engaged with the type of education their children are receiving from public schools. Another view that was repeatedly mention was that most parents, especially those in the rural areas, are not literate enough to develop a great concern of using CBIT in education.

Table 4.8: **Frequency results of qualitative data**

Question I: What can be done to equip you better with the knowledge of using CBIT?	
Theme	**Frequency of participants' responses per theme***
Professional development	225
Access to technology	329
Availability of support team	232
Question II: What role (positive/negative) do you believe the use of CBIT in education have on student learning?	
Theme	**Frequency of participants' responses per theme***
Potentially Positive	**448**
Potentially Negative	**380**
Question III: What do you perceive as the greatest challenge facing Kenya in regard to integrating CBIT in secondary education?	
Theme	**Frequency of participants' responses per theme***
Infrastructure	**81**
Capacity of Personnel skills	**335**
Social economic challenges	**411**
Question IV: You as a future teacher, what social-expectations do you believe the Kenyan society has on teachers in regard to using CBIT to teach?	
Theme	**Frequency of participants' responses per theme***
Society expects teachers to be computer literate	**350**
Teachers under-perform when they rely on technology to teach	**261**
The majorities in the society are indisposed regarding teachers use technology to teach. Indisposed	**187**

Notes: Some frequencies are greater than the total n=522 because some of the participants' responses were applicable to more than one theme

Findings from Qualitative Data: Focus Group Interview

Ten college students enrolled in a teacher preparation program were part of a focus group interview at the same university where the survey was administered. None of the participants in

the focus group interview had participated in the survey. The group interviewed consisted of seven women and three men, all whom were on their senior year toward completing their bachelor's degree in education B.Ed. A faculty from the university where I collected data assisted me to reserve a classroom that was not being used on the interview day.

It was on Thursday, December 10th, 2015 at 9:45am that I arrived at the university where I was to collect interview data for my research. It was a sunny morning, and the scenic view of the university made it feel welcoming. The landscape had well manicured green fences that were about four feet tall and seemed to follow the various walk paths. Every building I could see was made of cinder blocks with white trimmings on the windows and building columns. The roof trimming was painted green, which made it to blend nicely with the carefully trimmed grass and gardens that had various colors of flowers.

I was familiar with the university so I walked directly towards the classroom that I had reserved to conduct the interview. Upon walking inside the classroom, I found three students (two women, and one men) in their mid-20s. I informed them that I was there to meet with some students to do an interview for a research project that I was conducting. The students had been recruited by their professors, so this was the first time for us to meet face to face. I introduced myself to them, and they each introduced themselves by name and what degree major they were studying within the Department of Education. When the third participant, a woman, was introducing herself to me, I heard a knock on the classroom door and two women walked in. One of the women, who was already seated, shouted the name of one of the women who had just walked in and greeted her in Swahili. This signaled to me that some of the participants knew each other. I asked the two newcomers whether they knew the other students in the classroom.

The woman, who just came in, responded to me that she knew the two ladies because they are in their 4th year (senior year) and they had met when they took a class together a while back.

Once five participants had arrived, I went to the front of the classroom and pulled out my computer so I can get set up to start the interview as we waited for the rest of the participants to arrive. As I turned on my laptop computer I looked around and made several observation of the room. The classroom area was big and was packed with at least 60 single-person desks (the kind of desks that the seat and writing table are attached), which were arranged in five columns. The front of the classroom was a huge blackboard that covered two thirds on the front wall of the classroom. While standing at the front of the classroom, the left side had the entry door, and large glass windows that covered the entire wall starting half way from the bottom of the wall to the top. The back of the room was a plain white wall. The right side of the room also had large windows that covered the entire wall halfway from the ground. The floor was made of grey cement and the roof was wooden and did not have celling on it. I could not see any form of technology such as a projector in the classroom

By the 10:00 am scheduled time, a total of eight participants had already arrived. Six were sitting in the desk seats, while one man and one woman were sitting on top of the desktop chatting among themselves. I walked from the front toward where the group was seated in the middle part of the classroom and interrupted their conversation by informing them that we would start in ten minutes.

The two participants who were seated on the top of the desks sat down correctly in the desks and the room became quiet. The way they were seated was very formal, as the participants had sat in rows one behind the other. I wanted to create a relaxed atmosphere as well as encourage interaction among the participants, so I suggested to them that we arrange the desks to

make a circle. As we were in the process of doing so, two more participants walked in and excused themselves for being late. I assured them it was fine because we hadn't started yet. In Kenya, it is typical for Kenyan's to arrive five to ten minutes after the scheduled time.

It was now 10:06 and ten participants, seven women, three men, and I were seated in a circle. I started the conversation by thanking the participants for attending the interview and asked them to introduce themselves, and how they heard about the research. They each introduced themselves by name, area of study, and that they had learned about my research from one of their professors that I had asked to help in recruiting senior level participants.

After the introductions, I informed the participants the purpose of the interview, and handed them a sheet of paper (see Appendix A) that outlined their rights as participants. I informed them that I will be audiotaping the interview and asked whether everyone was comfortable with that, in which all of them responded that they agreed to the recording. I informed them that for the sake of their privacy, I will not refer them by name but rather I will assign them an alphabet letter, in which they will lift up to show me before they can answer a equations.

I laid out the protocol for the interview by informing the participants that I had a series of questions that I will ask one question at a time. I will give time on each question for everyone to get opportunity to answer it. I stimulated participation by informing the participants that there was no wrong answer to the questions, and everyone was highly encouraged to participant. After I laid out the protocol for the interview, I pressed the audio to record and, while reading from my laptop I embarked on asking the first question.

This section will present each question asked to the focus group and the themes that emerged from the group's responses.

Motivation for use of CBIT

The participants were asked to talk about their perceptions regarding their future supervisors' expectations (question #1) of them to use CBIT as well as their peers' (question # 2) use of CBIT, and how those perceptions might inform their intentions of using CBIT in their future teaching practices. The responses were mixed. For those who were concerned about the expectations of their supervisors to use CBIT, they were motivated by job security. For instance, participant (A) asserted that, "If the principal of my school finds a candidate who can use educational technology better than me, I'm certainly sure they will replace me with that person who can effectively use technology better than me." This view was parallel to observation from participant (C), which indicated, "… we all know how headmasters [school principals] like to take charge because they have power to fire and hire anyone, so if you have technology skills, you have a good chance of keeping your job." Another participant (J) agreed with that view by observing that "the work of headmaster is to promote student performance, and if you are good in technology, the headmaster might recognize your efforts." These pre-service teachers were primarily concerned with facing unemployment if they chose not to adopt CBIT in their teaching. The risks were too high to not consider its adoption.

Peers, too, motivated participants to consider CBIT training to "get ahead" in the job market and have job security. As observed by participant (E) "I want to be per with my peers in using technology [to teach] because my peers and I are aiming for the same jobs". She added that, "… life is full of competition, and it's the survival of the fittest that will prevail. …given this fact, I'm therefore aiming to be better than my peers in using educational technology" Other participants also referenced the 'trends' of using technology by highlighting that, a trend is a

result of a certain technology being used by many people. In this regard, participant (H) observed that "if there is a trend in the use of technology by my peers this will ultimately motivate me to use that technology too so I can remain relevant." The responses particularly indicated that some participants' intention to use CBIT was motivated by consideration of their colleagues whom they believed were their competitors, which included keeping abreast of new approaches.

For many of the participants, their appreciation of technology and their desire to advance their knowledge and practice in the classroom were the primary motivation for learning CBIT for teaching. As participant (B) indicated, "knowing how to use computers will earn me a plus from my potential boss …but my motivation to use computers comes from my love of technology". Participant (E) concurred with this view by asserting that "I mainly learn to use educational technology because I believe it is beneficial to learning, but I'm sure my supervisors will appreciate that I can use CBIT to teach" Participant (G) asserted that, "I am motivated by the need to develop a variety of teaching techniques. As you know, the continuation of using the typical teaching methods can be boring to the students to a point where by it does not encourage students to learn. …I believe if teachers integrate technology in teaching, students can enjoy the learning process." The minimal role of peer social pressure was also observed by participant (D) who asserted that, "I don't think I consider my peers when deciding to learn how to use technology, I just do it because it is beneficial to me" These statements showed that motivation to adopt CBIT for this segment of participants did not originate by in large from the expectation of supervisors nor from perception of their peers, but rather their intention to use CBIT was driven by other factors such as the commitment to master varying pedagogical approaches, their interest in technology, enhancing their students' learning outcomes, and their own pedagogic philosophy.

In asking about the supervisor's and their peers' role in intentions and perceptions of CBIT use in their future classroom, participants reported both extrinsic and intrinsic motivation. Extrinsically, job security or the threat of not getting a job or being "let go" because they might find someone who is more proficient in CBIT use, was a concern. Intrinsically, many thought that CBIT use was beneficial to learning and wanted to stay abreast of its possibilities.

The digital divide

The third interview question probed the participants to describe their perceptions and intentions of CBIT use as a result of what was going on in the context of Kenyan society. This explored pre-service secondary school teachers' perceptions of existing social expectations to use CBIT, and in what ways those perceptions had an impact on their intention to adopt CBIT in their future teaching practices.

Participants observed the increased use of technology by the Kenyan society in various sectors, such as banking, accessing government services, and social media. Participant (I) stated, "I believe that the society has really embraced technology. For example, look at how the President is pushing for the e-service of Government [electronic services], and also his pledges to provide a laptop to each child enrolled in standard one [first graders] …I think the fact that people voted for him because of those manifestos means that the society is aware of the of the benefits of technology". Commenting on the same point, participant (J) asserted "… isn't it that the reason why the current [government] administration is calling itself 'digital government'?" This observation indicated that the participants believed the recent exposure to technology in Kenya has resulted in the society placing high value in the use of technology, even by those parents that are themselves not savvy with using technology. As posed by participant (A) "…

what parent would not want to see their child being able to use technology?" Participant (D) gave equivalent reflection by observing, "I think in the past, parents didn't really care because basic things like electricity at school was a problem. But now, I think the ongoing electrification of all primary and secondary school gives the parents the impetus to expect teachers to have skills to use technology" The majority of participants believed that government institutions reinforced the need for teachers to have CBIT training, as every facet of the business world used technology and children needed to be prepared to function in a technology-laden context. Even though the use of technology is increasing in Kenya, especially for business use, some participants noticed this was creating a digital divide due to inequity in resources: leaving the poor behind, who still need basic needs met. Participants noted the issue of social hierarchy in Kenya. As asserted by participant (E), "… the majority in the poor lower class has different views regarding the whole thing of educational technology. …they perceive the investment on educational technology as a misplaced priority because the government can use those resources to provide social safety nets for other basic necessities such as food, medicine, and housing." The same participant, also indicated that, "… the middle and upper class members of the society can afford to buy computers for their children, therefore they must have higher high expectations for teachers to have skills of using computers to teach." Participant (C) also believed that there were divergent views among the Kenyan society but insisted that the divergence was geographical. He observed that "… I'm sure communities in the far-flung rural areas would demonstrate less urgency on teachers' use of CBIT compared to those that live in urban area".

Socioeconomic class was a major factor determining priorities, according to the participants. Studies on this phenomenon point to that a high perception of social expectations has an effect on individuals' decision to perform a behavior (Niederhauser and Perkmen, 2010).

While it was important to prepare Kenyan citizens to function in a technology-infused business context, it was also critical to assure that the basic needs of Kenyans were addressed. Participants were concerned that teaching with technology was not being emphasized without attention to the basic needs of Kenyan society. This would be a clash in values. It was evident that two participants believed that a segment of the society did not have high expectations for teachers to adopt CBIT because those priorities targeted middle to upper class audiences. It was also clear that the participants believed sooner or later, the Kenyan society will require teachers to have skills needed to teach using CBIT.

Improvement of teacher training programs: Access and curriculum

The participants were asked to describe their perceptions regarding how the teacher training program was preparing them to use CBIT (question #4) and what shortcoming they believed needed improved in order for the teacher training programs to provide them with the skills to use CBIT in the future (question #5).

A look at the responses from all the participants showed a pattern of sentiments indicating that the teacher preparation program was inadequate in preparing them to use CBIT when they start their teaching careers. One issue was not receiving adequate training within the teacher education program, in essence, the curriculum was inadequate or incomplete. For instance, participant (B) indicated that the curriculum for teacher preparation program had not prepared her to use CBIT. She observed "…I am forced to take other computer courses outside of the teacher training curriculum in order to learn how to use computers." Participant (G) was quick to support that statement by observing "…me too I had to take computer 'packages' from another school outside of the University". By computer packages, this participant was referring

to the certificates offered by private polytechnic centers. As the name suggests, the packages refer to learning how to use basic computer applications such as Microsoft Office applications and QuickBooks. In the end, if a pre-service teacher wants to incorporate more CBIT for classroom teaching, he/she must find supplementary programs outside of the college of education: maybe even outside of the institution. Nevertheless, this training does not include acquiring the pedagogical application of those computer skills.

The issue is not only access to appropriate curriculum for training but also access to computers. Given my experience of attending primary and secondary school in Kenya, I was aware that most people do not own computers and that the education system was at the beginning stages of integrating technology in education. Participant (F) stated, "most of the courses we have been taking are orally without interaction with computers. In other words, we learn about computers rather than learn with computers." Her statement implied that most of the courses she had taken approached the use of technology from a theoretical sense but not by having extensive practice of using those computers. In the interview focus group, only three out of the ten participants told me that they owned a computer. , The use of technology in Kenya is at the beginning stage in many sectors, including the teacher training programs. The participants indicated to me that their teacher training program did not have computers that could be loaned to pre-service teachers. The participants told me that they had to rely on the computer labs used by the general students of the university, thereby limiting their use of technology. The majority of the Kenyan population do not have much computer access. Even if their teacher training had provided them with the relevant curriculum to use CBIT in the classroom, they would have very little opportunity to practice the skills and feel confident employing them in the classroom.

There was a mismatch with what was promoted by the education program—CBIT use in the classroom— and the use of it by the faculty who teach these classes. Participant (E) observed, "…you have to understand that this is Kenya, even the professors that I take classes from, most of them do not use any technology to teach...how then can I learn how to use technology to teach?" With a body language and a voice that communicated frustration, Participant (F) commented, "I will walk out of here knowing that computers can be used to teach, but I will not have any practical knowledge of how to use computers to teach." Even though the teacher preparation curriculum stipulates that pre-service teachers are required to take two computer courses, it was evident that participants did not perceive their training had adequately provided them with the skills to use CBIT to teach.

The participants' responses suggested various measures that can be taken to improve effective delivery of technology skills by their teacher-training program. The majority of these suggestions underlined the need to reform teacher training programs in order to facilitate an effective learning of using CBIT teach. In particular, the prominent feature among the suggestions was reforming the curriculum of teacher training programs. For instance, participant (A) insisted on the need for teacher training programs to formulate specific courses that targets to equip teachers with the skills of using CBIT when he observed that "…most of us have only taken two computer course, one is the general introduction of using [basic] computer applications [such as] word, email, and internet… and the other is introduction to teaching using computers; where we learn how to present using PowerPoint, create spreadsheets, and maybe charts. That's it" He continued to make the point that "… adding courses that gives us opportunity to extensively practice could be helpful. …I self-taught how to use computer, but I know many students out there who are struggling just to use Microsoft Word". This comments

suggested that this participant perceived changing the curriculum as part of reform needed in the teacher training program.

Easy access to technology also featured as possible solution to equip pre-service secondary school teachers with the knowledge of using CBIT to teach. Participant (I) suggested that teacher training programs should provide pre-service teachers with access to computer labs that have the necessary teaching software. She observed "… computer labs here sometimes get so full to a point that we have to wait in line to use the lab computers". She then reiterated an earlier statement made by participant (F) about the need for teacher training programs to move beyond theoretical approach of using technology, into practical aspect of using those technologies to teach.

While some participants believed the change should come from reforming the teacher training program responses from participant (B), (D), and (G) alluded to the idea of allowing the job market to dictate teachers' use of CBIT. Their arguments revolved around the need for other entities, outside of teacher training programs, to spearhead the use of CBIT by teachers. For instance, participant (B) observed that "… make the use of CBIT mandatory for all teachers employed by the government." Participant (G) supported this assertion by suggesting that all schools that employ teachers should require them to be able to use CBIT to teach. He observed that, "the university already has many financial problems so it will take a long time before the university could buy enough computers… That's why I took computer packages, and I know that's what a lot of students do" His point seemed to shift the responsibility on pre-service teachers to find other channels where they can learn how to use computers. It should be noted that this approach would however place financial responsibility on students to attend polytechnic

schools. All of these statements had a common theme that other entities outside the teacher training programs should mandate teachers' use of CBIT.

Analysis of participants' opinion on the effectiveness of teacher training program in providing them with skills to use CBIT, as well as their suggestions on what could be done to better equip them with the skills to use CBIT highlighted three important factors. One it showed that reforming teacher training programs remains a significant factor. This reform would include reforming curriculum in order to include more course with pedagogical approach for integrating technology teaching. Second, there is a need to provide funding for the overall technology infrastructure of teacher education in Kenya. This would include providing students with an effective access to computers so that they can practice and have adequate exposure to using computer. Somekh (2008) observed that exposure to classroom environments that use technology has the potential to influence future teachers' beliefs about the value and complexity of using instructional technology on their own teaching practices. Third, factor is allowing the job market to force teachers to acquire skills of using technology. This idea is not a farfetched conundrum. Given that majority of the participants indicated that they acquired the basic skills of using computer either by self-taught or taking courses outside of teacher training programs, this idea might be a plausible solution for learners to first acquire basic skills of using computers then advance those skills in the teacher training program. Nonetheless, this approach has its own challenges as it places the responsibility on the individual. By doing so, it not only adds financial burden on the individual to acquire computer skills independently, but it also undermines the sole objective of teacher training programs, which is to equip teachers with the skills needed to effectively teach.

Technology benefits student learning, but filters/limits are necessary.

The sixth interview question asked the participants how they perceived the use of computers in the classroom. The responses for this question indicated that some participants had a favorable view that technology had positive benefits on student learning, while others believed that the use of technology had a negative impact on student learning. Participant (H) highlighted the favorable view by asserting that "… I believe the use of CBIT makes it easier for teachers to prepare lessons and therefore gives them more time to interact with students". This favorable view was also echoed by participant (C) who observed that, "using CBIT is positive because it can give both teachers and student opportunity to access information at any time". He added that, "students benefit from using CBIT because they can collaborate with other students as well as access information from a continent away". Another factor that was commonly mentioned was that "we live in a digital age" meaning that students will have to learn how to use technology in order to remain competitive in the global market. This statement coincides with responses from the first two questions, in that it is important for the individual and the Kenyan society to be competitive to participate in the local and global job market. All of these statements reflected that these participants believed using CBIT had an overall positive effect on student learning.

There were some participants that casted a negative view regarding the role of CBIT in students learning. Their negative views were mainly clustered on the concern for students misusing technology. For instance, participant (E) was concerned that unsupervised use of technology will fracture the African morals held by the students because it gives them opportunity to access adult sites. In addition, participant (I) observed that, "increased use of technology in the classroom makes students to become lazy, as well as it breeds cheating among students." This negative view of computer use by learners was echoed by participant (F) who

asserted that "if you give students computers with Internet, all they will do is 'Google' for answers, which in turn will make them lazy." All of these negative views highlighted to an important factor that some pre-service teachers were unaware of the filtering technology that restricts students to only access appropriate online materials. These responses clearly show that ethical and moral issues dominated the negative association of using CBIT in the classroom. More importantly these negative perceptions veiled the ethical issues that are experienced by educators around the world in the process of integrating computers to learning.

The responses from this question indicated that some participants perceived the use of computers in the classroom was beneficial to student learning, while others perceived it to have a negative effect. Among the theme that emerged from the responses was the concern about laziness and access to inappropriate material online by students. Although technology to filter web content exists, participants' comments raise an important factor about the funding of such technology in Kenyan schools.

Limitations on the findings

While due diligence was followed to ascertain that this study adhered to accepted norms of research, there are some limitations on the findings reported. For instance, the findings are based on self-reported evaluation of behavioral factors that influence CBIT. The findings on this study are also limited because they do not make comparison between on service teachers and pre-service teachers in understanding of factors that influence the use of CBIT by secondary school teachers. Lastly, the findings on this study have limitations because the data was collected from a single university. Even though the particular university had a diverse body of student from all 47

counties in Kenya, more research need to be carried on other different universities in Kenya and data be compared.

CHAPTER V

DISCUSSION

This study explored and identified sociocultural and behavioral factors that influence adoption of computer-based instructional technology (CBIT) by secondary school teachers in Kenya. As the Kenyan Ministry of Education embarks on the initiative to digitize secondary school curriculum, there seems to be an absence of clear strategies that addresses internal factors that influence secondary school teachers to adopt those technologies once the external factors, such as infrastructures, are in place. This chapter discusses the impact of this study based on the findings of the three methods used to collect data (quantitative survey questionnaire, qualitative survey questions, and focus group interview). The discussion is sequenced based on the research questions that guided this study. It first provides an in-depth examination on the significance of this study based on the findings from the data. This discussion is then followed by various recommendations for practices based on the findings of this research. Lastly, the challenges encountered during the process of this study and recommendations for future research are discussed.

Significance of the study

The significance of this study is established by exploring factors that influence secondary school teachers to adopt CBIT in Kenya.

The discussion on the implication of this study is guided by the central question of: what factors have a direct influence on pre-service secondary school teachers' intentions to adopt CBIT when they start teaching? This question is addressed by examining the findings from regression analysis in conjunction with findings from qualitative data. Findings from the regression reduced fit-model determined that subjective norm, superior social influence, perceived behavioral control, computer self-efficacy, facilitating conditions, and computer efficacy all had a significant direct prediction to secondary school teachers' use of CBIT. The goal of the present discussion is to go beyond these predictions and explain the significance in the context of education practices in Kenyan.

Findings from the quantitative and qualitative data highlighted three critical areas that require attention if CBIT use is to be integrated in the Kenyan secondary schools. Areas for improvement include: recognizing the role of sociocultural factors that influence teachers' adoption of CBIT; reforming of teacher education curriculum; and developing positive narratives that will change teachers' perceptions of Kenya's capacity to integrate CBIT in secondary education. Highlighting these factors is important because they point to matters that the Kenyan Ministry of Education must address in their attempt to implement the use of digital curriculum in secondary education.

Recognizing the Role of Sociocultural Factors That Influence Teachers' Adoption of CBIT

The findings from both the regression fit-model and qualitative themes reveal that issues affecting the use of CBIT in Kenya reach beyond the given roles and goals of educational specialists and practitioners and delve into the complex interrelationships between school, society, education, and culture. The findings point to sociocultural factors as the common

denominator that influences secondary school teachers to adopt CBIT in Kenya. These sociocultural factors are conceptualized in this study through a sociocultural lens. This approach was considered because, not only did the findings from the regression fit-model indicated that sociocultural factors dominated the prediction of participants' intention to adopt CBIT when they start teaching, but also because this approach is ideal in offering a perspective of influential factors from a larger dimensions of the Kenyan society.

Research of socialization effects on a behavior has long shown that the perception of how our friends, family, and peers, expect us to behave has a great impact on our intention to behave in a certain way (Hofstede, et al. 1994). The findings from the regression fit-model rightly implied that the variables that are rooted in the area of sociology (subjective norm, social outcome expectations, and superior social influence) each had a significant direct prediction on respondents' behavioral intention to use CBIT.

Subjective norm: Subjective norm is a sociocultural factor that is generally concerned with an individual's opinion about what "important others" believe the individual should do (Ajzen, 1991, p. 188). An Individual's intention to perform a behavior is not solely based his or her deliberation, but rather their intention is also shaped by the opinion of others, particularly those others the individual believes as better informed. In this study, the construct of subjective norm evaluated an individual's motivation to comply with using CBIT because they believed people important to them expect them to adopt this technology. The idea of 'important others' is a key feature to the factor of subjective norm because items on the survey asked the participant to rate the extent to which important others would approve or disapprove of performing a given behavior. Since the definition of important others could range widely, two approaches, (specified

'*important others'* and unspecified '*important others'*) were used to unravel the ways that subjective norm impacted secondary school teachers' adoption of CBIT.

In the first approach, 'important others' was examined as a general construct, with respondents left to determine what 'important others' means or whom it includes. Findings from the regression fit-model indicated that the general 'unspecified' subjective norm was a reliable factor in predicting pre-service secondary school teachers' intention toward using CBIT. The findings did not show a significant gender difference between male and female perception of subjective norm. Nonetheless, age differences seemed to influence respondents unspecified subjective norm, with younger respondents expressing a stronger perception of 'important others' influencing their intention to use CBIT.

The significant prediction that subjective norm has toward participants' intention to adopt CBIT is an indicator that this social factor has an influence on secondary school teachers' decision to adopt CBIT. Ajzen (1991) points to a general rule that the higher the scores of subjective norm with respect to performing a behavior, the stronger should an individual's intention to perform the behavior under consideration.

In the second approach, specific referents within 'important others' were examined using both qualitative and quantitative data. These specific referent groups were superior social influence and peer social influence.

Factors that motivate the use of CBIT: Superiors as a specific referent group was examined in this study as the degree to which pre-service secondary school teachers intend to use CBIT because they perceive that people superior to them in the teaching environment expect them to use CBIT to teach. As reported by many prior studies, influences from people with authority over subordinates can have a profound effect on individuals' adoption of technology

(Aydin and Rice, 1991; Compeau and Higgins, 1995; Huang and Chuang, 2004). In this study the regression findings from the regression fit-model revealed that the factor of superior social influence had a significant direct influence on participants' intention to adopt CBIT for classroom teaching. In the context of Kenya, this prediction suggested that educational leaders and administrators play a significant role of generating influential subjective norms that enhances the likelihood of secondary school teachers adopting CBIT.

The qualitative findings showed the factor of superior social influence to directly, as well as indirectly motivate participants' decision to acquire skills needed to teach using CBIT. In the direct form, the interview data showed that participants were concerned about pleasing the supervisor to ensure job security. As one participant indicated in the interview, "I have better chances of getting a job and retaining that job if I can demonstrate to my supervisors that I am good in using computer to teach." Indirect contributions of superior social influence mainly revolved around the participants' view of the supervisor being influential as a result of status, but not the driving motivator to adopt CBIT. Rather, these participants' responses pointed to their intention as driven by intrinsic factors, such as the love for technology and recognition of the role of technology in the modern society. The examination of the role of the supervisor in teachers' intention to adopt of CBIT underscores the great need to incorporate school principals and other educational opinion leaders as agents that *empower* secondary school teachers to adopt CBIT. Since some participants valued supervisors' status but were also motivated by other intrinsic factors, I use the term *empower* in this discussion to imply that supervisors should strive to form an alliance with, and gain "buy in" from, the teachers to integrate computer technology in education. As Rogers (1995) observes, when well-informed opinion leaders communicate

their approval or disapproval of an innovation, the majority in the society responds by adopting or rejecting to adopt that innovation.

Peer social influence: Studies of peer influence on behavior have long shown that an individual's motivation to perform a behavior is guided not only by an his or her attitude toward that behavior, but also by his or her perception of the beliefs held by other social members (Rimal and Real, 2003; Ajzen and Fishbein, 1980; Asch, 1951). Through interview data, the present study examined peers as a specific referent group that persuaded pre-service secondary school teachers to acquire the necessary skills to use CBIT in the future. The participants were asked about the role of their peers in their intention to use CBIT to teach. Findings from the focus group interview revealed that the factor of peers motivated participants to learn CBIT in order to "get ahead" in the job market and maintain job security. As a result of their peers, they are reminded of the competition to acquire a job. Evaluation of these statements indicated that, even though the role of peer pressure was not entirely influential, it still had an effect on participants who indicated that their deliberation to adopt CBIT to teach in the future was swayed by consideration of their peers. Either they were persuaded to adopt CBIT to teach because their peers were or they were motivated to use it because they were concerned about competition from their peers for employment.

The trend of using technology among peers was another factor that emerged as influential on participants' intention to adopt CBIT. The label of technology trend is considered here as the innovative ideas that are adopted by majority of teachers to incorporate the use of computer technology in teaching. Interview findings showed that some participants were motivated to learn using trending technology in order to remain relevant in the completion with my colleagues for job market. The participants' perception of trends as a motivating factor deserves attention

because it underlines the significant roles that peers have on their colleagues' resolve to adopt CBIT. From a practice standpoint, there is a need to develop a comprehensive mechanism that promotes easy diffusion of innovative ideas of using computers as a pedagogical tool in the context of Kenya. The mechanisms could include measures such as creating collaborative platforms where teachers can learn and share strategies of using technology to teach, as well as creating incentives for teachers who develop and promote creative ways of teaching.

Social outcome expectations*:* Besides the aforementioned referent people (superiors and peers) who influence pre-service secondary school teachers' intention to adopt CBIT, the social outcome expectations within the general society also plays a key role in individual's acceptance or rejection of CBIT use. Social outcome expectations are part of an interpersonal social relationship that influences an individual's motivation to perform a given behavior (Ajzen, 1991). The social pressure to perform a certain behavior can be experienced in many forms depending on the context (Ajzen, 1991). The present study used interview data from the focus group, as well as open-ended questions embedded on the survey to examined outcome expectation beliefs with regard to integrating CBIT in teaching practice.

While the general construct of subjective norm examined specifically the role of referent people, the factor of social outcome expectations examined the degree to which participants intend to adopt CBIT in order to achieve the social status and recognition bestowed to them by the Kenyan society. The qualitative findings showed that some participants believed there was pressure from the Kenyan society for teachers to have the skills needed to teach using computer technology. These findings mainly pointed to the ongoing social transformation in Kenya that is a result of rapid increase of technology use in various sectors such as communication, banking, farming, and access to some government services. As observed in chapter two, Kenya is

experiencing a technological leap. For instance, Internet penetration has grown from 3 million users in 2010 to 26.5 million users in 2014. That is a 58% Internet penetration, compared to 42% world-wide Internet penetration (Kenya Bureau of Statistics, 2015 economic survey; Zab, 2015). This increase translates to most Internet users having high speed Internet as their first experience of accessing the World-Wide Web. The same can be said about communication technology, whereby 70% of the 36 million owners of phones have mobile phones as their first phone to own (Kenya Bureau of Statistics, 2015 economic survey; Zab, 2015). The mobile phone ownership reveals that a huge segment of the Kenyan population leaped the landline wired phone technology. As technology integration continues to rise in the Kenyan society, Kenyans have become convinced that there should be more technology used in the classrooms, putting pressure on teachers and teacher educators to seek more training. Accordingly, the participants' view that there exists a high social expectation for teachers to use CBIT is based on the ongoing proliferation of technological trends in Kenya.

While some participants' rationale of 'high social expectations' was straight forward, other participants perceived social expectations as a more complex issue. Findings from the open-ended survey questions indicated that some respondents believed that there is a segment of Kenyan society that has low expectations on teachers' adoption of CBIT because they believe teachers underperform when they use technology to teach. The commonly mentioned item by the respondents was that some social members believe technology automates things, which leads teachers to be 'lazy' as they automate their teaching responsibilities. This perception could be due to ignorance about the possibilities of technology use in the classroom or simply the lack of up-to-date technology training and resources for teachers. Rogers (2010) diffusion of innovation theory explains how over time, an innovation idea gains momentum and diffuses across the

society. According to this theory, everything new to a person is a new innovation, and that it takes time for some members of the society to develop favorable opinions about that innovation. Considering this theory, there is still a large proportion of the society that view CBIT as a new innovation, and therefore have not developed favorable views toward it, mainly because the benefits of using CBIT are yet to be widely apparent in Kenya. Delving into "the element of time" found in Rodgers' (2010) diffusion of innovation theory, the socially negative view of CBIT will change with time, when the benefits of using educational innovation become apparent.

Gaining support from the social members with skeptical view of technology use in teaching will be essential in an effort to accelerate the use of computer technology in the classroom. To achieve this, the Kenyan Ministry of Education will need to highlight the benefits that the Kenyan society in large will gain by integrating technology in education.

The participants' perception of social outcome expectations for teachers to be competent in using CBIT to teach unveiled an important factor of a digital divide as a result of clash in values. The findings from qualitative data showed that some participants believed there were variations in social outcome expectations that are defined by economic status across social groups. This is because the participants, who indicated that there were divergent views on social expectations, also pointed out that they believed those with access to technology will have favorable expectations compared to those in the lower social class. As summed up by a participant on an open-ended survey question, the majority of society is less concerned about the use of technology to teach and more concerned about what to eat for the next meal. In addition, the digital divide was also present with the lack of computer access to a large segment of the population. This view highlights the fundamental issue of alleviating extreme poverty first and foremost and leveling resources, so that everyone in society is ready to teach and learn with the

latest technology. The digital divide features prominently in the challenges the Kenyan government must overcome in integrating technology in Kenyan education.

The Kenyan government has demonstrated its commitment through education to provide more technological opportunity to the population as a whole. An ongoing pilot program to provide laptop to every student entering first grade by the year 2017 demonstrates an example of this commitment. In this context, Kenya is on the right track in regard to reducing the gap in the digital divide. Nonetheless, much still needs to be done to provide premium education as part of the nation's effort to break away from poverty.

Understanding sociocultural factors that influence secondary school teachers to adopt CBIT is important in addressing challenges that inhibit secondary school teachers to adopt CBIT. It is clear from the discussion above that changing secondary school teachers' perceptions so that they comply with adopting CBIT will require actions, such as developing appropriate subjective norms, fostering peer learning, increasing supervisors' involvement in the integration process, and addressing extreme poverty that exclude the low social class from realizing the academic benefits of learning through CBIT.

Technology use and the perspective of sociocultural moral view

The sociocultural factors that influenced secondary school teachers to adopt CBIT were based on beliefs and values. Participants believed that more technology training would make them competitive workers in the global market, but they also believed that technology would expose young people to adult websites and "Googling" answers, consequently breaking down the moral fiber of Kenyan society. There is a need to recognize and give more attention to moral concerns of the community.

In sociocultural terms, the concerns of moral issues that emerged from the study are valid because traditional values play a significant role in the existence of many African societies. As Gyekye (2011) observes, the ethics of much of African society is rooted in the beliefs about what is right and what is wrong, and these morals are the fabrics that have held together those societies for many generations. African morals inform patterns of behaviors that are considered by members of a society to bring harmony (Gyekye, 2011). In this regard, secondary school teachers' that hold a negative attitude toward the effects of CBIT to learners may refuse to adopt them if they perceive that those technologies go contrary to their moral position. These concerns are not geographically limited to Kenya. In the United States, the issue of ethical use of computers has been addressed by implementing filtering technologies to prevent students from accessing certain websites. In this respect, the Kenya Ministry of Education should invest on existing technologies that filter Internet contents that the majority of Kenyan society deems to interfere with the moral ground of the general society. After these measures are in place, teachers' perceptions on moral concerns should be addressed through educational channels, such as teachers training programs, workshops for professional development, and social outreaches. These professional developments should not only provide teaches with the pedagogical scope of using technology to teach, but also to assist teachers in developing a culture of best practices of using technology to teach.

Social capital effects of ranking secondary schools

Another finding of the study that fell under the realm of sociocultural factors is the issue of inequality brought by unequal distribution of education resources. As mentioned in chapter 2, Kenya has a secondary school system that funds schools according to hierarchical ranks of

national schools, provincial schools, and district schools. The national schools admit top-performing candidates based on their exam outcomes of the Kenya Certificate of Primary Education (KCPE). These schools get the most funding, followed by provincial schools, then district schools. This study aimed to look at whether there was a relationship between the type of secondary school that a participant attended and their self-reported computer proficiency level. The findings from a cross-tabulation analysis indicated that the participants that attended national schools disproportionally rated their computer proficiency as average and above, compared to those who attended district schools. These findings confirmed Richardson's (2003) observation, that pre-service teachers' perception of educational technology is influenced by the "deep-seated beliefs" about learning that were developed from their experience as students.

There has been a recent development to the issue of distribution of educational resources since Kenya promulgated a new Constitution in August 2010. As of 2013, the hierarchy of secondary schools was devolved to county (state) governments. The devolvement of secondary school ranking has, however, not mitigated the problem because counties have retained the same hierarchical system when funding schools. Numerous studies that examined the relationship between distribution of educational resources and student performance hold a consensus that distribution of educational resources has an effect on academic outcomes (DiPrete and Eirich, 2006). In this view, the real solution is to accord equitable distribution of educational resources. Doing so not only will provide learners with equal exposure to educational technology, but it will also provide them fair opportunities of climbing the social ladder.

The Issue of Teacher Training Programs

A successful integration of CBIT to secondary education requires an evaluation of teacher training programs because they are the core apparatus of equipping teachers with the required skill to use CBIT. The critical function and content of teacher training programs features prominently in this study because findings point to a bleak picture that teacher training programs in Kenya are not providing adequate preparation for future teachers to use CBIT. Curriculum issues seemed to dominate this view. As one participant asserted, "there are just not enough courses that teach us how to use computer." Another respondent indicated that "…yes, they teach you about the theory of using computers to teach, but there is never class-based practices of how to effectively use those technologies." This assertion was echoed by another participant who argued, "they teach about computers, rather than teaching with computers". Regarding the acquisition of computer skills, the majority of participants indicated that they have had to take computer courses from private polytechnic institutes that have sprouted up across the country in the recent years. Based on these findings, it is reasonable to conclude that instead of equipping future teachers with the skills of using CBIT, the current curriculum of teacher training programs in Kenya seems to leave the responsibility of learning how to use CBIT to the teachers.

This approach is problematic for various reasons. Not every student can afford to attend private polytechnical school in addition to the burden of paying to attend a teachers training program at the university. This group of students, therefore, ends up graduating from teacher training programs without the necessary skills of using technology, such as computers, to teach. Additionally, computer packages taught at polytechnics only provide what Cuban (1998) calls "unimaginative" knowledge of how to use various computing applications, without exposing

students to modern technological mechanisms that foster cognitive behaviors. In other words, the knowledge gained by taking a polytechnic computer courses is basic computer knowledge not specialized knowledge for future to use computer as a pedagogical tool.

Integrating the use of educational technology in Kenyan involves challenging the boundaries of the educational structures that have traditionally facilitated learning. As mentioned in previous chapters, Kenya's learning technology has historically been the chalk and blackboard. This mode of teaching is still prevalent in many teacher training programs. The use of CBIT by teachers requires extensive training on the various pedagogies. As observed by Hennessy, Harrison and Wamakote (2010), "the successful integration of ICT into the classroom depends on the ability of teachers to structure their learning environments in non-traditional ways, merging technology with new pedagogies". This approach requires teachers to develop a very different set of classroom management skills that include finding innovative ways of using technology to enhance learning, encourage technology literacy, and deepen knowledge creation.

In the crosstabulation between participants, self-reported computer anxiety was examined in relation with their perception of computer use proficiency. Findings from this crosstabulation suggested that participants who scored high on the construct of computer anxiousness also indicated a low proficiency of using computers. As discussed in chapter 2, various factors contribute to technological anxiety. Key among them is the lack of environment that exposes an individual to those technologies. On discussing social cognitive theory, Bandura (1999), identifies the great influence of environmental and observational learning on human adaptation and change of behavior. Following this view, it is logical to conclude that more exposure and guidance with computer use will be helpful in reducing computer anxiety. Therefore, there is an

imperative need for teacher training programs to cater to teacher-training environments that adequately prepare future teaches with the skills to use CBIT when teaching.

The role of teacher training programs and the preparedness of pre-service secondary school teachers to use technology were also examined by cross-tabulating results from the construct of computer self-efficacy with participants' self-reported proficiency of using computers. Findings from the data suggested that participants with high computer self-efficacy tended to rate themselves high on their computer proficiency level. Conversely, participants who scored themselves low on self-efficacy of using computers, also rated themselves with a low proficiency in being able to teach with computers.

Numerous studies have shown self-efficacy to influence an individual's choice of whether to engage or not to engage in a behavior (Bouffard-Bouchard, 1990; Sam, Othman, & Nordi, 2005). The greater people perceive their self-efficacy to be, the more active and longer they persist on their effort to mange the situation (Bandura, 1986). Miura (1987), likewise, suggests that self-efficacy may be an important factor related to the acquisition of computing skills.

A key element of developing self-efficacy is mastery of experiences (Steyn and Mynhardt, 2008). In this regard, teacher training programs are the first point of contact where secondary school teachers can master the skills of using CBIT to teach. It is therefore imperative for teacher training programs in Kenya to provide training environments that are conducive in aiding future teachers to develop strong self-efficacy related to using CBIT.

The discussion above clearly shows that teacher training programs play a critical role in secondary school teachers' adoption and use of CBIT. It is in the backdrop of these findings that the present study further probed the participants' perceptions of possible solutions for the

inadequate acquisition of skills provided by teacher training programs. The three themes that emerged from the open-ended survey data were: “provide professional development”, “increase access to technology”, and “provide availability of support network”.

The theme of professional development concurred with the above discussion about increasing teachers’ exposure to educational technology. In particular, professional development would be more beneficial to teachers who are already in the field teaching since it is impractical to require them to return to the university to learn classroom technology use. The emerging theme of professional development was dominated by participants’ responses that highlighted the various means that technology skills could be enhanced. Among the solutions proposed by respondents included: providing more training on how to use CBIT through workshops, giving students opportunities to practice using CBIT, and reforming the curriculum to include more computer courses. We live in an ever-changing world of technological advances. Research has shown that students’ learning and outcome achievement increase when teachers engage in professional development focused on skills to address students’ major learning challenges (Mizell, 2010; Borko, 2004). In this regard, an effective integration of CBIT technology will require educational leaders in Kenya to institute a series of seminars, workshops, and other techniques that have the potential to enhance teachers’ skills of using CBIT to teach.

Participants recommended that workplaces require their workers to be technologically literate and teacher training programs should be required to train pre-service teachers with up-to-date technological methods for the classroom. These two recommendations are intertwined, as Kenya must be technologically literate in order to be competitive in the global economy. That is, as Kenya tries to attain its economic blueprint engrained on the Kenya Vision 2030, the country will be required to increase its participation in the global market. Global markets, on the other

hand, continue to require a technology-wise sophisticated labor force. In this viewpoint, reforming teachers training programs is critical if teachers will be entrusted to produce this workforce with technology skills. In fact, one could argue that computer literacy in Kenya may soon be a prerequisite skill for effective participation in the workforce, and as much a necessity as reading literacy. For this reason, teachers must be well versed in using technology in the classroom. As observed by Brownell and Brownell, (1991), adequately prepared teachers can act as change agents and accelerate the process of meeting students' needs for the Information Age.

Teachers' Perception of challenges facing Kenya:

Human perception plays a significant role of stimulating individuals to interpret and organize their thoughts and experience of the world (Pickens, 2005. p.54). One's perception of technology hardware (Conole, et. al. 2008), and one's perception in relation to environmental factors and control of those factors (Teo, 2010) affects one's use of technology. Strategic challenges face Kenya's effort to integrate technology in secondary education; and what teachers perceive to be those challenges affects their likelihood of adopting CBIT when they start their teaching practices.

I used the regression fit-model used in this study to evaluate the factors that predict participants' behavioral intention to adopt CBIT. Findings from this analysis suggested that participants' perceived behavioral control and their perception about the capacity of facilitating conditions contributed the most predictive power on their behavioral intention to adopt CBIT. The factor of perceived behavioral control represents an individual's belief that they can engage in a given behavior if they can decide at will to perform or not to perform the particular behavior (Ajzen, 991). The conditions that individuals perceive as restrictive are usually a result of past

experiences with the behavior or secondary factors that individuals perceive to reduce or increase the difficulty of performing the behavior in question (Ajzen, 1991; Richardson, 2003). Consequently, it is reasonable to assert that pre-service teachers' perception of barriers that impede the use of CBIT is informed by their 'deep-seated beliefs' about learning that were developed from their experiences as students. Since the use of technology is at the beginning stage of being integrated into secondary education, this means that the majority of secondary school teachers in Kenya have historically lacked the exposure of using technology in the classroom. This is an important factor because these teachers not only lack a frame of reference as they model their philosophy of teaching using computers, but they also lack awareness of recent initiatives that have increased accessibility of educational technologies in Kenya. In other words, they still perceive the limiting conditions that prevented the use of CBIT in secondary education when they were students.

Chapter one of this study outlines the various infrastructure initiatives undertaken by the Kenyan government in the effort to provide technology in education. These initiatives include investment in high speed Internet, electricity in public schools, and an increased availability of computers. While these initiatives are substantial compared to the past, participants' responses from the open-ended survey questions show that those initiatives remain obscure to pre-service secondary school teachers. For instance, the participants were asked to indicate their perception on the main challenges facing Kenya in regard to integrating CBIT. The responses focused on three indicators: deficiency in the areas of infrastructure that fosters the use of technology, availability of support network, and access to technology apparatus. These three indicators are crucial in understanding the challenging factors that pre-service secondary school teachers perceive to impede technology integration in secondary education. As evident from other studies

that have investigated the role of perception in technology adoption, the more resources and opportunities individuals believe they possess and the fewer obstacles or impediments they anticipate, the greater their likelihood to perform the behavior (Ajzen 1991).

Give or take, it is fair to say that perception does not always reflect reality. In other words, what an individual interprets or perceives may be substantially different from reality (Pickens, 2005). This view holds true on pre-service secondary school teachers' perception of external factors that facilitate using CBIT. Both quantitative and quantitative findings from the present study showed availability and access to resources, as the prominent factors that participants perceived to be the greatest challenges facing Kenya's integration of CBIT in secondary education. Nonetheless, the conditions that facilitate the use of CBIT in secondary education are not as grim as perceived by pre-service secondary school teachers. While these conditions are yet to be at the standard of the Western world, they have improved compared to the recent past through various infrastructure initiatives, such as providing electricity to every school in Kenya, increased access of high speed broadband Internet, and purchase of computers for many schools among other initiatives. Indeed, the Kenyan Ministry of Education needs to continue improving infrastructure in order to improve effective use of CBIT. However, this does not mean that one can assume the approach of 'build it and they will come', but rather the approach should incorporate instituting deliberate initiatives to inform a potential teacher about these improvements, and ways of promoting CBIT training that appeal to pre-service and veteran teachers. Effectiveness can be influenced by changing one's perception.

In summary, I have highlighted the dynamics of three areas that most influence the adoption of CBIT by pre-service secondary school teaches in Kenya. Providing a transformational agenda of integrating CBIT in secondary education without changing

sociocultural environment can become another futile activity. The optics of this study suggests that the strategy for integrating educational technology in secondary education therefore should incorporate effective sociocultural changes such as tasking school leadership with the role of garnering social influence through structural support and providing incentives to use CBIT. Since the findings suggest that peer social interaction has an influence on the behavioral intention to adopt CBIT, it would be advantageous for the strategy to integrate CBIT to include initiatives that support collaborative projects among peers of secondary school teachers. Addressing influences related to sociocultural factors would be incomplete without addressing the issues of inequity brought by unequal distribution of educational resources.

In addition, the findings from this study recommend that reforms are needed in the teacher preparation programs to equip future teachers with the necessary skills to use CBIT. This call for reforms is based on the current condition of teacher training programs. As reported by Hennessey, Harrison and Wamakote (2010), "there is an almost universal emphasis on teaching basic skills for software use and information gathering, whereas research indicates that integrating ICT into subject learning is far more effective for educational students" (p.40). Given this view, the reform should therefore include restructuring curriculums of teacher training programs so that it provides contextually appropriate courses content that reflect using CBIT to teach.

Barriers that impede effective use of CBIT need to be addressed. This will require changing teachers' mindsets that perceive existence of inadequate resources that allow effective use of CBIT. This issue of perception can be addressed using various mechanisms, such as media campaigns. Rogers (2010) observed that the mass media is the most powerful tool for spreading knowledge of innovations to a large audience rapidly. In this view, the Kenyan Ministry of

Education should roll out campaigns that aim to foment positive attitude toward integrating technology in teaching. In addition, measures should be taken to provide pre-service secondary school teachers with sufficient classroom field experience that acquaint them with the real world knowledge of using CBIT to teach. Facilitating environment that is conducive to the use of CBIT to teach is also pivotal to changing negative perceptions of using CBIT. In particular, the strategy to concentrate on purpose-based computer labs is becoming obsolete in the 21st century, where the use of tablets and other mobile computing has become prevalence. In this regard, teachers' perceptions will change by existence of provisions that make it convenient to use CBIT in the classroom.

Recommendations For Future Research

Future research would benefit from longitudinal studies that examine how intentions and technological initiatives manifest themselves over time, as participants transition from the teacher training phase into the real world of teaching practices. Additionally, conducting similar research on teachers already in the teaching field and comparing the results with the findings from factors that influence pre-service secondary school teachers is recommended.

Additionally, perhaps a stronger theoretical model could be developed that reflects behavioral intention of pre-service teachers to adopt CBIT in the context of Kenya. In particular, future studies should consider examining how the interaction of attitudinal factors, such as perceived ease of using CBIT to teach and perceived relative advantages of using technology to teach. These approaches will shed light to other factors that influence secondary school teachers to adopt CBIT in Kenya

Conclusions of the Study

The core objective of this study was to understand the factors that influence secondary school teachers in Kenyan to adopt CBIT. This objective was reached through the use of mixed-method research design. The inquiry took into consideration the contextual background of teacher education, as well as factors embedded in the wider Kenyan society. Kenya is a young country that gained its independence in 1963. The Kenyan government has a vision to transform Kenyan into a newly industrializing middle-income country by the year 2030. This ambitious vision came as a uniting social contract after the country had gone through the 2007/2008 Post-Election Violence that brought the worst bloodshed since the country's independence war.

Judging by the current outlook of technology use around the world, it is fair to conclude that Kenya is obliged to have a computer literate population in order to compete in the current global economy. Kenya is working towards reaching the Vision 2030. Nevertheless, it must keep pace. Given this urgency, it is therefore imperative to promote and implement the use of technology effectively. It is hard to think of any other way that Kenya can provide technology skills to the masses except by channeling it through education. With education, comes the role of teachers. While significant strides have been made on the external areas of infrastructure development, this has not been matched with successful strategies of addressing internal factors that might impede teachers' effective integration of technology in education.

Investing in external factors, such as technology infrastructure, is not a 'miracle pill' of getting secondary school teachers to adopt and use those technologies in the classroom. In order to provide teachers with the skills needed to effectively teach, with and about technology, this study has shown three internal factors that require critical attention. The first critical factor is recognizing the role of sociocultural factors that influence teachers' adoption of CBIT. These

sociocultural factors include understanding dynamics of social relations between the superiors and subordinates, peers, and social capital effects brought by inequitable distribution of educational resources.

The second critical factor involves reforming teacher education curriculum. Pre-service and veteran teachers should be consulted to help shape effective teacher training and professional development on the use of technology in the classroom. Murithi & Indoshi (2011) reported that training programs for secondary school teachers in Kenya are ill equipped to train teachers to use Information and Communication Technology (ICT). The findings of this study have reflected the same inadequacy of teacher training programs. Given this outlook, teachers currently in the field have inadequate skills to teach using CBIT. In this regard, this study suggested a key to integrating technology in education is the availability of staff development programs for the teachers already in the field. These programs will be in addition to reforming curricular currently used in teacher training programs.

The third critical factor is developing positive narratives that will change teachers' perceptions of Kenya's capacity to integrate CBIT in secondary education. This internal factor requires investing in essential areas that expose the benefits of using technology to change the negative perspective related to the use of technology in the classroom. As the findings of this study have shown, this includes investing in web content filtering technology in attempt to prevent students from accessing adult websites among other missuses of technology.

Careful examination of various factors addressed in this study has shown that it is undeniable that internal factors play a significant role of influencing pre-service teachers' intention and subsequent use of CBIT in the classroom. Once understood, various strategies can be developed to address these factors. There are many technology innovations that are valuable

to the masses, yet societies reject to adopt them due to poor diffusion strategies. This study has shown that there is a reasonable chance that if concerted effort is not given to address these factors, the dream of integrating technology in education, as part of Kenya Vision 2030, might just remain a pipe dream never to be realized anytime soon.

REFERENCES

Afe, O. (1991). *Teacher Effectiveness: Problem of Definition and Measurement*. Emenogu, B., Okoro, O. et al. (Eds.) Onitsha, Nigeria: Orient Publishers Ltd.

Agarwal, R., & Prasad, J. (1999). Are individual differences germane to the acceptance of new information technologies? *Decision Sciences, 30*(2), 361-391.

Agarwal, R., Sambamurthy, V., & Stair, R. M. (2000). Research report: The evolving relationship between general and specific computer self-efficacy—An empirical assessment. *Information Systems Research*, 11(4), 418-430.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior & Human Decision Processes,* 50(2), 179-211.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, JN: Prentice-Hall.

Anderson, S. E., & Maninger, R. M. (2007). Preservice teachers' abilities, beliefs, and intentions regarding technology integration. *Journal of Educational Computing Research, 37*(2), 151-172.

Anderson, S. (2008). Comparative perspectives on school Improvement. Mundy, K., Bickmore, K., Haydoe, R., Madden, M., Madjidi, K. (Eds.). *Comparative and International Education: Issues for teachers*. (p. 161—188). New York: Teachers College Press.

Asch, S. E. (1951). Interpersonal influence: Effects of group pressure upon the modification and distortion of judgments. In H. Guetzkow (Ed.), *Groups, leadership, and men* (pp. 177–190). Pittsburgh, PA: Carnegie Press.

Aydin, C; Rice, R.E. (1995). Attitudes toward new organizational technology: network proximity as a mechanism for social information processing. *Administrative Science Quarterly, 36*, 219–244.

Bai, H., & Ertmer, P. (2008). Teacher educators' beliefs and technology uses as predictors of pre-service teachers' beliefs and technology attitudes. *Journal of Technology and Teacher Education, 16*(1), 93-112.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191.

Bandura, A. (1986). *Social foundations of thought and action.* Englewood Cliffs, NJ. Prentice-Hall.

Bandura, A. (1999). *Social cognitive theory of personality*. Pervin, L., & John. O. (eds), Handbook of personality (2nd edition). New York: Guilford publications.

Beckers, J. J., & Schmidt, H. G. (2001). The structure of computer anxiety: A six-factor model. *Computers in Human Behavior*, *17*(1), 35-49.

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, *33*(8), 3-15.

Brownell, G., & Brownell, N. (1991). Designing tomorrow: Preparing teachers as change agents for the classroom of the future. *Computers in the Schools, 8* (1/2/3), 147-149.

Bohrnstedt, G. W. (1970). Reliability and validity assessment in attitude measurement. In Summers, G. (Ed), *Attitude measurement*, (p. 80-99). Chicago, IL: Rand-McNally.

Brzycki, D., & Dudt, K. (2005). Overcoming barriers to technology use in teacher preparation programs. *Journal of Technology and Teacher Education, 13*(4), 619-641.

Bunyi, First initial???(1999). Rethinking the place of African indigenous languages in African education *Int. Journal of Educational Development*, 19, 337–350.

Bourdieu, P. (2007). The forms of capital. In Soadovnik, A. (Ed.) *Sociology of Education*: *A Critical Reader.* (p. 83-95). Routledge, NY.

Callava, T. M. (2007). Mainstream social science faculty uses and attitudes toward information technologies: *ProQuest*.

Cameron, R. (2011). Mixed methods research: The five Ps framework. *The Electronic Journal of Business Research Methods*, 9 (2), 96-108).

Chen, J.-L. (2011). The effects of education compatibility and technological expectancy on e-learning acceptance. *Computers & Education, 57*(2), 1501-1511.

Chen, F. H., Looi, C. K., & Chen, W. (2009). Integrating technology in the classroom: A visual conceptualization of teachers' knowledge, goals and beliefs. *Journal of Computer Assisted Learning, 25*(5), 470-488.

Choy, D., Wong, A. F., & Gao, P. (2009). Student teachers' intentions and actions on integrating technology into their classrooms during student teaching: A Singapore study. *Journal of Research on Computing in Education, 42*(2), 175.

Christensen, R. (2002). Effects of technology integration education on the attitudes of teachers and students. *Journal of Research on Technology in Education, 34*(4), 411-434.

Collier, P. (2007). *The bottom billion*. NY: Oxford Univ. Press.

Cogburn, D. L. (1998). *Globalisation, knowledge, education and training in the information age.* Paper presented at the International forum on information and documentation.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.

Creswell, J. (2013). Steps in conducting a scholarly mixed methods study. *DBER Speaker Series*. Paper 48.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297-334.

Conole, G., De Laat, M., Dillon, T., & Darby, J. (2008). 'Disruptive technologies, pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology. *Computers & Education*, *50*(2), 511-524.

Cuban, L. (1998). High-tech schools and low-tech teaching. *A Commentary Journal of Computing in Teacher Education, 14*(2), 6-8.

Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. City, State??? Sage Publications.

DiPrete, T. A., & Eirich, G. M. (2006). Cumulative advantage as a mechanism for inequality: A review of theoretical and empirical developments. *Annual Review of Sociology*, Number? Issue? 271-297.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 982-1003.

Davis, F. D., & Warshaw, P. R. (1992). What do intention scales measure? *The Journal of General Psychology, 119*(4), 391-407.

Duyck, P., Pynoo, B., Devolder, P., Voet, T., Adang, L., & Vercruysse, J. (2008). User acceptance of a picture archiving and communication system – Applying the unified

theory of acceptance and use of technology in a radiological setting. *Methods of Information in Medicine, 47*, 149–156.

Ertmer, P. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development, 47*(4), 47-61.

Eshiwani, G. S. (1993). *Education in Kenya since independence*. Kenya: East African Publishers.

Evans, C., Coon, D., & Ume, E. (2011). Use of theoretical frameworks as a pragmatic guide for mixed methods studies: A methodological necessity? *Journal of Mixed Methods Research, 5*(4), 276-229.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Boston: Addison-Wesley.

Ford, D. M. (2007). Technologizing Africa: On the bumpy information highway. *Computers and Composition, 24*(3), 302-316.

Fouad, N. A., Smith, P. L., & Enochs, L. (1997). Reliability and validity evidence for the Middle School Self-Efficacy Scale. *Measurement and Evaluation in Counseling and Development, 30*, 17-31.

Gialamas, V., & Nikolopoulou, K. (2010). In-service and pre-service early childhood teachers' views and intentions about ICT use in early childhood settings: A comparative study. *Computers & Education, 55*(1), 333-341.

Gong, M., Xu, Y., & Yu, Y. (2004). An enhanced technology acceptance model for web-based learning. *Journal of Information Systems Education, 15*(4), 365-374.

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today, 24*(2), 105-112.

Gyekye, K. (2011). "African Ethics", *The Stanford Encyclopedia of Philosophy* (Fall 2011 Edition), Edward N. Zalta (ed.). http://plato.stanford.edu/archives/fall2011/entries/african-ethics/>.

Hennessy; Harrison; & Wamakote. (2010). Teacher factors influencing classroom use of ICT in sub-saharan Africa. *Itupale Online Journal of African Studies, 2*(2010), 39-54.

Hadley, M., & Sheingold, K. (1993). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education, 3*(101), 261-315.

Hardgrave, B. C., Davis, F. D., & Riemenschneider, C. K. (2003). Investigating determinants of

software developers' intentions to follow methodologies. *Journal of Management Information Systems, 20*(1), 123-152.

Higgs, G., Bellin, W., Farrell, S., & White, S. (1997). Educational attainment and social disadvantage: Contextualizing school league tables. *Regional Studies*, *31*(8), 775-789.

Hofstede, G. (1991). *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

Hu, P. J. h., & Hui, W. (2011). Is Technology-Mediated Learning Made Equal for All? Examining the Influences of Gender and Learning Style Technology Acceptance in Education . In Teo, T. *(Ed.), Technology Acceptance in Education: Research and Issues,* (p.101-122), Boston: Sense Publishers.

International Telecommunication Union. (2013). Global data: Retrieved from http://www.itu.int/en/ITUD/Statistics/Pages/stat/default.aspx?utm_source=twitterfeed&utm_medium=twitter

Johnson, R., Onwuegbuzie, A., & Turner, A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research, 1*(2), 112-133.

Kafu Patrick, A. (2011). Teacher education in Kenya: Emerging issues. *International Journal of Curriculum and Instruction, 1*(1), 43-52.

Kennedy, C. (1987). Innovation for a change: teacher Development and Innovation. *English Language Teaching Journal, 41*(3) 262-271.

Kenyatta, J. (1963). Facing Mount Kenya. London. London Press.

Kenya National Bureau of Statistics (2015). Economic survey 2015. Retrieved from http://www.knbs.or.ke/index.php?...2015.

Kinuthia, W. (2009). Educational development in Kenya and the role of information and communication technology. *International Journal of Education and Development Using Information and Communication Technology*, 5(2), 6-20.

Kipsoi, E. J., Chang'ach, J. K., & Sang, H. C. (2012). Challenges facing adoption of information communication technology (ICT). In *Educational Management in Schools in Kenya. Journal of Sociological Research, 3*(1), Pp. 18-28.

Kulik, J. A., Bangert, R. L., & Williams, G. W. (1983). Effects of computer-based teaching on secondary school students. *Journal of Educational psychology, 75*(1), 19.

Lai, C., Wang, Q., & Lei, J. (2012). What factors predict undergraduate students' use of technology for learning? A case from Hong Kong. *Computers & Education, 59*(2), 569-579.

Liao, H.-L., & Lu, H.-P. (2008). The role of experience and innovation characteristics in the adoption and continued use of e-learning websites. *Computers & Education, 51*(4), 1405-1416.

Lillis, (1985). Processes of secondary curriculum innovation in Kenya. *Comparative Education Review, 29*(1), 80-96.

Liverpool, L. S. O. (2002). Information and communication technology in teacher education. In *Teacher Education in Nigeria: Past Present and Future - Proceedings of the First Teachers' Summit*. Kaduna: National Teachers' Institute.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127*(2), 267.

Luan, W. S., & Teo, T. (2011). *Student Teachers' Acceptance of Computer Technology Acceptance in Education.* In Teo, T. *(Ed.), Technology Acceptance in Education: Research and Issues,* (pp. 43-61), Boston: Sense Publishers.

Ma, W. W. K., Anderson, R., & Streith, K. O. (2005). Examining user acceptance of computer technology: An empirical study of student teachers. *Journal of Computer Assisted Learning*, *21*(6), 387-395.

Marakas, G. M., Mun, Y. Y., & Johnson, R. D. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research, 9*(2), 126-163.

Mertens, D. (2005) *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods*, (2nd ed.). Boston, Sage.

Minkov, M., & Hofstede, G. (2012). Hofstede's fifth dimension new evidence from the world values survey. *Journal of Cross-Cultural Psychology*, *43*(1), 3-14.

Ministry of Education, Science and Technology (MOES&T)/Ministry of Information and Communication. (2006). *Ministry of Education National ICT Strategy for Education and Training.* Retrieved from www.education.go.ke/moestdocs/national%20ict%20strategy%20for%20educatio n%20and%20training%20june%202006.pdf.

Ministry of State Planning. (2010). *National development and vision 2030. Republic of Kenya. 8th poverty and economic policy (pep) research network.* Conference in Dakar, Senegal. Retrieved from http://www.pep-net.org/sites/pep-net.org/files/typo3doc/pdf/files_events/8th-PEPmeeting2010-Dakar/CBMS/Actual_uses_of_CBMS_for_MDG_Monitoring_in_Kenya__2_.pdf

Miyungu, J. (2012). *Fourth undersea cable goes live in Kenya.* The Standard Newspaper Online Media. Retrieved from http://www.standardmedia.co.ke/InsidePage.php?id=2000056198&cid=14&j=&m=&d=

Miura, I. T. (1987). The relationship of computer self-efficacy expectations to computer interest and course enrollment in college. *Sex Roles, 16*, 303-311.

Mizell, H. (2010). *Why professional development matters*. Oxford, OH: Learning Forward.

Murithi, N., & Indoshi, F. (2011). Attitude of teachers and students toward use of computers in teaching of computer studies curriculum in secondary schools. *International Journal of Current Research*, 3(11). 191-195.

Momanyi, L., Norby, R., & Strand, S. (2006). The need for integration of technology in K-12 school settings in Kenya, Africa. *AACE Journal, 14*(2), 154-177.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.

Mutula, S. M. (2003). Cyber cafe industry in Africa. *Journal of Information Science, 29*(6), 489-497.

Namunga, N., & Otunga, R. (2012). Teacher education as a driver for sustainable development in Kenya. *International Journal of Humanities and Social Science, 2* (5) 228-234.

Niederhauser, D., & Perkmen. S. (2008). Validation of the intrapersonal technology integration scale: Assessing the influence of intrapersonal factors that influence technology integration. *Computers in the Schools, 25*(1-2).

Ngugi wa Thiong'o, (1986). *Decolonizing the mind. The politics of language and culture in African literature.* Heinemann, Nairobi. Pubisher???

One Laptop Per Child: Retrieved from http://one.laptop.org/stories/kenya-joyful-collaboration.

Open Educational Resources (OER). *Africa: Building African education capacity through openness*. Retrieved from http://www.oerafrica.org

Oshikoya, T. W., & Hussain, M. N. (1998). Information technology and the challenge of economic development in Africa. *African Development Review, 10*(1), 100-133.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, 62(3), 307-332.

Parsons, T., & Smelser, N. (1956). *Economy and society: A Study in the integration of economic and social theory*. New York: Free Press.

Pickens, J. (2005). Attitudes and perceptions. *Organizational Behavior in Health Care. Sudbury, MA: Jones and Bartlett Publishers*, 43-75.

Pynoo, B., Devolder, P., Tondeur, J., Van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior*, *27*(1), 568-575.

Republic of Kenya. (2008). Kenya Vision 2030: A globally competitive and prosperous Kenya. Retrieved from http://www.vision2030.go.ke/

Republic of Kenya. (2012). Ministry of Education Science and Technology (MOES&T). A policy framework for science, technology and innovation. *Sessional paper* 2012.

Republic of Kenya. (2011). Budget Statement for Fiscal Year 2011/2012. Nairobi, Kenya: Public Relations Office.

Republic of Kenya. (2013). Budget Statement for Fiscal Year 2013/2014. Nairobi, Kenya: Public Relations Office.

Republic of Kenya. (2009). Kenya Population and Housing Census 24th/25th. Kenya National Bureau of Statistics (KNBS) enumerator's instructions manual.

Republic Of Kenya: Ministry Of Education, Science And Technology (MOES&T): Sessional Paper No.___ Of 2004. A Policy Framework For Education, Training And Research. Meeting The Challenges Of Education, Training And Research In Kenya In The 21st Century.

Republic of Kenya. (2007). *The Kenya Vision 2030.* Nairobi: Government Printer.

Richardson, V. (2003). Pre-service teachers' beliefs. *Teacher beliefs and classroom performance: The impact of teacher education, 6*, 1-22.

Rimal, R. N., & Real, K. (2003). Understanding the influence of perceived norms on behaviors. *Communication Theory, 13*(2), 184-203.

Roblyer, M. D., & Doering, A. H. (2010). *Integrating educational technology into teaching.* (5th ed.). Boston, MA: Ally & Bacon.

Robertson, S. I., Calder, J., Fung, P., Jones, A., O'Shea, T. & Lambrechts, G. (1996). Pupils, teachers and palmtop computers. *Journal of Computer Assisted Learning, 12*, 194-204.

Rogers E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.

Rogers, E. M. (1983). *Diffusion of innovations*. New York, NY: Free Press.

Sadaf, A., Newby, T. J., & Ertmer, P. A. (2012). Exploring pre-service teachers' beliefs about

using Web 2.0 technologies in K-12 classroom. *Computers & Education, 59*(3), 937-945.

Saadé, R. G., & Kira, D. (2007). Mediating the impact of technology usage on perceived ease of use by anxiety. *Computers & education*, *49*(4), 1189-1204.

Sam, H. K., Othman, A. E. A., & Nordin, Z. S. (2005). Computer self-efficacy, computer anxiety, and attitudes toward the Internet: A study among undergraduates in Unimas. *Educational Technology & Society, 8*(4), 205-219.

Shih, Y. Y., & Fang, K. (2004). The use of a decomposed theory of planned behavior to study Internet banking in Taiwan. *Internet Research*, *14*(3), 213-223.

Shimp, T. A., & Kavas, A. (1984). The theory of reasoned action applied to coupon usage. *Journal of Consumer Research*, 795-809.

Shiudu, A. (2014). Bill seeks to rank state officers in seniority order. The Standard Newspaper Online Media. Retrieved from http://www.standardmedia.co.ke/m/?articleID=2000107679&story_title=Bill-seeks-to-rank-State-officers-in-seniority-order

Simsek, A. (2011). The relationship between computer anxiety and computer self-efficacy. *Online Submission*, *2*(3), 177-187.

Smarkola, C. (2007). Technology acceptance predictors among student teachers and experienced classroom teachers. *Journal of Educational Computing Research, 37*(1), 65-82.

Smarkola, C. (2011). A mixed-methodological technology adoption study. In Teo, T. *(Ed.), Technology Acceptance in Education: Research and Issues,* (pp. 09-40), Boston: Sense Publishers.

Somekh, B. (2008). Factors affecting teachers' pedagogical adoption of ICT. In J. Voogt & G. Knezek (Eds.), *International Handbook of Information Technology in Primary and Secondary Education* (pp. 449-460). New York: Springer

Steyn, R., & Mynhardt, J. (2008). Factors that influence the forming of self-evaluation and self-efficacy perceptions. *South African Journal of Psychology*, *38*(3), 563-573.

Society for Information Technology and Teacher Education (SITE). (2002). SITE position paper: statement of basic principles and suggested actions ('Ames White Paper'). Available online at: http://www.aace.org/site/SITEstatement.htm.

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of Educational Research, 79*(2), 625-649.

Szabo, M. (2002). Educational reform as innovation diffusion: Development of a theory and test

of a model using continuing professional development and instructional technology. *Informing Science & IT Education*, (June), 1466-1480.

Tashakkori, A, & Teddlie, C. (Eds.) (2003). *Handbook of mixed methods in social & behavioral research.* City???, CA: Sage.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research, 6*(2), 144-176.

Tedla, B. A. (2012). Understanding the importance, impacts and barriers of ICT on teaching and learning in East African countries. *International Journal for e-Learning Security (IJeLS), 2*(3/4), 199--207.

Teacher Service Commission (2013). Recruitment of additional and replacement teachers for public primary and post primary institutions-July 2013. Retrieved from http://www.tsc.go.ke/index.php/downloads/finish/25-vacancies/250-teacher-qualification-requirments.

Teo, T. (2009). Modeling technology acceptance in education: A study of pre-service teachers. *Computers & Education*, 52(2), 302-312.

Teo, T**.,** Lee, C. B., Chai, C. S., & Wong, S. L. (2009). Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the Technology Acceptance Model (TAM). *Computers and Education, 53*, 1000-1009

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS quarterly*, 125-143.

Tilya, F. (2008). IT and Educational Policy in the Sub-Saharan African Region International. In J. Voogt & G. Knezek (Eds.), *International Handbook of Information Technology in Primary and Secondary Education* (p. 1145-1159). New York: Springer.

Tornatzky, L. G. and Klein, K. J. (1982). Innovation characteristics and innovation adoption implementation: a meta-analysis of findings. *IEEE Transactions on Engineering Management, 29*, 28-45.

UNESCO. (2013). Communication and information: What are open educational resources management (OERs)? Retrieved from http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-are-open-educational-resources-oers/

UNESCO. (2012). *Education for all global monitoring report (EFAGMR). Fact Sheet.* October *2012*.

Union, A. (2005). Africa's science and technology consolidated plan of action. AU/NEPAD, 57.

Unwin, T. (2005). Toward a framework for the use of ICT in teacher training in Africa. Open Learning: *The Journal of Open, Distance and e-Learning, 20*(2), 113-129.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences, 39*(2), 273-315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance Model: Four Longitudinal Field Studies. *Management Science*, 46(2), 186-204.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Vygotsky, L. (1978). *Interaction between learning and development*: *From mind and society*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1981). The instrumental method in psychology. *The Concept of Activity in Soviet Psychology*, 135-143.

Wabuyele, L. (2006). Computer use in Kenyan secondary schools: Implications for teacher professional development. In C. Crawford et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2006* (pp. 2084-2090). Chesapeake, VA: AACE. Retrieved on 02/17/2014 from http://www.editlib.org/p/22374.

Wamagatta, E. (2008) African quest and struggle for high schools in colonial Kenya: The case of the abortive Kiambu Local Native Council Central High School at Githunguri, 1926-1934. *Journal of Asian and African Studies*, 43(3), 345-362.

Watson, D. (2001). Pedagogy before technology: Re-thinking the relationship between ICT and teaching. *Education and Information Technologies*, 6(4), 251–266.

Wilson, F. (2003). *Statistical Methods 2nd Edition*. Academic Press: Elsevier Science (USA)

Woolcock, M. (1998) Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and Society,* 27, 151-208.

Yuen, A. H., & Ma, W. W. (2002). Gender differences in teacher computer acceptance. Journal of Technology and Teacher Education, 10(3), 365-382.

Yulu, T. (2012). Integrating ICT in Education: Effective use of technology to deliver education and training. Kenya Ministry of Educations: Retrieved on 8/13/ 2015 from http://www.education.go.ke/News.aspx?nid=451

Zab, S. (2015). Whitepaper: The Growth of the Smartphone Market in Kenya. Retrieved on

01/13/2016 from https://www.jumia.co.ke/blog/whitepaper-the-growth-of-the-smartphone-market-in-kenya/

APPENDIX A

Flyer to participate on the study & Consent form

Dear participant:

My mane is Fred Waweru. I am a doctoral student in the Social Foundations of Education program at Oklahoma State University in the United States. You are invited to participate in a research entitled: **Barriers of Integrating Technology in Education: An Exploration of Sociocultural Factors That Influence Pre-Service Secondary School Teachers' Future Use Of Computer-Based Instructional Technology in Kenya.** The purpose of this research is to examine the factors that influence secondary school teachers to integrate computer-based instructional technology in their classrooms. In particular, given the increased focus by Kenya Ministry of Education to digitize the curriculum for secondary education as part of Vision 2030, this study aims to investigate whether beliefs and attitudes held by 3rd and 4th year pre-service secondary school teachers toward educational technology has an impact on their behavioral intention to adopt computer-based instructional technology when they start their teaching careers. Your participation to this research will help bring to light the understanding of these issues, as well as help in developing strategies for addressing the challenges that face technology integration in Kenyan schools.

Your participation in this research is important and greatly appreciated. The survey will take approximately 30 minutes to complete. You will receive a compensation of 100 Kenya Shilling ($1.17) for participating in this research study. Your participation in this research is completely voluntary and you may refuse to participate without any consequences. Responses to this survey will only be reported in aggregated form to protect your identity when presenting the research findings. Further information regarding this research can be obtained by contacting the principal researcher Fred Waweru fred.waweru@okstate.edu, or my faculty advisor Dr. Denise Blum d.blum@okstate.edu. If you wish to get further information regarding your rights as a research participant, you may contact the Oklahoma State University Institutional Review Board at irb@okstate.edu

If you would like to know the results of this research, contact fred.waweru@okstate.edu. Thank you for your consideration.

Your signature below indicates that you have read the above information, are at least 18 years of age and agree to participate in this research. Please keep this consent form for your own record.

Name:_____ Signature:_____ Date_____

APPENDIX B

Research Survey

Thank you for participating in this research survey that examines factors that influence secondary school teachers to adopt educational technology. We value your opinion and honest feedbacks. The survey will take approximately 20 minutes.

Thank you.

I. Are you studying/training to become secondary school teacher? (*Circle one*) **Yes** or **No***

***Note**: If you selected **NO**, please stop taking this survey because it does not apply to you. Continue with the survey if you selected **yes**.

II. Which year of study are you toward your degree?
1) **1st year**. 2). **2nd year.** 3). **3rd year**. 4). **4th year**. 5). **5th year**. 6). **Graduate level**

III. Please circle the subjects you intend to teach in the future when you graduate from college. You can circle more than one selection.

Humanities	**Social sciences**	**Natural Sciences**	**Formal sciences**	**Applied sciences**	**Other subjects**
• Languages • Art and design • Music • Religious education	• Geography • History & governmen t	• Chemistry • Physics • Biology	• Math • Computer studies • Statistics	• Agriculture • Business studies • Physical education • Home science	• Please indicate

IV. Select the degree are you are currently studying?

1) Certificate (P1, P2, P3, P4)
2) Bachelors (B.Ed., B.A. or B.S)/Higher Diploma
3) Post Bachelor teacher certification
4) Masters (M.A., M.S., M.Ed.)
5) Post Masters/Doctorate

V. Select the highest level of education you have completed?

1) KCSE Certificate
2) Certificate (P1, P2, P3, P4)
3) Bachelors (B.Ed., B.A. or B.S)/Higher Diploma
4) Post Bachelor teacher certification
5) Masters (M.A., M.S., M.Ed.)
6) Post Masters/Doctorate

The following are a number of statements with which some people agree and others disagree on various levels about using Computer-Based Instructional Technology (CBIT). ***Computer-Based Instructional Technology (CBIT) is defined here as computer technologies used for classroom instruction. This includes various educational technologies such as instructional software, Web 2.0 tools, Adobe programs, as well as other programs such as those of Microsoft Office (Word, Excel, PowerPoint, Publisher, etc.).***

Please use the following scale to rate how these statements reflect your personal feelings about using computer based instructional technology (CBIT) to teach.

Strongly Disagree = 1

Disagree = 2

Neutral = 3

Agree = 4

Strongly Agree = 5

For each statement, write on the right side the number corresponding to the degree of your agreement or disagreement with the provided statement. Please note that there is no right or wrong answer; all that is important is your honest response to these statements.

	Scale: **1=** Strongly Disagree; **2=**Disagree; **3=**Neutral; **4=**Agree; **5=**Strongly Agree	1	2	3	4	5
1.	I would like to use computer-based instructional technology when I start my teaching career.					
2.	When I start my teaching career, I think using computer-based instructional technology to teach will enable me to quickly accomplish tasks related to teaching.					
3.	Using computer-based instructional technology to teach will increase my teaching ability.					
4.	I would dislike using any computer-based instructional technology when teaching.					
5.	I believe using computer-based instructional technology is compatible with my teaching philosophy					
6.	I perceive using computer-based instructional technology to teach as so complicated because I don't have adequate technology skills.					
7.	I think the operations of planning a lesson to teach using computer-based instructional technology is excessively mechanical and it involves too much time.					
8.	I think it takes too long to learn how to use computers technology to teach.					
9.	I think instruction that involves using computers in the classroom is too hard for					

	students to follow.					
10.	I think using computer-based instructional technology to teach will take too much time from my teaching duties.					
11.	I think using computer-based instructional technology will fit well with how I intend to teach.					
12.	I would prefer to teach using computer-based instructional technology than to use traditional resources (chalk and black board, posters, etc.).					
13.	Computer-based instructional technology is fun to use when teaching.					
14.	I believe using CBIT in my teaching will improve my students learning.					
15.	People who influence my behavior think I should use computer-based instructional technology when I start teaching.					
16.	Using computer-based instructional technology will improve my teaching.					
17.	Using computer- based instructional technology in the classroom will make it					

	easier for me to teach compared to chalk and board.					
18.	People who are important to me think I should use computer-based instructional technology when teaching.					
19.	I think my students will see me as good teacher if I effectively use computer-based instructional technology in the classroom.					
20.	I think effectively using computer-based instructional technology in the classroom will increase my colleagues' respect of my teaching ability.					
21.	I currently use computers when learning only because my professors require it, but not because I like using technology.					
22.	I think effectively using computer-based instructional technology in the classroom will increase my status among my colleagues.					
23.	My friends think I will use computer-based instructional technology when I start my teaching career.					
24.	My current professors think that I should use computer-based instructional technology when I					

	start my teaching career.					
25.	My classmates think I will use computer-based instructional technology when I start my teaching career.					
26.	Using computer based instructional technology in the classroom will increase my effectiveness as a teacher.					
27.	I feel confident that when I start my teaching career, I will be able to use whatever computer-based instructional technology is provided.					
28.	I feel confident that I can select appropriate computer based technology for instruction based on national curriculum standards established by the Kenya Ministry of Education.					
29.	I feel nervous when I think of using computer-based instructional technology.					
30.	I feel confident that I can help students when they have difficulty with instructional technology that is computer based.					
31.	When I start my teaching career, using computer-based instructional technology to teach will be entirely within my control.					

32.	I feel confident that I can facilitate student learning that incorporates appropriate computer based instructional technologies.					
33.	I have the knowledge and ability to make use of computer-based instructional technology when I start my teaching career.					
34.	I intend to enter a teaching career which I will use instructional technology skills					
35.	I am fully committed to using instructional technology in my future classroom.					
36.	When I start my teaching career, I believe there will be guidance available to help me in the selection of Computer-based educational technology to use when teaching.					
37.	I feel confident that I have the necessary skills to teach with Computer-based educational technology.					
38.	When using computer-based instructional technology, I will need to have an experienced person available to assist me with any difficulties that might arise					
39.	It scares me to think that I could lose a lot of data in the computer by hitting the wrong key.					

40.	Even if I might be teaching in a school that does not have Computer-based instructional technology, it is a good idea to learn how to use technology to teach.					
41.	I hesitate to use computers due to the fear of making mistakes I cannot correct.					
42.	Using computer to teach is somehow intimidating to me.					
43.	I perceive using chalk and board as a pleasant idea instead of using computer based educational technology.					

VI. What is your gender?
    1) Male
    2) Female

VII. Do you own a computer?
    1) Yes
    2) No

VIII. What is your age?

(Under 18)

(18—22)

(23—27)

(28—32)

(33—37)

(38—42)

(43—47)

(48—52)

(53—57)

(58+)

IX. Approximately how many hours do you spend on a computer each week?
    1) 1-5 hours
    2) 6-10 hours
    3) 11-20 hours
    4) 21-30 hours
    5) 31-40 hours
    6) More than 40 hours

X. Please read the following descriptions of proficiency levels of computer usage and select the level that best describes your computer proficiency.
    1) **Unfamiliar:** I have no experience with using computer technology
    2) **Newcomer:** I have attempted to use computer technologies but I still require help on a regular basis.
    3) **Beginner:** I am able to perform basic functions in a limited number of computer applications
    4) **Average:** I demonstrate general competency in a number of computer applications
    5) **Advanced:** I have acquired the ability to competently use a broad spectrum of computer technologies
    6) **Expert:** I am extremely proficient in using a wide variety of computer technologies.

XI. If you were to teach today, what specific computer technology tools (especially tools you received any instruction from your school/university) do you think you would use in your teaching? (Please specify the **Name** of the application e.g. Microsoft word, PowerPoint, etc.).

1)

XII. Please respond to each question (Use the back of the page if you require additional space)
    1) What can be done to equip you better with the knowledge of using CBIT?

XIII. Which of the secondary school classification did you attend?
    1) National
    2) Provincial
    3) District
    4) Private
    5) Other (please describe) _____

XIV. What do you perceive as the greatest challenge facing Kenya in regard to integrating technology in secondary education? Please explain why you believe that way

    1)

XV. What role (positive/negative) do you believe the increase of technology in education will have on student learning? Please explain why you believe that way

    1)

XVI. You as a future teacher, what social-expectations do you believe the Kenyan society has on teachers in regard to using education technology? Please explain why you believe that way

APPENDIX C

INSTRUMENT SCALE

Attitude toward using computer-based educational technology (ATU)

1. I would like to use computer-based educational technology when teaching.
2. Computer based instructional technology is fun to use when teaching.
3. I would dislike using computer-based instructional technology when teaching. *
4. I perceive using chalk and board as a pleasant idea instead of using computer based educational technology. *

Attitudinal structure:

Perceived Relative Advantage of using CBIT (PRA)

1. When I start my teaching career, I think using computer based educational technology to teach will enable me to quickly accomplish tasks related to teaching.
2. Using computer-based instructional technology will improve my teaching.
3. Using computer based instructional technology in the classroom will make it easier for me to teach compared to chalk and board.
4. Using computer based instructional technology in the classroom will increase my effectiveness as a teacher.
5. Using computer-based instructional technology to teach will increase my professional learning and practice.
6. I believe using CBIT in my teaching will improve my students learning.

Perceived Compatibility **(PC)**

1. I believe using computer-based instructional technology is compatible with my teaching philosophy.
2. I think using computer-based instructional technology will fit well with how I intend to teach.
3. I would prefer to teach using CBIT than to use traditional resources (chalk and black board).

Perceived Complexity of Using CBIT **(PUC)**

1. I think using computer-based instructional technology to teach will take too much time from my teaching duties.
2. I perceive using computer-based instructional technology to teach as so complicated because I don't have adequate technology skills.
3. I think the operations of planning a lesson to teach using computer-based instructional technology is excessively mechanical and it involves too much time.

4. It takes too long to learn how to use computers to teach.
5. I think instruction that involves using computers in the classroom is too hard for students to follow.

Subjective Norm (SN)

1. People who influence my behavior would think I should use computer-based instructional technology when teaching.
2. People who are important to me would think I should use computer-based instructional technology when teaching.

Subjective Normative Structure:

Social outcome expectations **(SOE)**

1. I think effectively using computer-based instructional technology in the classroom will increase my status among my colleagues.
2. I think effectively using computer-based instructional technology in the classroom will increase my colleagues' respect of my teaching ability.
3. I think my students will see me as good teacher if I effectively use computer-based instructional technology in the classroom.

Superior Social influences **(SSI)**

1. I currently use computers when learning only because my professors require it.
2. My current professors would think that I should use computer-based instructional technology when I start my teaching career.

Peer Social Influences **(PSI)**

1. My friends would think I will use computer-based instructional technology when I start my teaching career.
2. My classmates would think I will use computer-based instructional technology when I start my teaching career.

Perceived Behavioral Control (PBC)

1. When I start my teaching career, I will be able to use whatever computer-based instructional technology that is provided.
2. When I start my teaching career, using computer-based instructional technology to teach will be entirely within my control.
3. I have the knowledge and ability to make use of computer-based instructional technology when I start my teaching career.

Perceived Behavioral Control Structures:

Computer Self-Efficacy **(CSE)**

1. I feel confident that I can select appropriate computer based instructional technology for instruction based on national curriculum standards established by the Kenya Ministry of Education.
2. I feel confident that I have the necessary skills to teach with computer based instructional technology.

3. I feel confident that I can facilitate student learning that incorporates appropriate computer based instructional technologies.
4. I feel confident that I can help students when they have difficulty with instructional technology that is computer based.

Facilitating Conditions **(FC)**

2. When I start my teaching career, I believe there will be guidance available to help me in the selection of CBIT.
3. When using computer-based instructional technology, I will need to have an experienced person available to assist me with any difficulties that might arise.
4. Even if I might be teaching in a school that does not have Computer-based instructional technology, it is a good idea to learn how to use it.

Computer Anxiety **(CA)**

1. I feel nervous when think of using computer-based instructional technology
2. It scares me to think that I could lose a lot of data in the computer by hitting the wrong key.
3. I hesitate to use computer due to fear of making mistakes I cannot correct.
4. Using computer to teach is somehow intimidating to me.

Behavioral Intentions (BI)

1. I intend to enter a teaching career which I will use instructional technology skills
2. I am fully committed to using instructional technology in my future classroom.

*Reverse coded questions

APPENDIX D

OPEN-ENDED SURVEY QUESTIONS

XVII. If you were to teach today, what specific computer technology tools (especially tools you received any instruction from your school/university) do you think you would use in your teaching? (Please specify the **Name** of the application e.g. Microsoft word, PowerPoint, etc.).

1)

XVIII. Please respond to each question (Use the back of the page if you require additional space)

1) What can be done to equip you better with the knowledge of using CBIT?

XIX. Which of the secondary school classification did you attend?

1) National
2) Provincial
3) District
4) Private
5) Other (please describe) _____

XX. What do you perceive as the greatest challenge facing Kenya in regard to integrating technology in secondary education? Please explain why you believe that way

1)

XXI. What role (positive/negative) do you believe the increase of technology in education will have on student learning? Please explain why you believe that way

1)

XXII. You as a future teacher, what social-expectations do you believe the Kenyan society has on teachers in regard to using education technology? Please explain why you believe that way

APPENDIX E

FOCUS GROUP INTERVIEW QUESTIONS:

1. What are pre-service secondary school teachers' perceptions of social outcome expectations held by the Kenyan society in regard to teachers' use of technology to teach?

2. What role does the social normative of supervisors' expectations play in pre-service secondary school teachers' intentions to adopt CBIT to teach in their future teaching practices?

3. What role does the social normative of peer social interaction play in pre-service secondary school teachers' behavioral intention to adopt CBIT?

4. What are pre-service secondary school teacher's beliefs about technology and student learning?

5. What do pre-service teachers perceive as the greatest challenge facing Kenya in regard to integrating CBIT in secondary education?

6. What are pre-service secondary school teachers' beliefs on the adequacy of teacher training programs in providing the skills to use technology to teach?

VITA

Frederick Waweru

Candidate for the Degree of

Doctor of Philosophy

Thesis: SOCIOCULTURAL FACTORS THAT INFLUENCE PRE-SERVICE TEACHERS' INTENTIONS TO ADOPT COMPUTER-BASED INSTRUCTIONAL TECHNOLOGY IN KENYA

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Publications:

- Waweru, F. & Ntarangwi, M. (2012). Amending Eurocentric Narratives of African History in the U.S. Classroom: A Popular Culture Approach. In Blum, D. & Janak, E. (Eds.) Pedagogy of Pop: Theoretical and Practical Strategies for Success. (pp. 143—157). Lanham, Maryland: Lexington Books.