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Influence of Information and Communication Technology policy on the integration of
computer awareness in Botswana junior secondary school curriculum

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STATEMENT OF ORIGINALITY

This thesis is titled: *Influence of Information and Communication Technology policy on the integration of computer awareness in Botswana junior secondary school curriculum*. I declare that this is my own work and has not been submitted for another qualification to any other institution. I am the sole researcher responsible for designing and writing up both qualitative and quantitative elements of the study. Wherever other authors' ideas and concepts were used, I have duly acknowledged that.

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DEDICATION

I dedicate this work to

The country and all teachers,

To the teachers I say: Keep toiling for the sake of your country.

To my family: My lovely and loving wife, Ednah Jeannette Kgwefane,

My two lovely daughters: Kutlo and Amogelang Kgwefane

My entire family: Sophie Nkele, Samuel Moeketsi, Athe (late), France, James, Salamina, Bosa and Brian Kgwefane, Lemme Phillimon and especially my parents, Mr. John Phonoki and the late Mrs. Dorcas Letsobe Kgwefane, Mr. Cornelius and the late Mrs. Gertrude Titus

(Father and Mother-in-law)

and finally

to the late Mr. Lesang Moks Moeketsi; my brother, cousin, uncle, friend and grandfather. To

him in his rest I still say:

THEN...and now

I know I could ask you about this piece

Its coherence... relevance

Significance and nuances

the message... the diction... but you can't hear me.

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“The more difficult the victory; the greater the happiness in winning” - Pele.

ABSTRACT

The socio-economic transformation prompted by globalization and associated Information and Communication Technologies are cross-cutting and have inevitably found their way into the provision and delivery of educational services. Globally, countries use national ICT policies to promote and manage the complex process of integrating ICT in education. In 2007, Botswana launched the national ICT policy to facilitate effective use of ICT across Government sectors and transform the country's economy from mineral-led into knowledge-based one. *Thuto Net* is an important component of the national ICT policy aimed at equipping learners with relevant ICT skills and competencies required in the work place and for self-employment. This study investigated the influence of the national ICT policy on the integration of computer awareness in Botswana junior secondary schools. Specifically, it assessed the match or mismatch between the ICT policy intentions and practical outcomes. The study revealed the following: inadequate teacher preparation in terms of ICT integration, insufficient ICT resources, failure to integrate computer awareness into school curriculum and limited acquisition of critical ICT skills and competencies by the students.

The study used the pragmatic paradigm of the mixed methods hence combining the qualitative and quantitative approaches to generate rich data and attain a comprehensive understanding of policy impact on the integration of computer awareness across the junior secondary school curriculum in Botswana. Multiple research instruments were used to collect data including face-to-face interviews, focus group discussions, questionnaires, observations and document analysis to enhance and triangulate the results. A total of 192 questionnaires were completed. Sixty three interviews and nine focus group discussions were conducted. 10 lessons were observed. The national ICT policy and related documents were analysed. The study was conducted in six educational regions namely Central, Kgalagadi, Kgatleng, North East, Southern and South East. Junior secondary schools were

the main unit of analysis. Data was collected in twelve junior secondary schools, one secondary college of education, Botswana Examinations Council and Curriculum Development and Evaluation. A concurrent multilevel sampling strategy combining probability and non-probability sampling techniques was used to compare between different groups at various levels.

The findings indicate that integrating ICT in junior secondary schools is faced with multiple intertwined challenges. There are mismatches between policy intentions and practical outcomes. The ICT infrastructure that is provided is inadequate to support effective ICT integration into the school curriculum. Key policy implementers are not conversant with the national ICT policy. Teacher preparation for ICT integration is inadequate. The ICT curriculum is inconsistently implemented making it unlikely that learners receive adequate ICT skills required in the work place. The national ICT policy is inadequate to facilitate effective integration of technology in the education system in the country. The study proposed a framework to facilitate effective implementation of ICT in education.

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LIST OF ACRONYMS

BEC	Botswana Education Consolidation
BEC	Botswana Examinations Council
BGCSE	Botswana General Certificate of Secondary Education
BIPP	Botswana In-service and Pre-service Project
CAT	Consumer Acceptance of Technology
CAP	Computer Awareness Programme
CBAM	Concerns Based Adoption Model (CBAM)
CFS	Computer for Schools
EDN	Education Data Network
ETSSP	Education and Training Sector Strategic Plan
GEC	General Education Course
GDT	Government Data Network
EFA	Education For All
EU	European Union
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
IDT	Innovation Diffusion Theory
IMF	International Monetary Fund

IS	Information System
ISTE	International Society for Technology in Education
JC	Junior Certificate
JCE	Junior Certificate of Education
JSEIP	Junior Secondary Education Improvement Project
MCE	Molepolole College of Education
MCST	Ministry of Communication, Science and Technology
MDGs	Millennium Development Goals
MoESD	Ministry of Education and Skills Development
NCAF	National Curriculum and Assessment Framework
NAFTA	North American Free Trade Area
NATO	North Atlantic Treaty Organization
NDP	National Development Plan
NEC	National Commission on Education
NPMS	New Public Management System
OECD	Organisation for Economic Cooperation and Development
PAD	Pleasure, Arousal and Dominance
PBRs	Performance Based Reward System
PCK	Pedagogical Content Knowledge

PEIP	Primary Education Improvement Project
PGDE	Post Graduate Diploma in Secondary Education
PSLE	Primary School Leaving Examination
RNPE	Revised National Policy on Education
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
TCK	Technological Content Knowledge
TPD	Theory of Planned Behaviour
TPK	Technological Pedagogical Knowledge
TPACK	Technological Pedagogical Content Knowledge
TRA	Theory of Reasoned Action
UN	United Nations
USA	United States of America
USAID	United States Agency for International Development
UTAUT	Unified Theory of Acceptance and Technology Use
WTO	World Trade Organization

DEFINITION OF KEY TERMS

Computer Awareness entails introducing learners to the use of a computer as a tool that helps to increase productivity by automating a lot of tasks undertaken in everyday life (Computer Awareness syllabus, 2008).

Computer Awareness Integration involves the teaching of ICT both as a set of skills, knowledge and understanding in its own right and its use to support teaching and learning across the curriculum (Computer Awareness syllabus, 2008).

Technology integration in education means using ICT as a cognitive tool to teach subject matter, and to promote problem-solving and higher-order thinking skills or using the computer where it is the best medium to support the learning goal. (Koç, 2005; Wang et al 2014)

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CHAPTER ONE: INTRODUCTION

1.0 Overview

The chapter presents the background to the problem under investigation, describing the intricate relationship between globalization, ICT and education. It also highlights the emergence of national and educational ICT policies, rationale behind these and the conceptual framework helpful for comprehension of the Botswana national ICT policy. The context of the study is also discussed followed by the statement of the problem, research objectives, questions, purpose, assumptions, significance, limitations and delimitations. The chapter concludes with a discussion of the theoretical grounding for the evaluation of the Botswana national ICT policy.

1.1 Background of the study

Technology is at the epicentre of globalization. Rapid developments in information and communication technologies (ICTs) have greatly transformed and accelerated globalization. Yusuf (2005) and Kozma (2005) observe that ICT has revolutionised the world's socio-economic platform the result of which is increased globalization. Globalization inherently fosters socio-economic development, growth and competitiveness (Hajela, 2005; Kozma, 2008; Pillay & Hearn, 2009). In other words, ICT is a major catalyst of socio-economic advancement globally. Yusuf (2005) further notes that ICT is an indispensable part of human life. Invariably, ICT has effectively networked the world and transformed how people see and use knowledge against the backdrop of the Knowledge Age. According to Kozma (2008), the importance of knowledge lies in the fact that it can be used multiple times without losing its value. This view is shared by Pillay and Hearn (2009) who contend that technological innovation and knowledge are key drivers of economic development and growth.

The World Bank Report (2013) notes that the rapid advancement in broadband technologies has increasingly transformed the world into a complex interconnected knowledge-driven global village. Mokgoare and Nleya (2014) observe that continuous expansion of ICTs has extended deeply into education context. This transformation has permeated not only the delivery but also the quality of education provided by the schools globally. Given both technological transformation and expansion, the contemporary world requires students to be technologically competent if they are to function effectively and meaningfully in the knowledge society.

1.2 Education and ICT

The socio-economic transformation triggered by globalization and associated ICTs are cross-cutting and have inevitably found their way into the provision and delivery of educational services. Albirini (2007), Green (2006) and Kharade and Thakkar (2012) hold that the call for educational reforms across the globe places immense emphasis on the integration of technology into learning and teaching. As a result, these scholars and others have made four observations and contentions mainly triggering the strong argument for the integration of ICT into education: Firstly, computer-related technologies continue to evolve and permeate human activities. They argue that education systems should produce the calibre of students who possess technological skills and are thus able to function within the globalized world. Secondly, ICT's potential to improve the quality of education is immense. Shelly, Cashman, Gunter and Gunter (2002) and Yusuf (2005) also suggest that ICT as a research tool has motivational effects. It is dynamic and dependable and interactive in nature. Further, Albirini (2007), Koç (2005), Motiwalla (2007) and Oliver (2002) contend that ICT has the ability to defy geographical barriers. It is argued here that high speed broadband technologies permit independent and remote teaching (Devitt, Lyons & McCoy, 2014) while mobile technologies provide opportunities for e-Learning and m-learning (El-Hussein &

Cronje, 2010). Thirdly, a philosophical argument is raised, that ICT has the potential to promote constructivist practices as opposed to behaviourist approaches. Increasingly, according to Oliver (2002) and Singh (2013), there is a need to primarily focus on the learner and change the role of the teacher in the instructional setting. In the view of Pavel, Fruth and Neacsu (2015), there is a need to devise innovative ways of integrating technology to stimulate, and promote effective teaching practices. Lastly, education and socio-economic development are part and parcel of the globalization process. The close link between education and socio-economic development has been heightened in the globalization era. To this end, Al'Abri (2011) and Green (2006) see education as an important competition tool which gives individuals and nations a competitive edge in terms of socio-economic advancement.

According to Kozma (2005), most countries have tended to respond to the challenges associated with the globalization of education by initiating what appears to be isolated and fragmented ICT policies. The end result is that such ICT policies appear to be uncoordinated and somehow fail to produce tangible results. Ang'ondi (2010) agrees and observes that technology alone does not have the capacity to drive socio-economic development if it is not coupled with educational provision. In response to this policy planning deficit, most countries in the West (Chiumbu, 2008), were forced to formulate ICT policies in the 1990s. Consequently, the ICT policies were developed to meet the needs and demands of the advanced economies in the West but unfortunately these have been transferred 'wholesale' to the developing countries without looking at their unique context regarding their socio-economic challenges.

1.3 The need for ICT policies

Faced with a myriad of challenges which are internal and external, Sub-Saharan African countries have been forced to pay particular attention to the adoption and formulation

of ICT policies. Corkery, Land, and Bossuyt (1995) posit that ICT policy frameworks determine the performance of organisations. In their view, such policies would invariably help them avert mistakes that have the potential to cripple the ailing economies in that they explicitly outline the implementation strategies purported to lead to the attainment of ICT policy goals. This view is shared by Kozma (2005) who contends that comparatively, African countries need ICT policies precisely because their economies are characterised by limited resources. Tairab and Ronghuai (2017) observe the need for increased role of ICT in education and its innovative use to support active learner participation in school and beyond. It is argued that ICT policies play an important role in promoting the achievement of quality education. In contrast, Palvia, Baqir and Nemati (2015) observe that the policies and action plans are important tools in assisting governments to attract foreign investments. However, according to Al'Abri (2011) and Kozma (2005), Sub-Saharan African countries are experiencing enormous difficulties in their quest to develop relevant and appropriate ICT policies. Kozma (2005) also notes the high costs involved in the provision of ICT-related projects in Africa. Meanwhile, the World Bank Report (2013) advises that Sub-Saharan African countries have an obligation to implement the general use of ICT but at the same time specifically make educational ICTs their top priority in their development agenda.

1.4 Why educational ICT policies

According to Al'Abri (2011) and Green (2006), education is a necessary component through which countries can respond to the challenges and opportunities associated with socio-economic development and globalization in general. Kozma (2008) holds the same argument but emphasises that technology drives both the socio-economic development and globalization processes. The World Bank Report (2013) came out too to suggest that increasingly, technology and education are inseparable and intricately linked. Drawing from these arguments one can safely conclude that the place of technology in education occupies

centre stage in global debates. Hence, Kozma (2008) emphasizes that it is imperative that countries, particularly Sub-Saharan countries, develop ICT policies in order to harness its potential by successfully integrating ICT into education, and use it to propel their socio-economic development.

Yusuf (2005) rightly observes that recent developments indicate that in the developing economies, national ICT policies alone are inadequate in the quest to have a competitive edge in the global economy. This therefore calls for the need to formulate complementary educational ICT policies. Kozma (2005) too argues that the alignment of educational ICT policies to national development goals is more likely to facilitate effective monitoring, evaluation of public policies and initiation of changes corresponding to emerging needs.

Ang'ondi (2010) contends that educational ICT policies provide the rationale, goals, direction, shared vision and guidelines for sustained socio-economic development at the national level. Tondeur, van Keer, van Braak and Valcke (2008) stress the importance of school-based ICT related policies to guide how ICT is to be used in teaching and learning. In their study of 53 schools, Tondeur et al., found that school ICT policies have a significant impact on classroom ICT use. The policy plans assist in setting goals and defining means to attain such goals. In the view of Tondeur et al., successful implementation of ICT depends upon goals shared by different actors and at different organisational levels. In other words, such a policy development forum creates a sense of ownership among different stakeholders, increases chances of implementation (Howlett, McConnell & Perl, 2015) and teachers' use of ICT in innovative ways. Tondeur et al., (2008) highlight that ICT for school improvement requires sufficient school autonomy, development of school policies and collaborative school team. According to these scholars, educational ICT policies help address educational issues such as the professional development of teachers, availability of resources, access and

connectivity, evaluation and provision of guidelines for school and classroom use. Zlotnikova and Weide (2011) add that ICT policies assist in coordinating and regulating ICT-related projects.

The need for clearly articulated educational ICT policies is also bolstered by research related to technology integration into existing school curricular. Evidently, as observed by Kaffash, Kargiban, Kargiban and Ramezani (2010), Mishra and Koehler (2008) and Voogt and Pelgrum (2005), integrating technology into education is complex, making it a gradual process influenced by sophisticated socio-technical factors (Devitt et al., 2014). Thus, both national and educational ICT policies, in Kozma's view are instrumental in elucidating how ICT-based educational reforms and the desired socio-economic outcomes are related.

However, researchers advance multiple reasons to account for the failure to integrate ICT into existing school curricular (Keengwe, Onchwari & Wachira, 2008; Koç, 2005; Moore, 2009; Tay, Lim, Lim & Koh, 2012). Some identify inappropriate approaches to the integration of technology in general and ICT specifically into existing school curricular as a major impediment (Harries, Mishra & Koehler, 2009; Sir Dorabji Tata Trust & Allied Trusts, 2013). Yet others, (Batane, 2004; Behar & Mishra, 2015; Oliver, 2002; Orlando, 2011; Singh, 2013) attribute the failure to inadequate teacher training. In particular, it is pointed out that the inadequate use of learner-centred methodologies is the missing link in the puzzle. Taking the argument further, Orlando (2011) adds that while constructivist approaches are viewed as ideal for ICT classroom instruction, it was assumed that teachers would automatically use the approaches. Albirini captures most of the reasons and writes that:

efforts to explain and subsequently resolve the crisis of educational technology have centered mainly on the material obstacles to the implementation of educational technology: lack of planning, paucity of funds, shortage of hardware, absence of standards, inadequacy of teacher preparation, need of software updates, lack of computer expertise, lack of knowledge of how to apply technology in the classroom, insufficiency of access to computers, polarity of research, computer misuse, commercialized web content, digital divide, gender bias of technology, health issues, exposure to improper material etc. (Albirini, 2007, p.227).

The reasons outlined above are ominously diverse and many. Teaching draws from many kinds of knowledge and is a highly sophisticated activity (Mishra & Koehler, 2006). The nature of teaching and the divergent reasons provided explicating the inabilities of technology to transform education sufficiently indicate that integrating technology into education is a wicked problem (Mishra & Koehler, 2008). Importantly, as observed by Albirini (2007), research has largely focussed on ICT inputs such as inadequate and malfunctioning computers and insufficient teacher preparation.

Kozma (2005) favours a holistic approach to the integration of ICT. In other words, all the components of education such as curriculum, assessment, pedagogy, and school organisation need to be re-aligned to accommodate the integration of ICTs. Other studies have generally supported this view (Akiyemi, Ngwako & Nleya; 2000; Batane & Ngwako, 2017; Demiraslan & Usluel, 2008; Hosman, 2010) concluding that integrating ICT requires restructuring the entire education system. The complex process of integrating technology into existing school curriculum remains apparent and makes the need for clearly articulated educational ICT policies justifiable in developing countries. Voogt and Pelgrum (2005) observe that often times there is a discrepancy between policy intentions (intended curriculum), the practice at classroom level (implemented curriculum) and the outcomes

(attained curriculum). Baqir, Palvia and Nemati (2009) observe gaps between policy design objectives and actual outcomes. Similarly, Harries, Mishra and Koehler (2009) observe the variance between educational technology leaders' visions for technology integration and how most practitioners use it. The above assertions indicate the need for a solid foundation in the form of a policy to 'pull together' all the loose parts to attain a whole.

1.5 The context of study

As a response to the dictates of globalization, Botswana has in the past two decades instituted a number of policy reforms on the use of ICT across the different sectors of the economy. In education, a number of developments relating to the use of ICT started in the 1980s (Akiyemi et al., 2000). First was the launch of the Primary Education Improvement Project (PEIP), followed by the Junior Secondary Education Improvement Project (JSEIP), Basic Education Consolidation (BEC) and Botswana In-service and Pre-service Project (BIPP). These educational initiatives had educational technology built into their operations (Akiyemi et al., 2000). Subsequently, the Government established the National Learning Resources Centre at Tlokweng. Similarly, the education centres built under the auspices of PEIP were upgraded to include educational technology facilities. In addition, the National Media Centre was constructed in Mochudi (Akiyemi et al., 2000).

According to the Republic of Botswana (1994), the Revised National Policy on Education (RNPE) sanctioned the incorporation of Computer Awareness programme as one of the key components of secondary education (Garegae & Moalosi, 2011). In the view of Tabulawa (2009), this marked Botswana's formal response to globalization and the role of ICT in socio-economic development. The implementation of recommendation 32, section 5.5.13 (c) of the 1994 RNPE meant that Computer Awareness Programme (CAP) was now a compulsory subject for all students at junior secondary school level (Eyitayo & Eyitayo, 2005). The main focus was the need to promote basic computer literacy and equip learners

with ICT knowledge and skills in readiness for the world of work (Garegae & Moalosi, 2011). This is captured succinctly though somewhat paradoxically by two aims of the junior certificate curriculum blueprint: students should have “developed competence and confidence in application of computational skills in order to solve day-to-day problems” and that students should have “acquired awareness and/or literacy and understanding of computers in the world of work” (Republic of Botswana, 1995, pp. 8 - 9).

According to Garegae and Moalosi (2011), the syllabus for junior secondary CAP was developed and piloted together with the school computerization project in eleven junior secondary schools in 1996. The project was implemented in three phases from 1999 to 2002. The first phase wholly financed by the Botswana Government was implemented in 1999 with 25 junior secondary schools furnished with computer laboratories and a computerization package consisting of 20 desktop computers, network printer, Linux network server, 50 surge protection plugs, 50 security cables, 1 KVA UPS, 10KVA UPS and a multimedia projector. The second phase, a joint project between the Botswana Government and the United States of America (USA), started in 2000 where another sixteen schools were equipped with the same ICT resources. The second phase emphasized collaborative exchange of information and ideas between teachers and students in the two countries. The last phase in 2002 saw the remaining 154 schools equipped singly by the Botswana Government. Total expenditure for the project stood at P50 711 792.67, an equivalent of seven million US dollars (Garegae & Moalosi, 2011).

In line with this development, the three year Computer Studies programme was designed and offered in Molepolole College of Education (MCE). The course has been and continues to be offered as a minor since the first cohort of students was enrolled in 1997. According to Akiyemi et al., (2000), the Ministry of Education’s commitment to the

integration of ICT in education is demonstrated by the launch of nation-wide CAP rolled out to all junior secondary schools in the country.

In 2007, the Ministry of Communication, Science and Technology (MCST) launched the Botswana National Information and Communication Technology policy framework called *Maitlamo*. In the context of this study, the Botswana national Information and Communication Technology policy will henceforth be referred to as *Maitlamo*. *Maitlamo* is a Setswana word which denotes *national pledge* and the Botswana's commitment to the development of ICT infrastructure and facilitation of ICT uptake. *Maitlamo* ICT policy is built on, and complements the national Vision 2016 and "provides Botswana with a clear and compelling roadmap that will drive social, economic, cultural and political transformation through the effective use of ICT in the years ahead" (Republic of Botswana, 2007, p. 2). This is a broad based policy that covers the integration of ICT within most government sectors. The policy's specific application to education is through the *Thuto Net* initiative literally translated to mean 'networking in education'. *Thuto Net* seeks to promote the use of ICT in learning and teaching. More specifically, *Thuto Net* initiative focuses on the provision of inputs such as ICT skills, infrastructure (electricity, computers, network and telecommunication services, and technical support), access, and staff professional development. This study proposes the following conceptual framework to help appreciate the context and scope of *Maitlamo*, overall e-government strategy aimed at accelerating the country's transition to a knowledge society and the associated challenges.

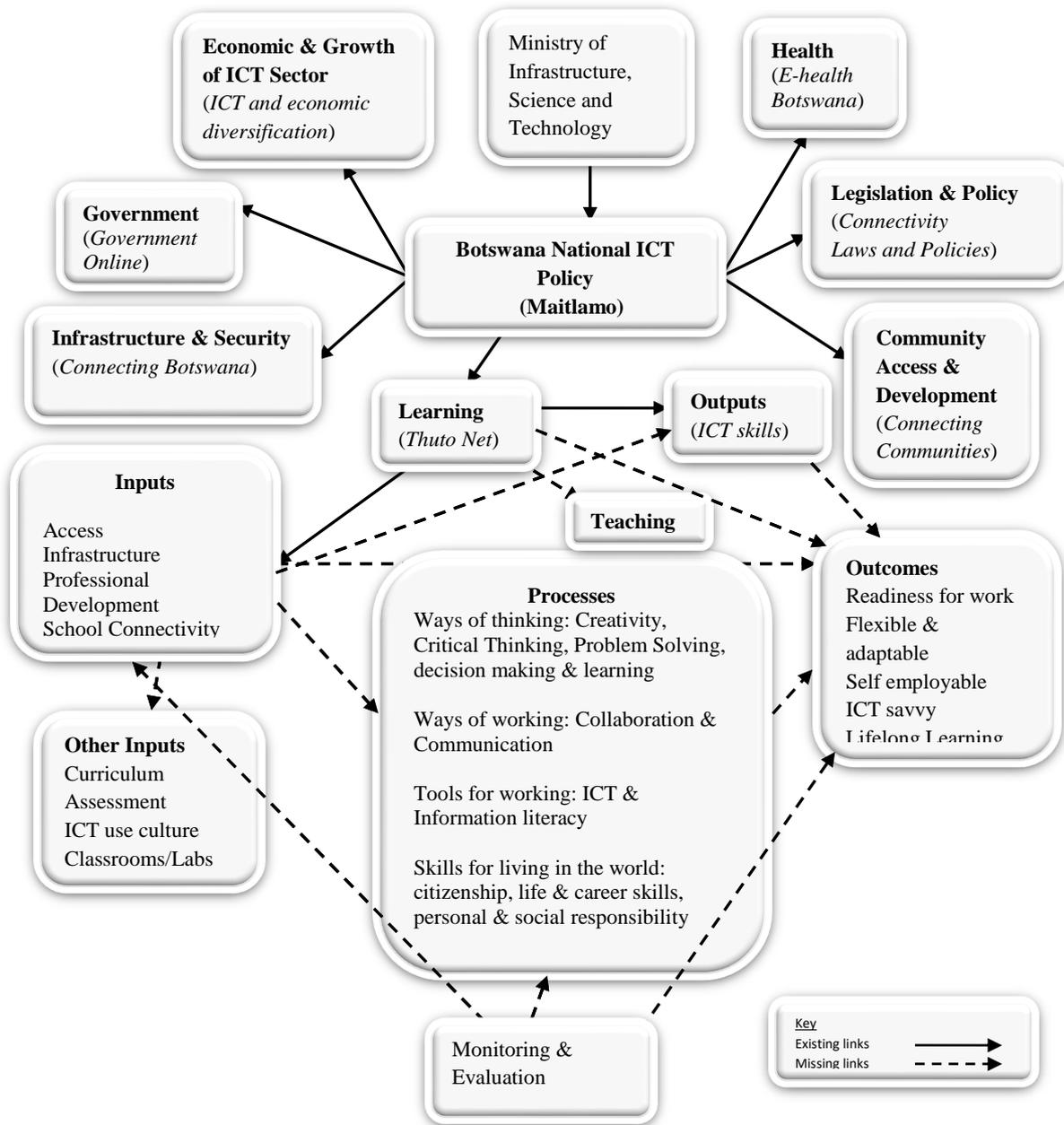


Figure 1: The Conceptual Framework: Botswana National ICT Policy

Sources: Alberta, 2013; Hosman, 2010; Kozma, 2008; Republic of Botswana, 2014; World Bank, 2013).

Maitlamo, at the centre, pivots government ICT related initiatives connecting to different sectors (illustrated with bold arrows) such as health, community access, economic growth and learning. Learning is addressed through the *Thuto Net* initiative. Only one connection is made to learning: inputs. Consequently, the framework (through the dotted

arrows), illustrates the missing links in the policy design, representing policy gaps. In view of the practical nature of ICT use, it is also suspicious that the policy overlooked the likely high unit cost associated with practical subjects. This might raise sustainability issues.

1.5.1 Development of ICT policy in Botswana

The development of *Maitlamo* is a positive move which resonates with global trends. This provides the necessary framework for the integration of ICT in the country's national planning processes. *Maitlamo* covers a number of important 'priority' areas such as: community access and development, governance, learning, health, economic development and growth of the ICT sector, infrastructure and security, legislation and policy (Republic of Botswana, 2007). In addition, *Maitlamo* seeks to: (a) promote sound social, economic, cultural and political transformation through effective use of ICT (b) maximize the power, reach, versatility and innovation of ICT, (c) secure key position in the emerging global information society and economic prosperity in the new millennium, and more importantly (d) develop ICT skills in children and young adults (Republic of Botswana, 2007).

1.6 Statement of the Problem

The launch of *Maitlamo* in 2007 was followed by the 2008 curriculum review which recommended the integration of CAP as a cross-cutting subject in the JSS curriculum. *Maitlamo* prioritizes inputs. However, it fails to align the inputs to the processes and desired outcomes. In turn, the integration of CAP into teaching and learning process is bound to be riddled with false starts, invariably affecting the production of learners who are aware of the labour market demands and/or ready for the world of work. In addition, there is little evidence to suggest that the integration of CAP across the curriculum at JSSs has led to school graduates who are ready for the world of work, self-employable or possess critical and problem solving skills. This situation then calls for the need to find out why schools are not producing graduates who were ready for the world of work. Could this be the result of the

poor articulation between the ICT inputs, processes and outcomes? This study therefore posed the following research questions which are outlined below.

1.7 Research Questions

- 1) How does *Maitlamo* influence teacher preparation for ICT integration at the junior secondary level?
- 2) How does *Maitlamo* influence the provision on ICT resources at junior secondary schools?
- 3) How does *Maitlamo* influence ICT curriculum implementation at junior secondary level?
- 4) How does *Maitlamo* influence learner acquisition of appropriate ICT skills for labour market?

In order to give this study a clear focus, the following objectives are outlined in the next section.

1.8 Research Objectives

1. Examine the impact of *Maitlamo* on the preparation of junior secondary school teachers.
2. Evaluate the effect of *Maitlamo* on the provision of resources in junior secondary schools.
3. Assess the influence of *Maitlamo* on ICT curriculum implementation in junior secondary schools.
4. Investigate how *Maitlamo* influences learners' acquisition of labour market skills in junior secondary schools.

1.9 Purpose of the study

The theoretical argument underpinning the purpose of this study is that policy informs practice. In turn, practice is shaped by policy dictates. A Republic of Botswana study rightly states that “the policy environment... supports the development of the practice environment,

which in ...turn creates learning results” (Republic of Botswana, 2014, p.18). In other words, policy provides a framework for implementation leading to achievement of desired goals.

The goals such as equipping learners with ICT skills and developing expertise among youth in readiness for the world of work acted as targets and microscopes through which the policy could be reflected upon for amendments or approval depending on findings. The purpose of this study therefore was to assess the match or mismatch between the ICT policy intentions and practical outcomes with specific reference to the integration of CAP into the JSS curriculum. In the next section, the potential significance of this study is highlighted.

1.11 Significance of the study

“The Policy Environment... supports the development of a Practice Environment, which in its turn creates Learning Results. The Learning Results ultimately provide a feedback loop for the policy setting bodies to adjust the Policy Environment – especially if Learning Results are below expected levels – in order to improve the outcomes of the education system” (Republic of Botswana, 2014).

The significance of this study rests much on its findings. The findings of this study are likely to highlight the strengths and weaknesses of *Maitlamo* or the matches or mismatches between the policy and classroom practices with specific reference to integrating CAP into the core curriculum at JSSs. While the strengths or matches would be useful as springboards in future policy review, the study would assist in bridging any existing gaps reflected by the weaknesses or mismatches. In light of this, this study was expected to be influential in future ICT policy reviews. This study envisaged developing a framework that could be used in policy reforms related to CAP integration specifically and broadly, technology use for classroom instruction. Such a framework could be useful in future curriculum reviews not only at junior secondary level but also across the levels of education in the country.

In the same vein, the findings of this study are likely to impact on practice. The results of this study will point out the reality of practice regarding the cross curricular integration of CAP at JSSs. Depending on the outcomes, this is bound to influence practice. This study will have unearthed information related to best practices across the globe with specific reference to computer integration in education. Thus, this study is bound to challenge current practice in junior secondary schools. Lessons learnt from this study might be relevant and helpful for the country's future endeavours with technology adoption and integration.

To date, the debate on globalization and ICT integration into education is on-going. This study will add to this debate especially from the perspective of a developing African country. This will be useful as part of literature for future reference in related areas, internationally, regionally and locally.

Finally, it is highly likely that this study will ignite further research in this field. Necessarily, this study will not cover all aspects related to technology and education. As a result, substantial ground will be left to be covered by other studies which would be provoked by the current study. Similarly, this study would raise other areas for research through its recommendations. Other researchers may become interested in taking up these areas.

1.12 Limitations of the study

Brannen (2005) indicates that research practice is shaped by research environment. The ethical clearance process at the University of Botswana took longer than anticipated and affected the data collection schedule. The process of obtaining permissions to conduct research added to the delay. These are sought from the Ministry headquarters and individual regions. The schools are widely spread and travelling between them was quite exhausting which could have affected the data collection process. It would have been more ideal to reach a school or two in the far West. However, the financial support received from the Office of Research Development was a welcome development to ensure good coverage of the schools.

Also, the use of multiple methods to investigate the same phenomenon provided rich data particularly as schools belong to clusters. Participants could share experiences of other schools in the same cluster.

Focus group discussions were organised and conducted accordingly. However, it was not easy organizing these as teachers and students were often very busy in the afternoons. In some cases, teachers could not sit for the duration of the discussion or moved in and out of the room. This disturbed the flow of discussions. However, the use of a focus group discussion guide was very helpful in maintaining reasonable flow of discussions. Similarly, there was 100% return rate for questionnaires enhanced by multiple follow ups and constant encouragement of participants to complete the questionnaires by teachers who volunteered to assist the researcher to keep track.

The mixed method proved to be labour intensive and required a lot of time (Johnson & Onwuegbuzie, 2004; Collins, Onwuegbuzie & Sutton, 2006). However, it proved to have been the most appropriate. It allowed probing to seek clarity and physical observations to corroborate quantitative data.

1.13 Delimitations of the study

This study's scope was limited to the integration of CAP at junior secondary schools (JSSs) and primarily within the eleven schools partaking in the study. Therefore it did not cover any other education levels where computer-related courses are offered. As such, the scope of generalisations was limited to this level and the schools involved in this study. Similarly, the study only reviewed *Maitlamo* as it relates to the implementation of integrating CAP across the curriculum at junior secondary schools. As a result, the *Thuto Net* initiative through which the policy largely addresses ICT in education was the main focus of this study. Similarly, this study did not attempt to review the JSS curriculum or the

CAP. It was restricted to the implementation of the integration of CAP across the curriculum.

This study used the following instruments: questionnaire, interviews, document analysis and observations. Regarding quantitative data, this study was limited to statistical descriptions about demographics (frequencies and percentages). Combined, qualitative and quantitative data sets were used complementarily to provide a holistic picture regarding the integration of CAP in the schools partaking in the study. Finally, this study restricted itself to the following variables: computer skills and competencies, teacher preparation, resource provision and integration of CAP.

1.14 Theoretical framework

1.14.1 Introduction

This study is multifaceted and straddles policy and practice – how policy informed practice and vice-versa. Reliance on a specific framework risked overlooking critical issues either in education, technology adoption processes or policy. Consequently, this study applied a combination of theoretical frameworks and at the same time tapping on the available technology adoption models. It is mainly situated within Baqir's (2009) Extended Design Actuality Gaps model which is fully explained later in this section. This section starts by highlighting the Design Actuality Gaps model and the related Extended Design Actuality Gaps (Baqir, 2009) model. A succinct discussion of technology adoption and use models will follow. On the basis of this discussion, the Chapter will then propose a custom-made theoretical design model which is relevant for the Botswana context.

The Design-Actuality-Gaps (Heeks, 2002) is a framework used to understand, evaluate and analyse the match and/or mismatch between policy formulation, implementation and the outcomes. It has been used to assess successes and failures of Information Systems

(IS) and government ICT projects particularly in developing countries (Baqir et al., 2009). The Design-Actuality-Gaps framework has been successfully used to identify discrepancies between the design of specific Information Systems (IS) and their implementation. In turn, these discrepancies offered in-depth understanding and analysis of the successes and failures of particular ISs in developing countries including Africa. Its major strength is its flexibility and the ability to provide alternative pathways in an effort to enhance the success rate of ISs. It also permits researchers to appreciate the match and/or mismatch between theory and practice from various dimensions (Baqir, 2009).

However, the application of the Design Actuality Framework has been limited to specific IS and government projects, and its relevance to other contexts has not been thoroughly explored. To enhance Heeks' (2002) Design-Actuality-Gaps framework, Baqir (2009) developed the Extended Design Actuality Gaps model with the hope of making the original framework useable in policy analysis and evaluation contexts. However, both the Design Actuality Gaps and its extended version do not explain and account for other factors relating to technology diffusion, adoption and use in education. These factors include ICT culture, pedagogy, curriculum and assessment. In the context of this study, literature (Achtenhagen, 2012; Batane & Ngwako, 2017; Kozma, 2008) has highlighted that these factors are also critical to the success or failure of ICT uptake. In light of this, the next section is a brief discussion of technology adoption and diffusion models.

Numerous models geared towards explaining the adoption and dissemination of technology have been generated and tested (Straub, 2009). Notably, most of earlier technology adoption and use models have since been consolidated to develop the Unified Theory of Acceptance and Technology Use (UTAUT) (Venkatesh, Morris, Morris & Davis, 2003) and UTAUT2 (Venkatesh, Thong & Xu, 2012). These include the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), The Motivational Model, the Theory

of Planned Behaviour (TPB), A model combining TPB and TAM, the Model of PC utilization, the Innovation Diffusion Theory (IDT) and the Social Cognitive Theory. Others include Concerns Based Adoption Model (CBAM), Consumer Acceptance of Technology Model (CAT), Pleasure, Arousal and Dominance (PAD) theory. The intention is not to explore all these models in this study but to highlight them and briefly explain their generic inadequacies as models to comprehensively inform this study.

Straub (2009) explains that the adoption models examine individuals and their choices to adopt or reject a particular innovation or the extent to which an innovation is integrated into appropriate contexts. Adoption is thus used to predict behavioural change towards an innovation. Behavioural change is understood through contextual, cognitive and affective factors. That is, the environment within which individuals live, how they perceive the innovation and its effects on them are critical determinants of technology adoption and use.

The technology adoption and use models mainly focus on individual consumers and their responses towards an innovation (Straub, 2009). In the context of this study which encompasses policy issues and thus involve multiple stakeholders, focussing on individual consumers may be insufficient. In turn, these models do not articulate issues related to technology integration particularly into education. Similarly, these models focus solely on behavioural changes at the expense of policy inputs, processes and outputs/outcomes critical in this study. While this study appreciates positive behavioural change, the inputs, processes and outputs/outcomes are considered critical since change is not occasioned for its sake. Also, most of the technology adoption models build onto one another. Therefore, these models are somewhat similar in their conceptual underpinnings. For example, UTAUT consolidates 8 earlier models. Somewhat, this reflects the gravity of the shortcomings of the individual technology adoption models for use in this study as standalones. The focus of UTAUT1 and 2 is still on individual consumers.

Diffusion theories look at how innovations are disseminated taking into account factors such as time, social pressures and the rejection or adoption of innovations (Straub, 2009). According to Straub (2009), adoption and diffusion theories agree that the adoption of an innovation is greatly influenced by individual and societal attitude and beliefs. Like their technology adoption and use counterparts, diffusion theories concentrate on individual consumers' decision to adopt and use technology. They also assume that the purpose is to disseminate information about a particular innovation for adoption rather than the processes (Straub, 2009). Such shortfalls within diffusion models render them inadequate to meaningfully inform this study and its education context. The Design-Actuality Gaps Framework thus provides a starting point in understanding the intricacies inherent in the use of ICT in education.

1.14.2 The Design-Actuality Gaps Framework

Traditionally, the Design-Actuality Gaps framework (Heeks, 2002) has been used in understanding the failures, successes and improvement of Information Systems (ISs) in developing countries (Baqir et al., 2009). It has also been used to explain the failures and successes of particular government projects (Baqir et al., 2009). The Design-Actuality Gaps model holds that the success or failure rate of IS are attributable to discrepancies between the design and the implementation of ISs. Too often, there are gaps arising from the mismatch between policy assumptions and the users' context (Heeks, 2002).

The Design-Actuality Gaps model identifies two challenges which normally arise during the evaluation process: the subjectivity and timing of evaluation. Most of the ISs evaluation do not take into account the subjectivity inherent in making judgements and the failure to recognize that "one person's failure might be another's success" (Heeks, 2002, p.101). In other instances, the evaluation does not take into account the fact that "today's failure might be tomorrow's success" (Heeks, 2002, p.101). Put differently, what works for

someone may not necessarily work for other people. Similarly, what may have failed might be turned into something that works.

The Design-Actuality Gaps model assesses the failure and success of ISs on a scale ranging from *total failure*, *partial failure* and *success* (Heeks, 2002). According to Heeks, a total failure represents a scenario where an initiative was never implemented or where a new system was implemented but immediately abandoned. A partial failure is when major goals are not achieved or when there are significant undesirable outcomes. In the view of Heeks, a partial failure includes a variety of cases: One example is where only a subset of originally stated objectives is achieved. Another form of partial failure includes the sustainability failure described as where an initiative succeeds at first but is later abandoned after a year or so. Such cases can occur during the implementation process or operation owing to the dynamic nature of design and actuality linkages. For instance, gaps can be visible when funds are withdrawn or staff with relevant competencies quit (Heeks, 2002). Lastly, the success of an initiative occurs where most stakeholders achieve their main goals and most outcomes are desirable.

The Design-Actuality Gaps model recognizes the multiplicity of factors accounting for the success or failure of ISs (Heeks, 2002). In the view of Heeks, ISs success occurs when there is synergy between ISs technology and tools and the task at hand. Conversely, the failure of ISs occurs when there is mismatch between ISs technology and tools and the task at hand (Heeks, 2002). Put differently, Heeks contends that “the greater the mismatch (i.e., the greater the change), the greater is the risk of failure, and the greater the match, (i.e., smaller the change), the greater the likelihood of success” (Heeks, 2002, p. 4).

The context of the design and implementation of information systems is critical. Heeks (2002) for example, conceives technology as both the embodiment of the physical artefacts and the inscriptions that seek to predict the world. The physical artefacts include

information data stores, data flows, technology (hardware and software) and processes (the activities of users & others). The inscriptions refer to how the ISs processes will be undertaken, the objectives and values that people will have and the implementation structures. Implementation structures include culture and politics, staffing and skills (qualitative & quantitative aspects of competencies), management systems and structures and other resources (particularly money and time) (Heeks, 2002).

The Design-Actuality Gaps model identifies two sets of gaps: *Country context* and *hard-soft gaps*. Country context gaps refer to the country context and contextual differences which can be subtle, implicit or explicit. In other words, the context of designers can be completely different from that of users physically, culturally, economically and in many other ways. In such a case, the designer inscriptions are likely to be more significant from user actuality (Heeks, 2002). Hard-soft gaps are often linked to the rationale behind the need to modernize information systems often resulting from the dictate of globalization. The central aim is often economic and market rationalism. ICT is viewed as the key tool technically and technologically towards reducing the digital divide. Disparities then often exist between the hard design and soft actuality (Heeks, 2002). The Design Actuality Gaps framework is

graphically depicted as figure 2.

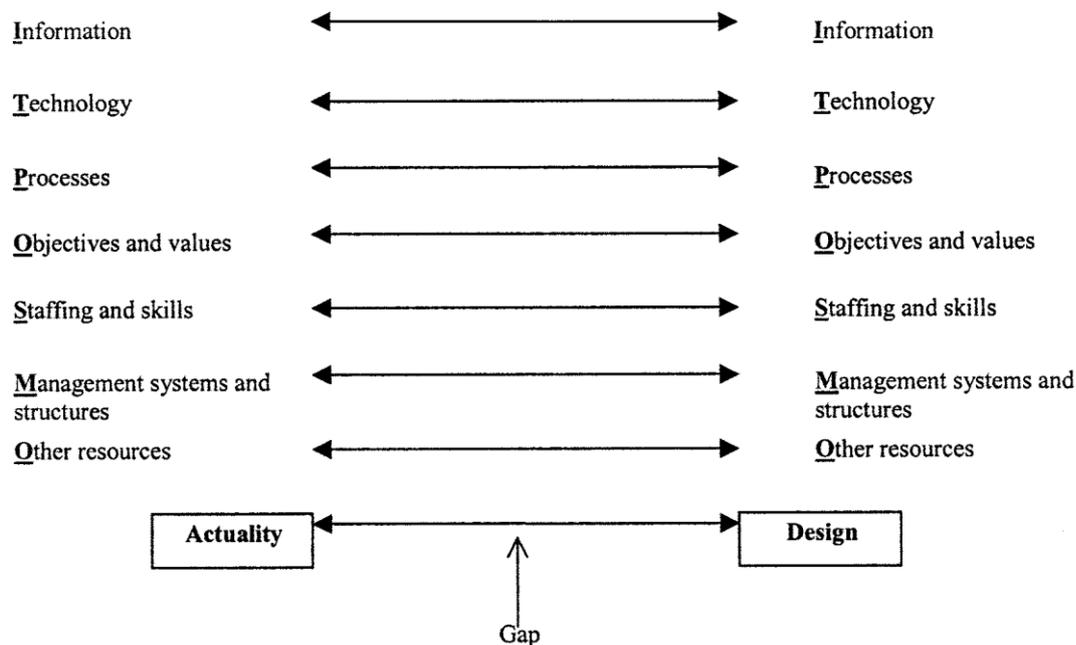


Figure 2: Design Actuality Gaps framework (Heeks, 2002)

While the Design Actuality Gaps is a useful framework for this study, its traditional confinement to ISs limits its scope and usability in policy analysis. Against this backdrop, the Extended Design Actuality Gaps (Baqir, 2009) is discussed as a complementary framework.

1.14.3 The Extended Actuality-Design Gaps Model

The Extended Design-Actuality Gaps model is an improvement on the Design Actuality Gaps Model. It is more relevant to the evaluation and analysis of government ICT policies (Baqir et al., 2009). Baqir and colleagues argue that most national ICT policies are made or adopted without theoretical foundation. In the view of Baqir et al., this usually results in gaps and poor linkages in policy, outcomes and effectiveness of the implementation processes. Due to lack of theoretical foundation, developing countries are unable to learn from gaps between policy design objectives and actual outcomes.

Baqir (2009) argue that policy evaluation processes can be prospective (*ex-ante*) and retrospective (*ex-post*). Ex ante evaluation estimates outcomes and align goals, objectives and action plans related to policy. As a result, monitoring is carried out to support policy and

make amendments where necessary. Ex-Post evaluation analyses actual outcomes of the policy with the view to legitimizing the policy and make it relevant to the needs of the users. These evaluations aim to find out what works, what does not in the policy design and implementation and *performance gaps*. Performance gaps occur when there is a mismatch between what was planned and what was accomplished (Baqir, 2009). Baqir adds that gaps can also be studied from the design and actuality (dimensional gaps) and from elements within each dimension (elemental gaps). In turn, any discrepancy between the design and practice environments depict dimensional gaps while any disparity between design and practice elements reflect elemental gaps, allowing further understanding of the gaps. The main advantage of the Extended Design-Actuality model is that it looks at the entire policy design and users' context instead of focusing on a single ISs project. Figure 3 is the graphic representation of the Extended Design-Actuality Gaps framework.

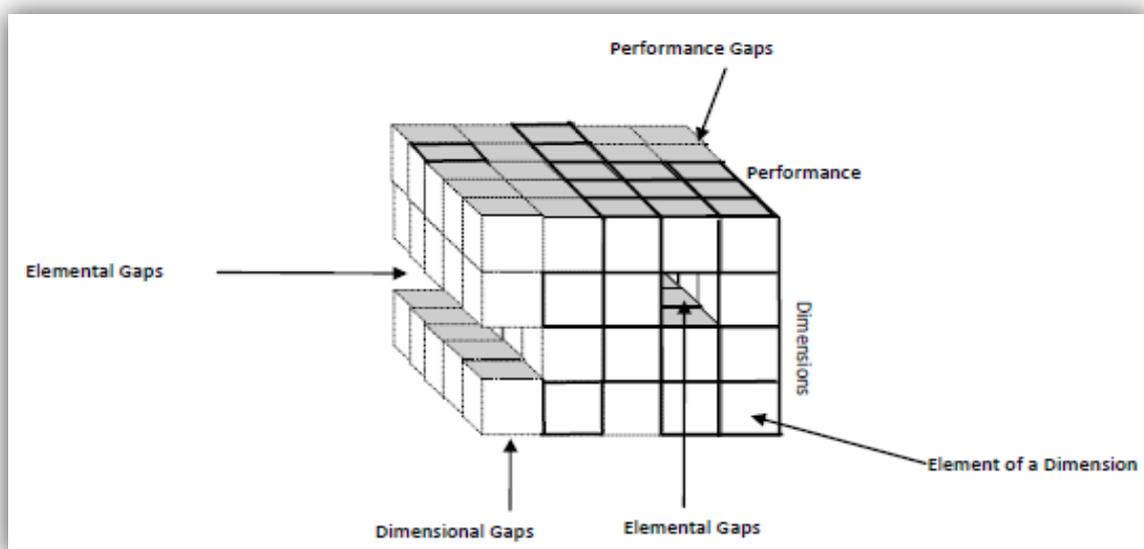


Figure 3: The Extended Design-Actuality Gaps framework (Baqir, 2009)

The Design actuality-gaps and the Extended Design-Actuality Gaps are suitable to guide this study which looks at the integration of ICT into Botswana's junior secondary school curriculum. These will be helpful in assessing synergy and/or lack thereof between theory and practice with regard to the implementation of the cross curricular integration of

computer awareness programme (CAP) at junior secondary schools (JSSs). This will help reflect on the policy intentions, what has been attained and what is missing at the level of policy design and formulation.

The Design-Actuality gaps model for example has been used extensively in developing countries including Africa. The Extended Design Actuality Gaps framework has also been used to assess the success of an ICT policy in a developing country (Pakistan). Botswana is a developing country hence shares contextual similarities with most developing countries elsewhere and particularly in Africa. Like other developing countries, Botswana has developed *Maitlamo*. Its impact in the different sectors it has since identified needs to not only be monitored but also evaluated to guide its fruitful progress. This study attempts to evaluate the uptake of ICT in education particularly in the context of *Maitlamo*.

However, the frameworks discussed above have not been applied to the integration of technology into education. Specifically, since the Extended Design Actuality Gaps framework has been used to evaluate an entire policy, the prerequisites it identifies are somewhat different from those relevant to this study. Hence this study will augment the use of the Design-Actuality and the extended gaps models by drawing on Kozma's (2008) ICT, Education Reform and Economic Growth conceptual framework. Some of the identified attributes necessary in integrating technology into education are briefly discussed.

1.14.4 Antecedents for Technology Integration into existing school curriculum

Kozma (2008) asserts that there are different ways of integrating ICT into the existing school curriculum as part of educational reforms. Figure 4 is an illustration of how ICT can be integrated within the education system in general and the school curriculum in particular.

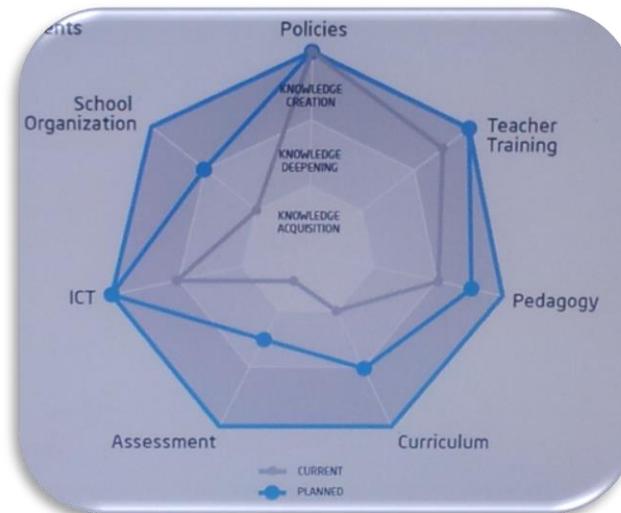


Figure 4: ICT, Education Reform, and Economic Growth: A Conceptual Framework (Kozma, 2008)

Kozma's identifies the following components as critical for the successful integration of ICT into the education system: education policies, teacher training, pedagogy, curriculum, assessment, ICT and school organisation. The conceptual framework envisages an education system directed by policies that will move it progressively along the education ladder: knowledge acquisition, knowledge deepening and knowledge creation.

In the view of Kozma, the education policies must have clearly articulated visions geared towards educational change and aiming at knowledge deepening and creation. The policies must allow continued and sustained progressive changes during which students are engaged in continuous lifelong learning and the creation and sharing of new knowledge. In the process, students should continue to refine their skills in collaboration, enquiry, information management, critical thinking and creatively apply these skills to generate new knowledge and support their continued learning. According to Kozma, these skills can be fostered by collaborative investigation and research projects where students design and develop intellectual and creative works that can be shared within and outside the school.

Teachers will have a high degree of professionalism and training with knowledge of appropriate pedagogies for ICT use in learning and teaching and allowance for continuous teacher professional development. Teachers will assume the role of mentors. Also, there must be congruence between the curriculum goals and ICT use shifting from emphasis on memorization of isolated facts and disjointed principles to that which promotes understanding deep interrelations between concepts, facts, and their principles as well as their application to real day to day life. Assessment should be flexible permitting students, with the guidance of their teachers, to assess their own and each other's learning. The school should be reorganised to permit participation by all stakeholders inclusive of teachers, parents and community members. ICT must be readily available for use by students and teachers in schools, homes, businesses and social venues to allow continued access and use of a variety of tools.

The framework sets a positive tone and helps identify the key requisites for technology integration into an existing curriculum. However, it is idealistic and assumes rationality in policy formulation. It also assumes other critical processes such as monitoring, maintenance and evaluation will be automatic. Besides, it offers descriptions of each aspect without providing criteria for its measurement. Below are some discussions of the benefits of technological pedagogical content knowledge within classroom settings.

1.14.5 Technological Pedagogical Content Knowledge

Shulman (1986) discussed the relationship between content and pedagogy and argued that the construction of pedagogical content knowledge (PCK) is critical if schools are to effectively transform the teaching and learning processes. Shulman's PCK framework did not include technology as a specific aspect of pedagogical content knowledge. This however, does not suggest that technology is not critical to education and teacher preparation

processes. At the time of the inception of PCK, technology had not permeated the education arena as much as it had, for instance, the business environment.

Mishra and Koehler (2006; 2008) build on Shulman's PCK framework by highlighting the importance of technological pedagogical content knowledge (TPACK) in the integration of technology in the school curriculum. According to Mishra and Koehler (2006; 2008), teachers need content, pedagogical and technological knowledge if they are to effectively integrate technology in their classrooms. TPACK emphasizes two other forms of knowledge to enable teachers to successfully integrate technology into education: Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK). Developing appropriate technological tools requires critical understanding of the knowledge of a given discipline and the appreciation of the impact of technology on classroom practices (Mishra & Koehler, 2006; 2008).

Therefore, the choice of technologies determines the type of content ideas that can be taught. Similarly, the types of technologies that can be used are influenced by certain content decisions. Mishra and Koehler (2008) contend that technology limits the possible representations of concepts while at the same time providing newer alternative representations that can be navigated with relative ease. TPACK suggests that teachers' knowledge of the subject content alone is not enough. Rather, teachers need to show thorough understanding of the manner in which technology application can transform the subject matter, that is, how representations of the subject matter can be constructed. Furthermore, teachers must be able to choose appropriate technology for specific content and vice versa.

Specifically, the TPACK model argues that technology and pedagogy mutually influence each other (Mishra & Koehler, 2008). TPACK is defined as the understanding of the interaction between technology and pedagogy and how particular technology can change learning and teaching (Mishra & Koehler, 2008). Teachers need to show an adequate

understanding of the merits and demerits of various technological tools in relation to divergent disciplinary contexts and pedagogical designs and strategies (Mishra & Koehler, 2008). They contend that TPACK is the synergy between these three forms of knowledge. Understanding the knowledge structure ensures better appreciation of the interaction and linkages of technology, pedagogy and content. Consequently, TPACK advocates five competencies:

- a) understanding the representations of concepts using technologies
- b) pedagogical techniques that apply technologies in constructive ways to teach content in differentiated ways according to students' learning needs
- c) knowledge of what makes concepts difficult or easy to learn and how technology can help redress conceptual challenges
- d) knowledge of students' prior content-related understanding and epistemological assumptions
- e) knowledge of how technologies can be used to build on existing understanding to develop new epistemologies or strengthen old ones.

Figure 5 is a pictorial representation of the TPACK model.

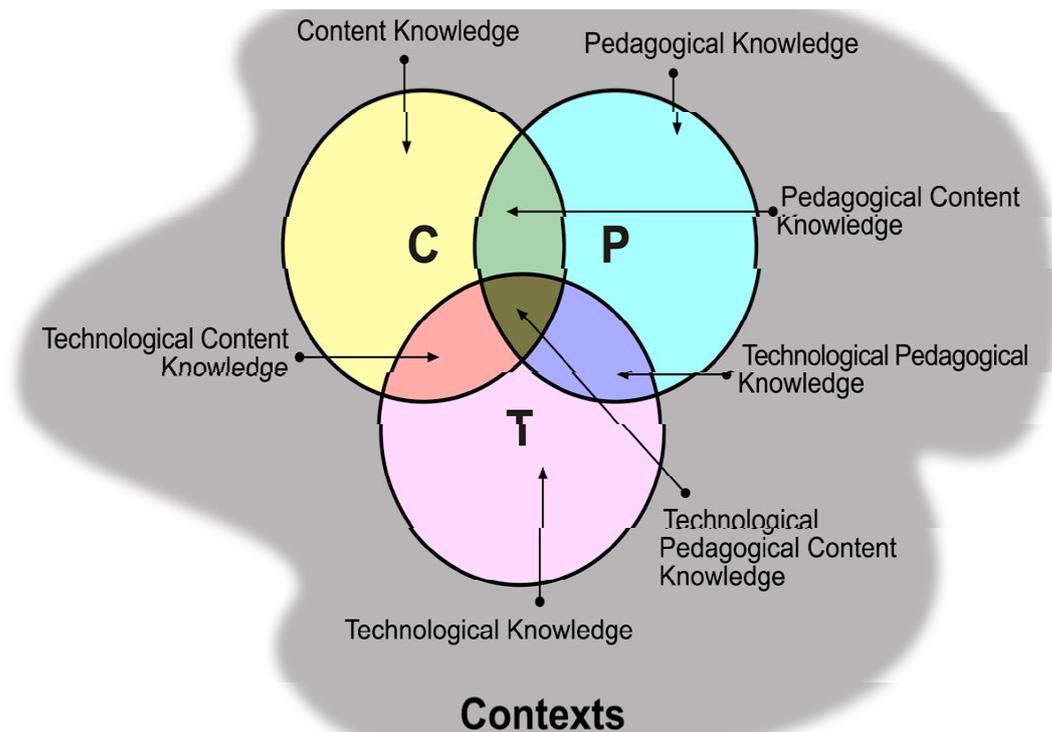


Figure 5: The TPACK framework (Koehler & Mishra, 2008)

Significantly, the TPACK model elucidates the importance of teacher knowledge in terms of content, pedagogy and technology use. However, focussing on teacher knowledge alone risks ignoring other significant factors such as availability and, accessibility of the resources and supportive management which are associated with technology integration into existing curricula. These factors and others, in the context of this study, relate to policy which falls outside the scope of the TPACK model. Consequently, the other shortfall of the TPACK model is that it does not address the relationship between teacher knowledge, technology integration and policy issues. It assumes that teacher preparation will suffice to facilitate technology integration in education.

Studies have also pointed to the contrary: that even when teachers possess knowledge of using technology, they still may not use it for other reasons (Batane & Ngwako, 2017; Hosman, 2010; Nkhwilume, 2013; Watson, 2005). This calls for the need to consider other critical factors in technology integration in education. To look into policy related issues, this

study also calls for the need to adopt and adapt the Design Actuality Gaps (Heeks, 2002) and the Extended Design Actuality Gaps (Baqir, 2009) to the Botswana context.

1.14.6 Adaptation of integrated approach for ICT policy analysis in Botswana

This study proposes the use of an integrated ICT model to evaluate the uptake and challenges associated with the integration of ICT in Botswana's junior secondary school curriculum. The proposed approach is an adaptation of the Design-Actuality Gaps and Extended Design-Actuality Gaps models to the Botswana context. Such an adaptation will assist this study to objectively assess and analyse the impact of *Maitlamo* on the implementation of the cross curricular integration of CAP at junior secondary level. This study will be able to evaluate any existing benefits and/or discrepancies between the policy design and implementation (actualisation).

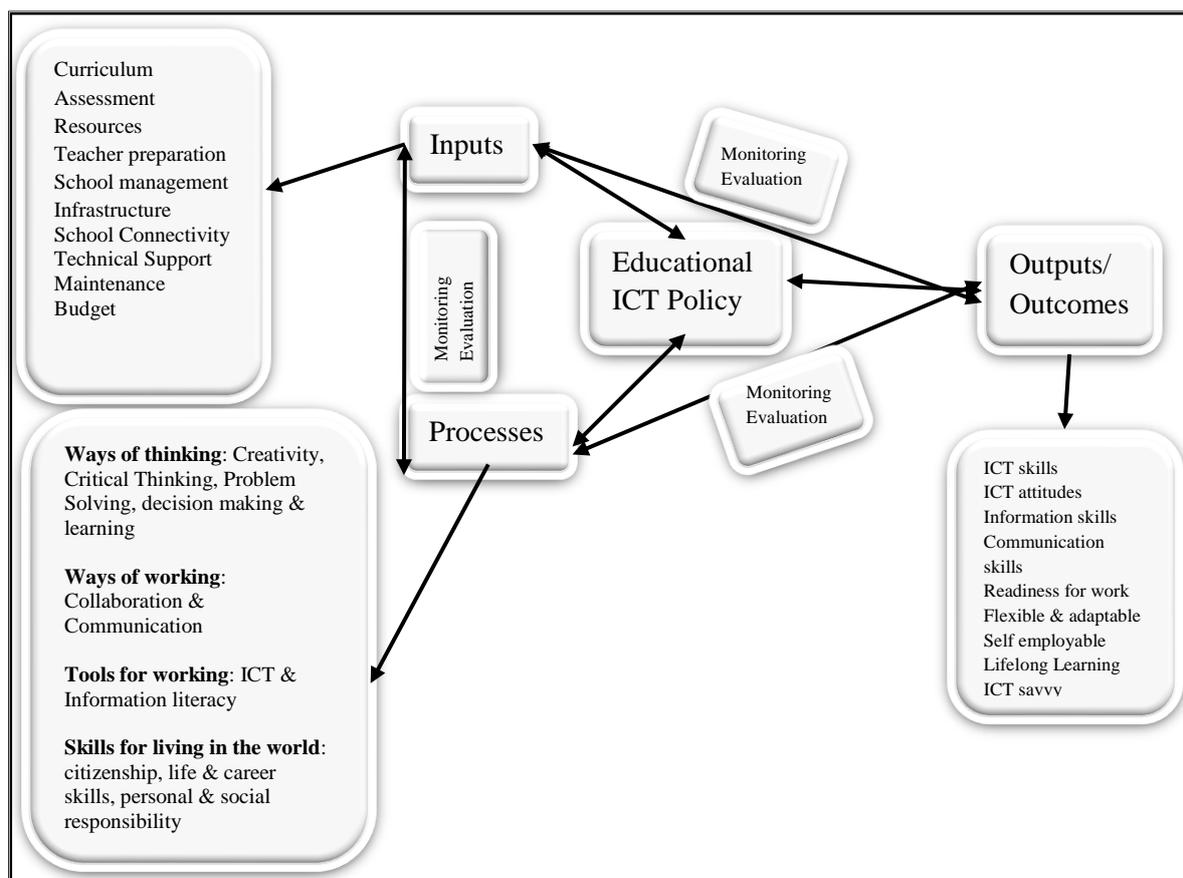


Figure 6: Adaptation of Educational ICT Policy Model (Inputs-Processes-Outcomes)

The adapted Educational ICT Policy Model underscores important concepts and attributes of a national educational ICT policy. The inputs such as suitability of curriculum, appropriate assessment procedures, availability and accessibility of resources, relevant teacher preparation, technical support and supportive management structure are critical for implementation of ICT integration across the curriculum. The processes which include ways of thinking and working, tools for working and skills for living in the world highlight the activities related to ICT integration. They shape the education purpose and inform the curriculum, assessment practices and pedagogies. The outputs/outcomes such as students' ability to search for and manage information, effectively use ICT to communicate and solve real life problems, become ICT competent, and flexible and adaptable graduates ready for the world of work illustrate policy intentions with respect to products of an education system. They are reflective of the ultimate aims of the policy. While outputs would show short term goals, outcomes represent long term goals of an educational system.

Also, the model illustrates the interrelations between the major constructs: inputs, processes and outputs/outcomes. Inputs alone will not guarantee implementation. At the same time, the processes are dependent on the inputs. Much cannot be achieved by concentrating efforts on either. Thus, these are interdependent and intricately linked as shown by the multidirectional arrows and are reflective of the policy as much as informed by it.

Similarly, there is a need for constant monitoring and evaluation in all areas to continually search for disconnections at design and execution levels with the aim to bridge them. This model proposes monitoring and evaluation of the inputs, processes and outputs/outcomes. Effectively carried out, these would help schools continually reflect on their performance. In turn, feedback from schools will inform policy and even trigger policy evaluation. Also, monitoring and evaluation are proposed processes between each of the key constructs of inputs, processes and outputs/outcomes. This will ensure vertical coherence

between these three and ultimately that of the policy. Finally, the model illustrates that ICT integration in education is determined by a dynamic process that involves a set of interrelated factors.

To better understand synergy or lack thereof between theory and practice in the implementation of cross curricular integration of CAP in Botswana JSSs, this study assesses the match or mismatch between intentions and practical outcomes of *Maitlamo*. Primarily, *Maitlamo* guides, coordinates and promotes the overall integration of ICT within government sectors. Specifically to education, the *Thuto Net* initiative was designed to drive ICT integration. Essentially, the *Thuto Net* initiative has mainly four targets through which it will promote ICT integration in schools: infrastructure (electricity, computers, network and telecommunications services, Internet connectivity and technical support), access, staff professional development and general ICT skills. It is critical for this study to assess how the policy performs in the highlighted areas. Among others, the extent of implementation of the cross curricular computer awareness integration will shed light into the degree of progress made in implementing aspects of the *Thuto Net* policy initiative. Within the context of the outlined policy aspirations: (a) social, economic, cultural and political transformation through effective use of ICT (b) maximisation of the power, reach, versatility and innovation of ICT, (c) securing a key position in the emerging global information society and economic prosperity in the new millennium, and significantly (d) development of ICT skills in children and young adults, this study will also attempt to examine the impact of other areas crucial to ICT integration in education to which the policy does not extend: ICT use culture, curriculum, assessment, processes and outputs/outcomes. An examination of these elements will point to the match or mismatch between policy intentions and practical outcomes. Any significant impact of other missing elements will illustrate policy design gaps.

On the same tone, the question connects to current global trends and related 21st century skills required in the information age. That is, “Can the implementation of the current cross curricular computer awareness integration position Botswana as a key player in the information society?” Answering this question will reflect match/mismatch between policy intentions and actual outcomes.

Two sets of data will be generated to represent design and actuality dimensions. The design is understood in terms of the *Thuto Net* initiative and its elements (inputs) as shown in table 1.

Table 1: Key aspects of the Thuto Net policy initiative

Dimensions	ICT Skills	Infrastructure	Access	Professional Development
Elements of design dimension	Digital	Electricity	student computer ratio (study)	Training school heads & teachers
	Information	Computers	Donated computers	
		Network services		
		Telecommunication services		
		Internet connectivity		
		Technical support		

The *Thuto Net* initiative is a component of the broader *Maitlamo* which builds on and complements two of Botswana’s important policy documents: the Revised National Policy on

Education (RNPE, 1994) and Vision 2016 (1996). On the international front, the policy appears to have gained impetus from the growth in broadband technologies and internet as well as the School Net Africa initiative (2003). Two other important international frameworks that have somewhat influenced the policy are Education for All (1990) and the associated Millennium Development Goals (MDGs) to which Botswana is a signatory.

While the main policy is aimed at coordinating all ICT integration efforts in the country, the *Thuto Net* initiative particularly targets ICT integration in education. The four targets of the *Thuto Net* initiative identified will form the key inputs for assessment in terms of the performance of the policy initiative. It will also benefit this study to look into other crucial areas pertinent to the implementation of ICT integration in education.

Missing elements such as how the integration will be done, what processes will be put in place and the anticipated school products will be perceived as design elemental gaps. These will also be cross checked at the actuality design in view of their significance and possible impact. As such, the policy initiative content as well as its implementation process will be assessed.

The actuality dimension is understood in terms of implementation particularly taking into account policy performance in the areas such as ICT skills, infrastructure (electricity, computers, network and telecommunication services), internet connectivity and technical support, access and staff professional development. The extent to which these are well-articulated within the *Thuto Net* initiative is one of the main focuses of this study. The rate of implementation will reflect existing gaps and their significance. Similarly, this study will evaluate the extent of achievement of set goals against what has been achieved to date to determine the rate of success or failure of implementation of the cross curricular integration of CAP and, logically, of the policy.

Chapter Summary

This chapter introduced the study, highlighting the intricate relationship between globalization, ICT and education. The background to the development of global national ICT policies and arguments for integrating ICT in education were also discussed leading to historical developments and efforts of ICT integration in education in Botswana. Further, the chapter highlighted the problem, research questions, objectives, assumptions, purpose, limitations, delimitations and significance of the study. Lastly, the chapter presented the theoretical background and other complementary frameworks supporting the study. The next chapter presents reviewed literature related to the intricate relationship between globalization, ICT and education and associated research questions.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview

This section introduces and examines the literature around globalization and its intricate links with Education and Information and Communication Technology (ICT). It examines how globalization manifests itself and ways in which transmission of global ideas is done, those instrumental leading to different global reforms. The critical role played by technology is also closely looked into. The impact and effects of globalization in education, how education transformations and ICT policies are exported and imported across the globe are examined. Simultaneously, the effects of these on education in the world, the African continent particularly sub-Saharan Africa is also gleaned. Finally, the transformations within the Botswana education context with specific reference to ICT use are introduced.

2.2 Evolution of information and communication technologies

The genesis and evolution of ICT can be traced back to the emergency of telegraphic systems of communication. According to Hajela (2005), the Telegraph network emerged in the 1850s specifically focusing on social, economic and cultural issues. The Telegraph network made possible the immediate flow of information using electricity without the need for physical movement of goods or people or means of transport. The geographical differences and distances were no longer barriers to information transactions between nation states as was the case in the past.

Closely following the Telegraph network was the development of the telephone as a means of communication in 1876. The telegraphy and telephony technologies eventually gave birth to the wireless telex and fax technologies. These technologies provided new ways of managing global ventures. Finally, the computers were linked to the existing communication networks eventually leading to the Internet which marks the most crucial development in communications technologies. Hajela observes that:

The advent and rapid development of digital technology, satellite communication, fiber-optic global communication networks, convergence of computer (information) and communication technologies, and above all, the Internet and the world-wide-web, and broadband services further reduced barriers caused by distance in the effective management of global enterprises (Hajela, 2005, p. 4).

The new technologies have led to a networked society (Yusuf, 2005), removing geographical barriers as impediments for movement of people, goods and capital across and around the world (Kozma, 2005; 2008). This gave impetus to the concept of globalization (Al'Abri, 2011) which criss-crosses all human global activities, making it a complex concept.

The role and impact of ICT in facilitating globalization has been extensively documented (Albirini, 2007; Giddens, 1990; Hajela, 2005; Kozma, 2005, 2008; Pillay & Hearn, 2009; Salih, 2001; World Bank, 2013; Yusuf, 2005). The recent robust developments in ICTs which culminated in a successful merger of the two led to the Internet and recently broadband technologies. The world has been compressed into a single space with increased connectivity. Kozma (2005) claims that connectivity permits speedy movement of people, goods and capital across and around the world. In the view of Kozma, people have more access to information than ever before. ICT permits instant information transmission to the world such that local activities are influenced by occurrences in distant places (Giddens, 1999). Critically, ICT facilitates collaboration and networking, knowledge creation and sharing; knowledge can be recycled without losing value (Kozma, 2005). Consequently, the evolution of technologies has hugely benefitted and revitalized globalization.

Over the years, technology has evolved. This includes technology associated and used in education; from standard technologies such as blackboards, radio and television to computers, the internet and broadband technologies. The evolution of technology has brought with it cross cutting reforms across the world extending to requirements for reforms in

education to embrace new technologies in the learning and teaching processes. Critically, developments in communications technology have enhanced the globalization process.

2.3 Conceptualization of globalization

Conceptualizing globalization is intensely contested and remains a vague concept (Shakoori, 2018). Aptly Assefa, Rugumamu and Ahmed (2001) and Gainsborough (2007) ascribe the problematic conceptualization of globalization to its complexity comprising cultural, technological, economic, social and political aspects. Perceptions of globalization are as diverse as its conceptualization. On the main, scholars link globalization to colonialism and the current wave of neo-liberalism (Gainsborough, 2007; Marobela & Mmereki, 2013; Tolofari, 2005; Wade, 2004) and power play (Chiumbu, 2008; Dale, 2009; Dale & Robertson, 1999; 2012). These scholars contend that globalization thrives on propagation of ideas and exportation and importation of policies generated in developed countries. Specifically, Chiumbu observes that the policies and reforms are propagated as ideas because of the realisation that "... people are not ruled by force alone, but also by ideas. True control, is not achieved by coercion alone but also by gaining people's consent for this control. This is done through ideas created by intellectuals" (Chiumbu, 2008, p. 4), supported by rich nations and exchanged across borders (Ketlhoilwe, 2013). Hilt, Riese, and Søreide (2018) discusses the concept of 21st century skills such as problem solving and lifelong learning within the discourse and debates around globalization.

The success of globalization is heavily reliant on ICT (Albirini, 2007; Hajela, 2005). The role and impact of multilateral institutions and transnational corporations in driving globalization through policies and reforms is extensively documented (Al'Abri, 2011; Chiumbu, 2008; Corkery, 1995; Dale 1999; Hajela, 2005; Hayman, 2005; Hennessy; 2010; Kozma, 2005; Tolofari; 2005). Hilt, et al., (2018) also caution against the dangers associated with transnational policy borrowing without taking into account the role of local policy actors

within the global discourses. Most reforms propelled by globalization have an external locus of viability (Dale, 1999). That is, they are externally generated, mainly by developed countries, and imported or exported to developing economies and those in transition in the form of policies. While there are cases where recipient nations voluntarily adopted certain policies and reforms, there are situations where coercion was used to ensure adoption. Often, the institutions provided technical and financial assistance to enforce naturalization of these policies and reforms (Chiumbu, 2008; Dale & Robertson, 2012).

Kozma (2005) concludes that developing countries face problems in reforming policies congruent with the current global changes because of competing interests; they have to balance the interests of the donors against their own priorities. Consequently, in the view of Kozma, this has led to implementation of projects with minimal or no impact due to lack of coordination. In this regard, Tabulawa (2009) cautions that while drawing upon global influences in trying to guide policy directions is acceptable, relegating local circumstances and concerns that should determine policy shape to the periphery is suicidal. As such, ICT policies have to show discreet balance between local and global contexts.

2.4 Public policy cycle: global practices

Described as an iterative multi staged process of interconnected processes (Corkery, Land & Bossuyt, 1995; Howlett, McConnell & Perl, 2015), the public policy making process comprises mainly of 5 stages a) agenda setting, b) policy formulation, c) decision making, d) policy implementation and e) policy evaluation (Howlett et al., 2015). Where the processes of one stage interconnect, a policy window is created and with it new developments such as actors, tactics and resources. In the view of Howlett et al., the agenda setting stage comprises the problem, policy and politics woven into public policy making. The policy formulation stage represents the discovery of policy solutions suited to address the problem. This stage brings in subsystems actors such as policy analysts and stakeholders to deliberate upon policy

alternatives. The decision making stage involves an examination of the policy solution to conjoin the problem, policy, politics and process. The implementation stage sets in motion putting policy decision into practice. Lastly, the evaluation stage reflects on the entire policy cycle which may lead to policy termination, continuation or reshaping. This may be in terms of what is working and what is not or other motivational factors such as external shocks.

Globally, however, public policies have been characterized by non-use of valid and reliable information (Tatto, 2012). Corkery et al., (1995) contend that public policies are haphazard and often based on perceptions, stored conventional wisdom and attitudes of interest groups or bureaucratic interests. Mwansa, Lucas and Osei-Hwedie (1998) add that in Botswana public policies are usually dominated by technocrats while consultation and active engagement and participation by citizens remain largely symbolic (Obasi & Lekorwe, 2014). Globally, there are weaknesses in the policy formulation process one of which is lack of attention to implementation strategies during policy formulation (Corkery et al., 1995). There are also typical attempts to skip critical processes such as consultation which lead to policy design gaps (Baqir et al., 2009; Heeks, 2002) and lack of requisite resources or an underestimation of the complexity of the policy (Corkery et al., 1995). In the case of education policies, schools are provided with vague mandates (Tatto, 2012).

2.5 Globalization and educational policies

According to Dale and Robertson (2009; 2012) globalization internationalized education policies, making them externally initiated with little or no regard for local priorities and needs of individual countries. Drawing from the Bologna Declaration and subsequent Bologna Process, Dale and Robertson (2012) assert that the higher education transformation is a response to globalization, a way of standardizing European higher education and setting Europe as a competitor through education. Beyond these, this is a covert attempt to globalize education; its increase in scope has seen it extend beyond the European borders and

motivated debates in countries such as United States (US) and Australia. The extension of the Bologna Process to other parts of Europe may compel competitors to re-craft their education policies to counter this process or emulate it. Green (2006) concludes that globalization aims to remove national control of education systems as they converge towards some regional or global standard.

Kozma states that “Education is among public sectors that most effects – and is most affected by – these developments” (Kozma, 2005, p. 2). The changes in education systems across the world are characteristic of the effects and responses to globalization (Al’Abri, 2011). According to the World Bank (2013), in the 21st century, education cannot be separated from technology. This statement can be perceived as a compelling prescription for countries which have not integrated technology into their education systems to do so. It sets a priority for all economies irrespective of the concerns and challenges they might be facing.

The constant link of education to sustainable socio economic development made education vulnerable to marauding globalization changes. Globally, education systems are asked to embrace new technologies (Kozma, 2005) by developing national policies that include the use and application of ICTs in education. Incidentally, ICT policies were first crafted in developed countries in response to the information age and later transferred to developing countries, particularly in Africa in the period between 1996 and 2000, through multilateral and bilateral donors (Al’Abri, 2011; Chiumbu, 2008; Dale, 1999; Ang’ondi, 2010). In turn, the donors influenced policy content and shape, strengthening their influence on policy terms and constricting policy alternatives of any given nation state. Most influential at global level include the World Bank and IMF, OECD and G8. At regional level, there were EU, North American Free Trade Area (NAFTA) and the Asia Development Bank (Chiumbu, 2008). Atuahene (2013) highlights two key similarities within ICT policies in Africa. These are the purposes and narratives embedded within the ICT policies. Most African countries

develop their ICT policy frameworks in the context of the Millennium Development Goals (MDGs). It is not surprising that the discourse among African leaders and policymakers revolve around issues of ICTs for development (ICT4D).

Most countries in Africa and Sub-Saharan Africa responded to globalization by including ICT in national economic sectors including education even before national policies (Farrell & Isaacs, 2007); something not uncommon (Kozma, 2005). According to Zlotnikova and Weide (2011), most African countries have national ICT policies which include ICT inclusion in education prominently through the promotion of computer science and information technology school-based subjects other than access, use and integration of ICTs within the school systems.

However, this is not peculiar to Africa as evident in various studies across the globe (Harries, et al, 2009; Keengwe et al., 2008; Koç, 2005; Moore, 2009; Sir Dorabji Tata Trust 2013; Tay et al., 2012; Tondeur, van Braak & Valcke, 2007). Moore indicates that it is common to find technology taught as standalone course or courses. In turn, the general uptake of technology in education has been slower than anticipated (McCleod & Richardson, 2013; Oliver, 2002). Consequently, one solution was development of ICT policies to improve technology uptake. The policies should be guided by a shift from techno-centric approaches to infusion and integration. Integrating technology into the curriculum entails infusing the necessary components to extend and enrich curriculum course (Moore, 2009); using ICT as a medium to support learning goals (Koç, 2005). Therefore this is a process where ICT is driven by instruction and the shift from learning about ICT to learning with ICT (Keengwe et al., 2008; Moore, 2009; Sir Dorabji Tata Trust 2013; Tay et al., 2012).

Literature indicates that the integration of technology in education is a complex process requiring a balanced interplay between multiple variables (Koehler & Mishra, 2008; Munro, 2010; Younie, 2006). The availability of technology alone is insufficient. Studies

reveal cases of lack of use (Laronde, 2010), few teachers intending to integrate technology into their teaching activities (Sang, Valcke, van Braak & Tondeur, 2009) and those with varying frequency of use of ICT despite technology availability (Tay et al., 2012).

Increasingly, multiple key factors have been unearthed with implications for national and educational ICT policies. These include inputs, processes and outcomes.

2.6 Slow uptake of technology in education

In education, the integration of ICT was not preceded by research (Hosman, 2010; Munro, 2010; Voogt & Pelgrum, 2005) and appropriate theoretical frameworks (Albirini, 2007). Policies are ill-informed by lack of measurement of outcomes of ICT projects while past studies underestimated the cost of integrating ICT in education (Hosman, 2010). In other words, ICT in education is an equivalent of vocationalization of education which has for a long time proved unsustainable particularly in developing economies mainly due to exorbitant implementation and maintenance costs (Lauglo, 2005). ICT in education is a long term infrastructural and human capital investment. Technology changes outpace the speed at which people change. Reliable data from rigorous and valid formative and summative feedback is required to avert poor planning and under-commitment, and mismatches between aspirations and outcomes reflected by failing ICT projects (Hosman, 2010; Tatto, 2012). Hosman adds that planning must be informed by what technology can and cannot do or which capabilities it can enhance.

Additionally, results on the impact of ICTs on learning are questionable (Keengwe et al., 2008), inconclusive (Munro, 2010; Wang, Hsu, Reeves & Coster, 2014; Watson, 2005), mixed (Skryabin, Zhang, Liu and Zhang (2015) and disappointing (Behar & Mishra, 2015). Studies report enhanced experiences amongst professors and students and efficiency of information transactions (Hosman, 2010, Laronde, 2010) as shown by a recent study (Khaled, 2014). Another study by Smith and Hardman (2014) reported lack of significant differences

in performance in Mathematics between students using computers and those not using computers. There are also cases of regression as illustrated by Hu's (2007) report where a school in America dropped the 1:1 computer per student ratio because the use of computers did not impact on students' performance. Behar and Mishra report disappointing results with projects such as massive open online course (MOOC), One Laptop Per Child (OLPC) and the Hole-In-The-Wall aimed at increasing students' access.

Further, many ICT-in-education projects have failed to take into consideration factors such as teacher preparation (Behar & Mishra, 2015), educational outcomes and infrastructure (Hosman, 2010). Yet, in the view of Hosman, the focus must include the entire ecosystem of the project, a truthful assessment of the conditions into which ICT is introduced and an enumeration of realistic anticipated goals to be achieved by the use of ICT. In sum, the holistic approach accounts for requisite inputs and processes, and anticipated outputs and outcomes which research should identify.

2.6.1 ICT inputs, processes, outputs and outcomes

Various studies have pointed out necessary inputs for successful introduction of ICT in education such as teacher preparation, teaching methodologies, management and technical support, ICT culture, availability and accessibility of resources, curriculum and assessment and best practices in the integration of ICT. These key inputs are critical for the successful integration of technology in education. Other studies have reflected on key processes such as ways of learning and thinking, tools for learning and communication and collaboration (Alberta, 2013; Kozma, 2008; World Bank, 2013) and monitoring and evaluation. Lastly, the need to operationalize outputs and outcomes has also been highlighted for the monitoring and evaluation of the impact of ICT implementation (Hosman, 2010). Outputs and outcomes are intricately intertwined and influence each other. Sufficient education inputs should be

supplied at the macro level to be processed at the school or micro level to produce expected outputs and outcomes (Republic of Botswana, 2013).

In the study titled ‘Study on declining learning results’ (Republic of Botswana, 2014), the triad of inputs, processes and outputs and outcomes is comprehensively discussed. The findings of the study indicate cross-cutting inconsistencies between education policy and classroom practices. As a result, the findings show that: (i) secondary education curriculum does not integrate skills and content, (ii) assessment emphasizes content at the expense of skills, (iii) pedagogy used by teachers is out-dated, (iv) the learning environment is poor with focus on teaching than learning, (v) resources are far from optimal and (vi) schools are not properly managed. In the midst of the obtaining circumstances, the study concludes that expected outcomes will not be achieved. The study’s focus was not on ICT integration per se but on declining learning results. However, the issues raised include poor alignment between overall education policy and classroom practices. The existing conditions in schools greatly influence the integration of CAP across the curriculum at junior secondary. This study specifically seeks to interrogate the nature of the linkages between inputs, processes, outputs and outcomes regarding the integration of CAP in the JSSs.

2.6.1.1 *ICT inputs*

2.6.1.1.1 **Teacher preparation**

Behar and Mishra (2015) argue that, over the years, research has proven that “The single most important determinant of the educational outcomes for a child within a school is the capacity of his or her teacher...” (p. 73). Behar and Mishra recommend effective teacher preparation for learners under the age of fourteen (14), and still going through developmental stage. Teachers require skills to meaningfully integrate technology into education (Bingimlas, 2009; Doering, Veletsianos, Schabber & Miller, 2009; Harris, Mishra & Koehler, 2009; Hosman, 2010; Keengwe et al., 2008; Laronde, 2010; Mishra & Koehler, 2006, 2008; Moore,

2009; Zhao & Bryant, 2006). Hosman notes that training is required on an initial and on-going basis. Through constant use of ICTs, teachers gain competence and confidence and more importantly begin to appreciate its potential for learning and teaching purposes (Batane, 2004; Demetriadis, 2003). Teachers' willingness to integrate technology into the classroom practices also depends on their preparedness to accept their changing roles (Batane, 2004) and positive attitudes towards technology (Khan, Hasan & Clement, 2012). This provides a forum for diffusing technology and preparation of teachers who are more likely to integrate technology in learning and teaching during their practice (Gülbahar, 2008).

It is important for teachers to know when and how to use technology, and not perceive it as a panacea to all education problems because technology is not an end itself but a means to an end (Hosman, 2010; Keengwe et al., 2008; Koç, 2005). Koç argues that teachers should *inter alia* be taught appropriate use of technology to deal with the 'wicked' problem (Mishra & Koehler, 2008) of integrating technology into their teaching. Mishra and Koehler emphasize the need for teacher preparation to extend beyond technical literacy to a broader understanding of technology including when and how to use it. The answer to this problem seems to lie not only in the availability of technology in classrooms (Orlando, 2011) and training teachers on how to use it (Sir Dorabji Tata Trust 2013), but also, and more importantly, in appropriate teacher preparation for effective and meaningful integration of technology into teaching and learning processes (Harries et al., 2009; Sir Dorabji Tata Trust 2013). Sang et al., (2009) conclude that the integration of ICT has the potential to shape teacher thinking and beliefs, teacher self-efficacy, computer self-efficacy and computer attitudes in education.

Research has also pointed to the need to expose and prepare teachers for ICT integration during pre-service, somehow challenging the sufficiency of in-service programs in teacher preparation for meaningful integration ICT in education (Batane, 2004; Behar &

Mishra, 2015; Jones, 2003; Mishra & Koehler, 2006; 2008; Moore, 2009; Mphale, 2014; Orlando, 2011). Sang et.al express the importance of influencing teachers' teaching philosophies, practices and attitudes and ascertaining their increased efficacy in ICT use. Consequently, several authors advocate for the adoption of Technological Pedagogical Content Knowledge (TPACK) framework to inform teacher training programmes (Hooker, 2017; Koh, Chai, Benjamin & Hong, 2015; Mishra & Koehler's, 2006; 2008). This framework emphasizes pre-service teacher preparation and underlines the need to find 'the right combination of technologies, teaching approach, and instructional goals' (Mishra & Koehler, 2008). Unfortunately, this has implications for and challenges the role of institutions where teachers are trained. As Tella (2011) observes, these institutions produce teachers who are expected to use technology in their practice. Therefore educators at higher education institutions must model best practices of ICT use in education to promote suitable pedagogical approaches for integrating ICT into school curricula. However, there remains a gap between how ICT is addressed in teacher preparation institutions and what is expected of them when they enter the teaching profession (Becuwe, Roblin, Tondeur, Thys, Castelein & Voogt, 2017). Oberski (2009) emphasizes the imperative for connection between the curriculum used during teacher preparation and that used at practice environment. According to Oberski, these curricular must allow teacher trainees' exposure to and application of best practices such as creative teaching and teaching for creativity.

The need for teachers to be fully prepared for integrating technology into education is a necessary prerequisite. However, other studies (Batane & Ngwako, 2017; Sang et al., 2009) have indicated that teacher preparation alone is not sufficient to facilitate successful integration of technology into education.

2.6.1.1.2 ISTE standards

Well-articulated standards or indicators are helpful in monitoring the performance of an education system and enhance the design and implementation of educational policies (Republic of Botswana, 2013). Often, these are classified in terms of inputs, processes and outputs and outcomes. The argument here is that the kind of interaction between the inputs (resources) and processes (activities) determines the quality of the product (impact). Laronde (2010) reveals that some countries have adopted and formalized the International Society for Technology in Education (ISTE) standards to promote uptake of and technology integration in education. According to Laronde, these are minimum standards of ICT proficiency for students, teachers, teacher educators and administrators. For instance, the ISTE (2007) indicates 6 key standards for students: creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem solving and decision making, digital citizenship and technology operations and concepts. The latest ISTE (2018) standards have seven broad standards for educators (<http://www.iste.org/standards/for-educators>). These standards are proposed in relation to the seven roles that educators are expected to play in the process of integrating technology in their classroom practices: learner, leader, citizen, collaborator, designer, facilitator and analyst. Each of the standards has minimum set of three indicators (refer to appendix Q). These standards are worthy of consideration for adoption and adaptation to the local needs.

2.6.1.1.3 Curriculum and ICT integration

The curriculum embodies what is learnt in schools, embedded knowledge, skills, attitudes, competencies and values to be imparted to the learners (Achtenhagen, 2012; Republic of Botswana, 2013). Achtenhagen notes that, curriculum specifies content and objectives to be mastered by learners, making curriculum critical to the success of teaching and learning processes. A well-articulated curriculum must connect with lived experiences of

the learner (Republic of Botswana, 2013), enabling learners to engage in critical, creative and complex thinking opportunities (Wang et al., 2014). However, Achtenhagen contends that the attainment of high order thinking abilities depend on the curriculum content.

ICT has been introduced into global curricula in various ways (Kaffash, Kargiban & Ramezani, 2010; Voogt & Pelgrum, 2005): as a discreet subject, a curriculum area within technology, a discreet subject used in other areas or across the curriculum. It is amply suggested that ICT should be viewed as an enabling tool to enhance learning and teaching (Hosman, 2010; Kozma, 2008; Moore, 2009; Nleya, 2010; Shelly et al., 2002; Wang et al., 2014; Yusuf, 2005) and the concomitant suggestion for ICT integration across the curriculum (McMahon, 2009; Moore, 2009; Younie, 2006). Thus, curriculum must have room for integrating ICT use in the learning and teaching processes (Republic of Botswana, 2013).

Integrating technology into existing curriculum is not easy (Mishra & Koehler, 2008; Munro in McDougall, 2010); it is a 'wicked problem' (Mishra & Koehler, 2008). ICT integration requires a curriculum that permits 'learning with' technology rather than learning 'from technology' and not computer awareness per se (Koç, 2005; Tay et al., 2012; Wang et al., 2014). Integrating technology into the curriculum entails infusing the necessary components to extend and enrich curriculum course (Moore, 2009); using ICT as a medium to support learning goals (Koç, 2005). Therefore this is a process where ICT is driven by instruction and the shift from learning about ICT to learning with ICT (Keengwe et al., 2008; Moore, 2009; Sir Dorabji Tata Trust 2013; Tay et al., 2012; Wang et al., 2014).

High achieving systems have adopted the development of curriculum standards and regulations to improve educational system performance (Tatto, 2012). Kozma (2008) suggests the need for congruence between the curriculum goals and ICT use. There is a need for a curriculum that promotes understanding deep interrelations between concepts, facts, and their principles as well as their application to real day to day life. Voogt and Pelgrum (2005)

observe that change towards information society implies drastic curricula changes contributing to students' lifelong learning competencies not addressed by the current curricula. However, availability of time and practicality of introducing ICTs in lessons can be critical constraints (Nkhwalume, 2013; Watson, 2005). The prevailing global climate requires learners with a different set of skills such as effective communication and collaboration, critical thinking and problem solving. As a result, global patterns show a move to curricula that focus on skills development and learning outcomes (Republic of Botswana, 2013) and the emergence of outcomes or competency-based education curricula (Republic of Botswana, 2014).

Studies on approaches to the integration of ICT in education such as (Singh, 2013; Tay, et al., 2012; Wang et al., 2014) seem to be influenced by the (social) constructivist paradigm, its embedded epistemology and inherent learner-focussed methodologies. As such, they tend to make academic propositions and implicit challenges to ICT policies. Inadvertently, they refrain from conceptualizing ICT policies as enablers of environments promoting learner-centred pedagogies, for example through agitating for progressive curricula and assessment procedures. These studies also overlook the contextual disparities across the globe and that the proposition for learner-centred pedagogies is not a new phenomenon to education sector having been minimally successful especially in Africa (Tabulawa, 2013).

2.6.1.1.4 Pedagogy for integrating ICT into school curricula

Achtenhagen (2012) defines instruction as teaching methods and learning activities employed to assist learners master the curriculum-specified content and objectives. "Complex teaching learning environments need a corresponding treatment within the instructional processes" (Achtenhagen, 2012, p.13). Put differently, there must be a match between curriculum content and pedagogy where change in curriculum is supported by analogous

change in teaching approaches (Republic of Botswana, 2014). Contextualization of the curriculum or how teaching is done, classroom organization and interactions have implications for the kind of skills that can be imparted to learners and the type of workforce produced (Republic of Botswana, 2013).

Garegae and Moalosi (2011) observe that the use of ICT in instruction affects pedagogy in three ways: focus of instruction, teaching approaches and change of role of learners and teachers. Research points to the somewhat urgent need for a paradigm shift consonant with the use of ICT in education (Oliver, 2002; Orlando, 2011; Singh, 2013). Commentators such as Oliver, (2002) and Singh (2013) argue that ICT naturally embraces and presupposes constructivist practices as opposed to behaviourist approaches. Consequently, constructivist practices are predicted as the most compatible with the use of ICTs (Kaffash, 2010; Orlando, 2011; Wang et al., 2014). Constructivist practices refer to student-centric learning which include teacher-student and student-student collaboration and knowledge construction (Orlando, 2011) using ICT as cognitive tools (Wang et al., 2014). In the view of Wang et al, the use of ICT as cognitive tools entails allowing students to solve problems and develop skills such as critical and creative thinking, analysis, evaluation and communication. According to Kaffash (2010) and Orlando (2011), the conventional assumption is that the introduction of ICT will automatically be accompanied by the adoption of learner centred approaches. This has implications for teacher professional development at pre and in-service levels. At pre-service stage, teachers need to be exposed to learner-oriented methodologies more than ever before (Kharade & Thakkar, 2012). Equally important is the need for the teachers to be ready and willing to appreciate and accept their 'new' roles in the dissemination of ICT technologies in teaching and learning (Batane, 2004; Singh, 2013).

Differently, Mungoo and Moorad (2015) prefer the use of learning and teaching approaches fit for the context. These scholars are opposed to prescriptive methods which are

not context conscious and deny teachers the autonomy to creatively and flexibly employ an array of approaches to help students in mastery of concepts. In agreement with Tabulawa (2009) that learner centred approaches are not suited for Botswana's context, the scholars cite large classes, inadequate resources and congested curriculum as impediments to the adoption and implementation of learner centred methods in Botswana classrooms.

Studies (Kaffash, 2010; Kharade & Thakkar, 2012; Orlando, 2011; Wang et al., 2014) are preoccupied with suggesting learner-centred approaches and often fail to link these to curriculum content and assessment practices. To assume that employment of constructivist approaches where learners are active participants alone will lead to effective integration of ICT and the realization of intended outcomes is problematic.

2.6.1.1.5 Assessment

Assessment is closely linked to curriculum and pedagogy (Achtenhagen, 2012; Republic of Botswana, 2013). "Assessment procedures that emphasize recall of facts in a curriculum that seeks to cultivate 'soft skills' is dysfunctional" (Republic of Botswana, 2013, p. 57). In other words, attainment of desired outcomes is dependent on the relationship between these three facets. Any disparity between them is bound to cripple the performance of the others. As such, any shift in assessment is driven by congruent change in curriculum. Emphasizing the interconnectedness of the three elements, Achtenhagen concludes that "... curriculum, instruction and assessment should strongly and stringently be related to each other as triad - with the intention to get the same levels of complexity for all elements of the triad" (Achtenhagen, 2012, p. 17).

As a form of evaluation and reflection, assessment has multiple functions. It serves to measure whether or not intended goals are reached (Achtenhagen, 2012), providing feedback to educators and administrators (Ito, 2014). Ito contends that students may not engage with their courses but engage with assessment as extrinsic motivation. According to Ito,

assessment as intrinsic motivation is even more important in higher education. As such it is an inseparable component of teacher action and growth. In this era of the 'push' for integrating ICT in education, assessment can be used to provide feedback regarding effective integration of ICT in learning and teaching (Martin, 2015). In higher education, assessment is a form of encouragement to students to adopt effective approaches to their study in order to be successful with the learning outcomes embedded in assessment processes as well as reinforcement of higher order thinking (Crosling, 2012). On a different note, Clouder and Hughes (2012) and Ito (2014) add that assessment drives learning, and argue that well-conceived and implemented assessment can play an important part in making learning enjoyable, meaningful and more engaging. Also, according to Clouder and Hughes, assessment has a potential to enable students to engage with peers and tutors, gain personal insight, feel valued and supported, and above all feel a sense of belonging to a learning community. Finally, Clouder and Hughes conclude that assessment can motivate students to succeed.

The continued reforms in education in general and assessment in particular, demand that ICT be supported through a competency-based education system that essentially challenges the relevance and adequacy of traditional assessment practices. Traditional assessment practices which are primarily reliant on tests and examinations, are criticized for being driven by perceived need to measure individual intellectual capability (Mokgosi, 2013), perpetrate rote learning and recall of facts and not in sync with current developments in the world of work (Republic of Botswana, 2013). Instead, progressive assessment procedures entailing formative and summative forms, with clear strategies of testing soft skills are preferred (Mokgosi, 2013; Republic of Botswana, 2013). Assessment requires flexibility to allow students, with the guidance of their teachers, to assess their own and each other's' learning (Kozma, 2008).

However, lack of dependable assessment procedures for determining technology capabilities of pre-service teachers poses a challenge (Martin, 2015). Martin alleges that the only available measure of assessing pre-service teachers' technology capabilities is whether or not students successfully completed an Educational Technology course offered. Lack of proper assessment for pre-service teacher ICT competencies has implications for assessment in the schools. Nevertheless, efforts to address this gap are in place. For example, Avdeeva, Zaichkina, Nikulicheva and Khapaeva (2016) have developed a framework to assess teacher ICT competency. These competencies include selection, processing, creation and placement of information and, organization of communication. For their part Wang et al., (2014) observe that the use of ICT as a cognitive tool involves more than comprehension of content knowledge but also soft skills such as critical thinking and problem solving. The reality on the ground is that the assessment of students' learning outcomes remains a challenge and invariably calls for the use of alternative assessment tools (Wang et al., 2014). In other words, using ICT in learning and teaching requires careful balance of content and skills' assessment such that either is not jeopardised. As such, educators would require knowledge and awareness of diverse assessment procedures and alternatives.

Not many studies explore the place and role of assessment in relation to integrating ICT into education. Instead, assessment processes and their implications are briefly mentioned in most studies. For example, Batane and Ngwako (2017) reveal that internal and external teacher assessment processes do not encompass the use of ICT in learning and teaching. Without assessment for the CAP, teachers and students are bound to take it for granted (Batane & Ngwako, 2017). No assessment is planned for the integrated variant of CAP. This study aims to examine how lack of externally-based assessment influences the implementation of integrating CAP across the curriculum at JSSs.

2.6.1.1.6 ICT management and technical support

School management support has been identified as critical for the successful integration of ICTs in education. School leadership and management include the school climate, culture and other environmental characteristics that facilitate successful integration of ICT in schools (McCleod & Richardson, 2013; Republic of Botswana, 2013). A supportive culture which promotes technology integration is critical in any school. Hence, the school leadership needs to take the lead in integrating ICT use in their routine work. At the same time it has to demonstrate sound understanding of technologies and how they can be applied to carry out varied tasks (Arokiasamy, Abdullah & Ismail, 2015). According to Arokiasamy et al., ICT integration involves making critical decisions such as authorizing funds. Put differently, the school leadership needs to be viewed as an organizational quality rather than a personal quality of a school leader (Rikkerink, Verbeeten, Simons & Ritzen, 2015). This is consistent with the value of transformational leadership which emphasizes synergy between individual efforts and collective teacher engagement within schools. Effective school management must encourage a sound shared vision to guide ICT implementation (Khan et al., 2012; Pheko, 2013) and build a technology use culture (Batane & Ngwako, 2017). Batane and Ngwako's study revealed that lack of ICT use culture and supportive organisational structure as some crucial impediments to ICT use. A study by Nkhwalume (2013) reported lack of administrative support for ICT integration. In this study, student teachers were keen to use projectors. These were not available. Management's response was lack of funds. Technical support is also critical for constant network problems and individual computer troubleshooting problems (Batane, 2006; Garegae, 2012; Hosman, 2010).

However, studies (Garegae, 2012; Khan et al., 2012; McCleod & Richardson, 2013) on the role of school leadership overlook contextual differences particularly in centralised

education systems. Also, they often ignore the role of the ICT policy as a potent enabler for the establishment of ICT use culture and empower school managers to support and nurture this culture.

2.6.1.1.7 Availability and accessibility of resources

Availability of and access to resources has also featured as important inputs particularly in developing countries where ITC resources are scarce. While most emerging economies such as Peru, Thailand, Turkey and Uruguay (World Bank, 2013) are aiming for a student-computer ratio of 1:1, with some like America having achieved this target (McCleod & Richardson, 2013), the same cannot be said about most developing countries (Chikati, Mpofu, Muchuchuti & Sidume, 2013; Nkhwalume, 2013). In other countries such as Belgium, Germany, Korea and Italy, home access is reportedly higher than at school (World Bank, 2013).

In developing countries, notwithstanding the steady decline in the relative cost of acquiring ICT gadgets, the cost of owning and maintaining sustainable computer systems in schools is rising (Peterson, 2007). Similarly, resources such as computers, printers and scanners are not available in all institutions (Batane, 2006; Khan et al., 2012; Nkhwalume, 2013). According to Kopcha (2012), teachers can feel as though they lack access to available technology if it does not work properly. Similarly, lack of internet access is problematic (Liyanagunawardena, Adams & Williams, 2014). As Liyanagunawardena et al., report, a digital divide between the poor and the rich as well as rural and urban dwellers is observable. Technological access is also no longer an either/or dichotomy (Hosman, 2010). In Sub-Saharan Africa, lack of access is still physical and gender-based (Khan et al., 2012). All students such as the economically disadvantaged and special needs students need equitable access to technology because access can be problematic when it causes 'digital divide' between students (McCleod & Richardson, 2013). Further, access is not only physical but

also literacy related, constituting second level divide (Chikati et al., 2013). According to Chikati et al., this has been observed as a barrier to technology more than physical access.

Access can also mean ‘access to computer with or without a fixed or wireless internet connection; access to broadband internet, which offers higher speeds than narrowband connection; and access to mobile broadband, via mobile devices such as standard mobile phones, smart phones and tablet computers’ (World Bank, 2013). The report indicates that 93% of 15-year-olds have access to a computer at school in OECD countries and 92.6% with access to the internet at school. The report also indicates that by 2009, student-computer ratio in OECD schools for the same group of students had dropped from 13:1 to 8:1 compared to most African countries where the student-computer ratio was 150:1. According to the report, Africa ranks high in mobile penetration with educational opportunities. A case in point is the MoMath project in South Africa used to help students learn Mathematics (World Bank, 2013). Meanwhile, Ratsatsi (2002) opines that in education, equity can be observed at several levels. It can be addressed by what causes the inequity and who is involved. According to Ratsatsi, “Equity requires both that unequals are treated differently (vertical equity) and that equals are treated similar (horizontal equity)” (p.46).

Another related input is maintenance of ICT infrastructure. Garegae (2012) raises doubts about the extent to which developing countries with meagre resources such as Botswana can sustain the integration of ICT across the curriculum. According to Garegae, rapid technological change and expensive ICT related resources cast doubts on the sustainability of ICT projects in education. Hosman (2010) argues that as long term infrastructural investment, ICTs also have to be maintained thus constantly call for reinvestment at a much faster pace than traditional infrastructure investment. Hardware and software need updates and upgrades when they get obsolete (Hosman, 2010).

In most parts of Africa, electricity supply is non-existent in some areas (Khan, et al., 2012), expensive and unreliable. Atuahene (2013) adds that even large cities experience the disruptive power shedding. In turn, Hosman and Atuahene caution against the use of old computers which not only will require and use more electricity but also poses the danger of e-waste.

Availability and accessibility of ICT resources cannot be overemphasized and aptly listed as one of the priority areas of *Maitlamo*. It would be interesting to find out how the policy has thus far influenced the provision of computers for use across the curriculum. Also, the current study aims to investigate internal processes such as resource allocation and placement; these may influence accessibility of resources. Adequacy of resources is relative and often times dependent on organizational structures.

Studies such as (McCleod & Richardson, 2013; World Bank, 2013) capture these inputs in isolation assuming that taking care of one will suffice to facilitate the integration of ICT into the core curriculum. Similarly, ubiquity of resources does not guarantee use (Laronde, 2010). The complexity of integrating ICT into an existing curriculum was reported in a qualitative study (Batane & Ngwako, 2017) involving 52 student teachers. This was a tracer study following educational technology training received by student teachers during the post graduate diploma in education programme (PGDE) at the University of Botswana. This study used TPACK framework to find out if student teachers used technology in classroom instruction and reasons for lack of technology use. The study findings indicated that student teachers believed technology was useful in enhancing learners' comprehension of concepts, and were generally technically competent and confident in using ICT. However, in public schools, technology was not used while minimal and simplistic use was reported in private schools. Some of the impediments to technology use included lack of resources, infrastructural incompatibility with technology use and overloaded curriculum. Significantly,

lack of technology use culture was reported. Neither the university nor the school required student teachers to use technology in classroom practice.

The study concluded that integrating technology into the curriculum required a multifaceted approach which takes into account all elements influencing the decision to use ICT in learning and teaching. It recommended inclusion of technology proficiency indicators in the assessment instrument, provision of mobile ICT resources, review of curriculum and assessment procedures and a systemic approach to technology integration into the curriculum.

The study highlighted critical issues relevant to the current study. It illustrated the significance of some key inputs such as teacher preparation, curriculum and availability of ICT resources. It also underscored the importance of internal and external processes such as assessment and school-based measures to ensure accessibility of resources. However, it did not connect these to outputs and outcomes. Integrating technology into the learning and processes should not be done for its sake. It is critical, therefore, that outputs and outcomes related to technology integration are also looked into to establish the connection or lack of between the inputs, processes and outputs and outcomes. The current study looked at the connection or lack thereof between these three especially from a policy perspective.

However, the general observation made by the current study is that the bulk of global studies relating to the integration of ICT in education tend to focus more on inputs thus marginalizing the significance of linking inputs, processes, outputs and outcomes. One fundamental weakness of such studies is their embedded assumption that providing key inputs alone will solve the complex problem of integrating ICT within existing curricula.

2.6.1.2 *ICT Processes*

Kozma (2008) identifies four policy rationales for ICT implementation in education: supporting economic development and promoting social development, advancing education reform and supporting education management. Pheko (2013) states that schools are expected

to have well thought out processes for managing, adopting and implementing innovations. Tatto (2012) stresses the significance of monitoring and evaluation as critical processes at implementation stage to look at activities planned to attain set targets. For instance, certain skills not necessarily new save for enhanced ICT skills (Kereluik, Mishra, Fahnoe & Terry, 2013) are required in the 21st century: creativity and critical thinking, problem solving, decision making, collaboration, communication and information literacy, and citizenship, life and career skills. According to Tatto, implementation processes must show connection to outcomes to produce multi-skilled, adaptable and flexible work force (Tabulawa, 2009). The relationship between inputs, processes and outputs and outcomes is crucial particularly the value addition by the school (Mohiemang, 2008). That is, school-based processes are critical in the realization of set goals.

Education systems are expected to equip learners with skills, knowledge and attitudes (Republic of Botswana, 2014). Therefore learning and teaching processes must focus on and engage learners in authentic learning, equip them with competencies, technical and cross curricular (Tondeur et al., 2006) or hard and soft skills (Nenty & Phuti, 2014) and enable them to create and share knowledge (Alberta, 2013). Hard skills are cognitive in nature and embrace general technical skills. Soft skills are interpersonal characteristics influencing how an individual relates to and interact with others, as well as one's career prospects and performance in the work place. Nenty and Phuti allege that soft skills underlie the reflection of hard skills, making them highly significant. These include skills such as collaboration, effective communication, critical and creative thinking and problem solving (Nenty & Phuti, 2014). This can only be achieved if teachers engage learners in varied learning activities.

2.6.1.3 *ICT outputs and outcomes*

Outputs and outcomes have to be highlighted prior to the introduction of ICT to guide implementation and help monitor progress towards goals (Hosman, 2010; Tatto, 2012). In the

view of Hosman, these will be aimed at addressing an identified problem since technology cannot be used to solve unidentified problems. In turn, the problems determine targets and desired outputs and outcomes. Tatto (2012) emphasizes that the implementation process should be evaluated to assess its link with outcomes. Learning results provide a feedback loop to reflect on policy with the intention to make amendments particularly if targets are not met (Republic of Botswana, 2014). Outputs are short term and include skills students acquire such as creativity, collaboration and communication. Outcomes represent long term competencies such as lifelong learners, adaptable graduates and their readiness for the world of work, labour market.

Tondeur et al., (2006) emphasize the need for ICT policies to set attainment goals. Providing an example of Flemish education curriculum, Tondeur et al., explains that the attainment targets are distinguished between subject specific and cross curricular attainment targets for primary education. Cross curricular attainment targets refer to generic skills such as social skills and meta-cognition which includes ICT competencies. In this context, ICT competencies are used to support or direct teaching and learning. At the same time, ICT is used to catalyse innovative teaching and learning. Therefore, achieving the goals of the educational and catalytic rationale, it is highly likely that the goals of the socio economic rationale will be accomplished (Tondeur et al., 2006). Put differently, teachers will make efforts to use ICT creatively while learners are bound to attain the technical and lifelong skills.

Among few studies which attempt to connect ICT policy and ICT integration is a study by Garegae (2012). In this study which looked at the integration of ICT into Mathematics curriculum, *Maitlamo*, specifically the *Thuto Net* component is scrutinised in the discussion of barriers to ICT integration into the subject. Other than pointing out input deficiencies already addressed by other studies (Batane & Ngwako, 2017; Nkhwalume, 2013,

Sithole & Lumadi, 2012), the study concluded that the *Thuto Net* initiative was inadequate to support ICT integration into the core curriculum. However, the interest of this study was to systematically assess the influence of the *Thuto Net* initiative with specific reference to the integration of CAP in JSSs.

A few studies (Batane & Ngwako, 2017; Hosman, 2010) comprehensively discuss ICT integration, appreciating the intricacy of the process and instigating imperative connections between the different elements of an education system which has to accommodate ICT. Even fewer studies tend to extend the debate to ICT policies and their synergy with the various components of education to leverage the integration of ICT in education. The current study holds that this is a literary void which required further investigation especially in developing countries. Global national ICT policies were drawn to curb lack of coordination in ICT related projects and provide roadmaps towards attainment of desired goals. In education, these policies represent strategic maps to steer education not only to integrate ICT in education but also to ensure that the integration helps education produce suitable graduates for the information age. Whether or not ICT policies meet their set targets cannot be ignored.

In sum, successful integration of ICT in education requires that all the necessary inputs are in place amply supplied at the macro level (Republic of Botswana, 2013). The inputs must be properly processed at the micro level leading to realization of envisaged outputs and outcomes. Since all these cannot take place in a vacuum, comprehensive ICT policies must be in place to guide and support this interaction (Republic of Botswana, 2013).

2.7 Botswana Context

Botswana is an independent republic in Southern Africa and achieved its independence in 1966. It is a landlocked country that covers 582,000 square kilometres. The current population stands at two million (Garegae, 2012). At independence, majority of

Batswana lived in rural and remote areas or in small agro-towns. The major growth areas have been around mining areas (Jwaneng, Letlhakane and Orapa, Sowa Pan and Selibi Phikwe) the town of Lobatse, the city of Francistown, and the capital Gaborone (Weeks, 2005). Weeks further states that “At independence, Botswana was one of the poorest countries in the world with its wealth based in livestock and limited potential for tourism” (Weeks, 2005, p. 95). Diamonds were discovered in the 1970’s providing the foundation for rapid growth ever since. Since independence in 1966, Botswana has enjoyed political stability, democracy and freedom from corruption (Weeks, 2005) which, collectively, facilitated sustained development. Growth allowed government spending in most sectors of life including education. Botswana uses a 7-3-2 basic education system: 7 years of primary school, 3 years of junior secondary school and 2 years of senior secondary school. The first ten years are available to all children. Students sit for three nationwide examinations: the Primary School Leaving Examination (PSLE), the Junior Certificate of Education (JCE) and the Botswana General Certificate of Secondary Education (BGCSE) (Republic of Botswana, 2014). Tertiary education, mostly government sponsored, is provided by public and private colleges and universities. Over the years, Botswana’s secondary curriculum has undergone reviews and transformation in an attempt to keep abreast with developments across the world and changing market needs.

2.7.1 Botswana’s response to globalization

Boikhutso (2013) contends that Botswana’s first deliberate and systematic attempt at globalizing the curriculum was through the first Commission on Education (1976) which aimed at preparing children for useful, productive life in real world. Capturing the intensifying effects of globalization, Tabulawa (2009) asserts that Botswana’s response to globalization was through the Revised National Policy on Education (RNPE, 1994) geared at producing ‘a self-programmable learner’. That is, products of an education system must be

adaptable life-long learners, receptive to change and technologically competent (Nleya, 2009). Amongst its specific aims, the RNPE intended to “implement broader and balanced curricular geared towards developing qualities and skills needed for the world of work” (Republic of Botswana, 1994, p. 6) at school level. Consequently, efforts have been made to keep pace with global developments and to make Botswana competitive in the information age; to move from an agro-based economy to an industrial economy (Lauglo, 2005) and even further into the somewhat ambitious knowledge-based economy (Republic of Botswana, 2014). Computer literacy has been highlighted as one of the critical skills (RNPE, 1994) to make the work force ready to make the best use of ICT (Bose, 2010).

2.7.2 Botswana’ Policy Framework

Botswana’s development of secondary education occurs within the context of six year National Development Plans (NDPs) and are guided by three major policy frameworks established by National Commissions on Education (NECs) followed by White Papers on National policy on Education (Lauglo, 2005). First NEC was in 1977 (Education for Kagisano) and second was in 1993, and the Revised National Policy on Education (RNPE) approved by government in 1994 (Lauglo, 2005). This study traces developments in secondary education with respect to technology uptake from NDP 7 (1991) to date. Relevant developments in teacher training institutions will be highlighted.

2.7.3 Education Technology Uptake since NDP 7

According to Atuahene (2013), on recognising the importance of ICT for development (ICT4D), the Botswana government increased its ICT expenditure since the adoption of NDP7 through NDPs 9 and 10. Government expenditure on ICT in NDP 7 rose from US\$ 2.72 million to US\$ 86.21 million during NDP 9. Meanwhile, NDP 7 states that education takes over 20% of Government recurrent budget constituting ‘a larger share than any other activity’ (Ministry of Finance and Development Planning, NDP 7, p. 313).

Throughout the National Development Plans (NDP 7, 1991; 8, 1997; 9, 2003 & 10, 2009), Botswana has been focussing on sustaining and increasing equitable access to relevant quality basic education particularly by implementing recommendations from the Revised national Policy on Education, Government White Paper No.2 of April 1994 (RNPE, 1994) following recommendations from the Report of the National Commission on Education (1993).

Botswana has aimed to provide an educated populace capable of entering further education and / or joining the labour force as workers sufficiently trained to benefit from training on the job through secondary education (Weeks, 2005). Nleya (2009) notes that Republic of Botswana (1994) holds the view that human resource is a critical input factor in economic development, making it significant to invest in education and training for national development. In line with this objective, there have been consistent efforts to provide requisite inputs such as infrastructure and equipment mainly by building more schools and expanding existing ones. Technology equipment such as computers has been provided particularly at secondary schools for CAP and computer studies.

Consistently, education is linked to socio-economic developments. Anticipated outputs and outcomes also reflect general uniformity with the aim to equip secondary education learners with employable knowledge and skills, values and attitudes, in preparation for the world of work. The outputs for secondary education especially at junior secondary level are clearer in the commission's report: critical thinking, problem solving, individual initiative and interpersonal skills (NEC, 1993, p. xxxi). The mismatch between desired and actual outcomes is widening each year; attainment of desired educational outcomes is increasingly becoming elusive (Republic of Botswana, 2014). Whether integrating CAP into the core curriculum will help schools develop processes to facilitate achievement of the outputs and outcomes is an important component in the current study.

As part of human resource development, teacher training has primarily been addressed through pre and in-service training programmes with opportunities for further professional development. In-service teacher training relating to new developments such as implementing CAP has been preferred (Batane, 2004) and carried out through staff development programmes; a few teachers would be selected for training and would be expected to train colleagues in schools where they were based.

Expansion and diversification of secondary curricular to include practical and technology oriented subjects has also been pursued, resulting in secondary curriculum overload (Republic of Botswana, 2015). However, Weeks (2005), observes that Botswana has resisted the full vocationalization of its secondary schools preferring a pre vocationalized education system. Weeks defines vocationalization as efforts to include practical or industrial subjects as part of the general education likely to generate some basic knowledge, skills and dispositions that might prepare them to become skilled workers or to enter manual operations. Amongst technology oriented subjects, computer awareness has somewhat been successfully introduced across education levels particularly at junior secondary schools.

2.76.4 The evolution of technology in education in Botswana

2.7.4.1 *Primary school level*

RNPE (1994) recommended ‘standard’ technologies of radio broadcasts at primary level. According to Eyitayo and Eyitayo (2005), the Botswana Government’s prioritised ICT literacy in the curriculum targeting ICT for all schools with promotion of integration and infusion of computer skills into core and optional subjects at upper primary level. The aim was to equip learners with pre requisite skills in readiness for junior secondary level. Contrary to this claim, the apparent difficulty of introducing computers at primary level is clear because “Apart from computer skills, the Commission believes that the commercial subjects can be successfully integrated into Mathematics and communication skills into the

language subjects” (Republic of Botswana, 1994, p. 107). Recommendation 19, section 4.7.36 reads: “the educational broadcasting programmes should be updated and expanded to serve the needs of primary schools, including an expanded use of audio cassettes” (RNPE, 1994, p. 116). There was also a plan to introduce computer awareness at upper primary education. However, there was no computing curriculum in place to guide implementation. Theoretically, there appears to be progress in terms of introducing ‘modern’ technology at grassroots level and establishment of continuity to junior secondary education. However, lack of curriculum to guide implementation is a setback bound to create a continuity vacuum. Also implementation is likely to be delayed, haphazard and not uniform.

2.7.4.2 Junior secondary school level

In NDP 7, two major developments geared at preparing learners for the world of work included the expansion of the junior secondary schools’ syllabus to include more practically oriented subjects such as computing. All JSSs were provided with computer laboratories and equipment leading to the implementation of the diversified junior secondary curriculum during NDP 8 which included computer awareness. Thus, a non-examinable Computer Awareness Programme (CAP) was introduced as compulsory core subject for the three years of JSSs to familiarise the students with the machines to curb technophobia in the future (Garegae, 2012). The exercise started with a pilot project in computer laboratories built in 11 schools. CAP was rolled out to schools in 1999. In early 2000, twenty-five more schools were equipped with the remaining 154 equipped by 2002. Its syllabus covered two basic computing skills of keyboarding and productivity tools which include Word Processing, Spread sheet, Databases and Graphics. Subsequently, through NDP 9, computer awareness was to be integrated into the core curriculum while an Education Data Network (EDN) would be developed to connect computers in laboratories in schools to the internet. The integration of CAP into the core curriculum is the focus of this study.

2.7.4.3 Senior secondary school level

As a response to RPNE (1994) recommendation and continued efforts to diversify the senior secondary curriculum, two parallel courses were introduced in 29 schools: Computer Awareness for all form 4 and 5 learners and Computer Studies as a subject option at senior secondary schools for those wishing to pursue computer courses at tertiary level (Eyitayo & Eyitayo, 2005). Weeks (2005), describes the CAP at senior secondary schools as complicated. Teachers are expected to teach the programme to a large pool of Form Four (Grade 11) students ranging between 500 and 800. Mostly, it was taught by Mathematics and Science teachers or other departments. Further, computer awareness appears disorganised without qualified teachers and proper guidance such that teachers taught what they deemed fit. “What is achieved at the schools is dependent on the participation of other staff...” (Weeks, 2005, p. 121).

2.7.4.4 Tertiary education level

For purposes of this study, tertiary education is categorised into two especially with respect to teacher training: University of Botswana and colleges of education. The university is semi-autonomous while the colleges are 100% government sponsored.

According to Eyitayo and Eyitayo (2005), computer literacy at the university was faculty based and started in 1995/96 academic year in most faculties. For instance, it was first offered in the Faculty of Social Sciences in the 1996/7 academic session as an eight week non-credit course with students expected to attain a 50% pass mark as a pre requisite for graduation. A review in the academic year 2002/3 resulted in increased requirements across most university departments and the resultant introduction of two General Education Courses (GECs): GEC 121 and 122. These were compulsory two credit courses for all year 1 students. GEC 121 introduced students to computer systems and basic computing skills such as application packages, e-mail and Internet. GEC 122 was slightly advanced introducing

students to advanced skills such as operating systems and file management concepts. Further advancements at the university led to the introduction of and transition to e-Learning through the Blackboard and Moodle. Students received and submitted academic work electronically.

2.7.4.4.1 ICT in Colleges of education

The Revised National Policy on Education (RNPE, 1994) recommended Computer Awareness for all teacher trainees in the two education colleges of Molepolole and Tonota set up in 1985 and 1990 respectively. In addition, a Computer Studies department was established at MCE in 1997. In this regard, “In-service programmes will be conducted to equip teachers with necessary skills to deliver the programme and manage the IT facilities in the schools. The Colleges of Education will be equipped with computer laboratories for training of Computer Studies teachers as well as computer awareness for all teacher trainees” (Republic of Botswana, 1997, p. 368).

The computer studies subject was divided into two: Content and Professional Studies. The content component dealt mainly with Computer Applications: Word Processing, Spread sheet, Database, Presentations and Graphics. The Professional Studies component was meant to equip teacher trainees with skills of teaching Computer Awareness content. Subsequently, the CAP was introduced in JSSs in 1999 coinciding with completion of studies by the first group from Computer Studies.

The CAP comprised 8 modules: generic computer knowledge, basic computer skills and productivity tools: Word Processing, Spread sheet, Database, Graphics and Project (Republic of Botswana, 1998). However, the JSSs’ syllabus review retained the CAP. At the same time, it introduced integrating the CAP into the core curriculum.

2.8 Computer Awareness integration across the curriculum

Botswana secondary education needs to integrate content and skills because “The present-day expectation that IT in some form or other is used in all subjects is not met at all” (Republic of Botswana, 2014, p. 8). The integration of Computer Awareness into the core curriculum forms the central interest of this study. Specifically, this study wishes to assess the match or lack thereof between *Maitlamo* intentions and the integration of CAP into the core curriculum. Changes in curriculum must be accompanied by related changes in areas such as teaching approaches, teacher education, resource provision and assessment (Republic of Botswana, 2014). Therefore the evaluation would take into consideration the adequacy of inputs: infrastructure and equipment such as computers and other related devices, availability and accessibility of equipment, management and technical support, teacher training and internal and external school processes such as monitoring and evaluation and key teaching and learning processes aimed at achieving desired goals. According to Weeks “... the development of practical subjects up to 1992, in secondary schools, has been under resourced, inadequately maintained, poorly planned and implemented” (Weeks, 2005, p. 107). Considering CAP as practical in nature, this study intends to find out how integrating Computer Awareness into the mainstream curriculum is being handled.

Indications of efforts to provide requisite inputs such as implementation of diversified curricula at secondary schools and supply of computers related to the introduction of technology especially CAP are observable particularly in NDPs 8 and 9. However, there appears to be a mismatch between numbers of inputs such as computers and the required numbers for integration of CAP into the core curriculum. The assumption seems to be that those which were supplied for implementing CAP are sufficient to serve in this regard. The validity of the assumption is questionable. Computers required for CAP are comparatively fewer than those required for integrating the same into the core curriculum. Issues of lack of

access to available computers and maintenance deficiencies might be raised. In 2002, access by staff to computers in most secondary schools was still very constrained (Lauglo, 2005). Meanwhile, Sithole and Lumadi (2012) highlight the inadequacy of computers for Business studies, lack of access to those allocated for CAP and the resultant conflict between Business Studies and Computer Awareness teachers over access to computers allocated to CAP. Secondary school computer laboratories are inadequately equipped and ICT plays a minor role in education in secondary schools (Republic of Botswana, 2014).

The adequacy of computer related devices such as data projectors and projection screens may also be problematic, raising similar challenges such as lack of access, leading to frustration. Bose (2010) raises concerns over relevance of available software and content. The study indicates that the content available in current software is not contextually suitable for Botswana students, calling for indigenously developed software and related content, including internet based to capture what students are familiar with.

The national development plans are also silent on other infrastructural developments such as making existing classrooms compatible with computer awareness integration into the core curriculum. Batane and Ngwako's (2017) study indicates that existing classrooms are not ready for ICT use. This limits the cross curricular integration of CAP to available computer laboratories. In turn, logistics of using the laboratories by the entire school might pose challenges of over use, loss of equipment especially devices such as mice and complications of accountability.

The supply of electricity to the schools is still problematic yet electricity supply may impact negatively on sustained use of computers and integration of computers into the core curriculum (Garegae, 2012). Lauglo (2005) submit that there is insufficient supply of electricity in Africa and that when there is supply, it is often costly. Teachers' efforts might be frustrated by lack of constant supply of electricity or constant power outages, computer

networks and internet connectivity which are invariably affected by power cuts (Atuahene, 2013).

Lack of trained teachers for newly introduced programmes such as CAP was acknowledged specifically in NDP 8. Lack of qualified teachers can remain a major challenge even when equipment is available and “Especially in junior secondary schools, staffing of ICT teaching will remain a major challenge given the large number of students who are to get some exposure and learn very basic skills as part of computer awareness ...” (Lauglo, 2005, p.19).

In a survey involving seven JSSs, (Dart, 2007) teacher trainees showed strongest demand for development in ICT skills despite being exposed to CAP. This could be pointing to the inadequacy of the programme which has been found to be ineffective in colleges of education (Bose, 2004). In another study Bose (2010) concludes that teacher training institutions offer basic level computer training inadequate in content and pedagogy to make student teachers competent in using ICT in classrooms. In Bose’s survey, 87% of the participants expressed dissatisfaction with the pre-service ICT curriculum. The training of teachers to effect envisioned educational changes is inadequate (Republic of Botswana, 2014). In-service programmes are insufficient (Batane, 2004). Teachers who completed Computer Studies as their minor in colleges of education lack the integration skills (Garegae, 2012). This study reflects the imbalance between technical and pedagogical skills required for the core curricula integration of computer awareness. Pedagogical skills would promote knowledge of relevant processes linked to desired outputs and outcomes.

Integrating CAP into the core curriculum at JSSs has similar resource implications for teacher training institutions particularly colleges of education. Lecturers must be competent computer users with the relevant pedagogical skills to model computer awareness integration into different subjects for the student teachers. Developing countries need to adopt authentic

diffusion strategies to deal with operational and contextual implementation challenges which slow the diffusion of ICT innovations (Nleya, 2009). Resources for these experiences must be adequate. Inadequacies in these institutions are likely to impede the teaching of computer awareness and the implementation of integrating CAP into the core curriculum at JSSs.

2.9 Maitlamo

To offer further guidance to projects already on going in different government institutions, the Government of Botswana came up with a draft of *Maitlamo* in 2004.

NDP 10 captures *Maitlamo* as a way through which Botswana will realize its goal of being “an active participant in the Global Information Society and a nation that uses ICT effectively” (Republic of Botswana, 2009, p. 124). Using the *Thuto Net* initiative, “... Government will educate children in ICT and other subjects, such as mathematics, science and engineering, which are required for success in the digital age” (Republic of Botswana, 2009, p. 124).

In 2006, Botswana produced its first draft of *Maitlamo* under the Ministry of Communication, Science and Technology (MCST). Literally translated, *Maitlamo* means pledge. The policy was a product of collaborative effort between the public, private and civil society (Republic of Botswana, 2007). It aimed at inter alia, providing the country “with a clear and compelling roadmap that will drive the social, economic, cultural and political transformation through the effective use of ICT in the years ahead” (Republic of Botswana, 2007, p. 2). Further, the policy envisaged to ensure Botswana to “... flourish economically...” (p. 2).

The policy addresses effective application of ICT in seven areas: Community Access & Development, Government, Learning, Health, Economic Development & Growth of the ICT Sector, Infrastructure & Security and Legislation & Policy. Its vision reads: “Botswana

will be a globally competitive, knowledge and information society where lasting improvement in social, economic and cultural development is achieved through effective use of ICT” (Republic of Botswana, 2007, p. 4). The policy also carries three broad objectives: “Creation of an enabling environment for the growth of an ICT industry in the country; Provision of universal service and access to information and communication facilities in the country; and Making Botswana a Regional ICT Hub so as to empower Botswana and to make the country’s service sector globally competitive” (Republic of Botswana, 2007, p.4).

Maitlamo policy focuses on education through *Thuto Net* programme. *Thuto* is derived from the local language’s (Setswana) for education. The programme emphasizes development of ICT skills in children for Botswana to attain a ‘knowledge-based society’ reflected in the country’s 2016 vision. The programme also aimed at connecting all schools and learning centres through the school connectivity initiative providing broadband and narrowband levels. All schools are to be connected to the central education network building upon the Government Data Network (GDN). In addition, through *Thuto Net*, all public libraries would be provided with modern computers connected to high speed Internet. Computers would be made accessible to students in classrooms through the Computers for Schools (CFS) programme. The plan was for government and private sector to ‘donate’ surplus and recycled computers to schools. Further, *Thuto Net* aimed at professional training and support of school heads, school-based IT managers and teachers done in phases. The view was to enhance their understanding of ICT and its use as classroom tool as well as educational content.

The RNPE (1994) and the revised junior certificate (JC) syllabus (2008) advocate ICT integration and infusion across curricula subjects. ICTs, especially computers, are supposed to be both content and used as teaching and learning tools. In other words, local documents

recommend both learning with technology and learning about technology. However, *Maitlamo* addresses only three areas: infrastructure, maintenance and teacher training.

Though it addresses teacher training, it only looks at in-service training without mention of pre-service training. In sum, teachers will only be trained on ICT integration after completion of studies. This has a bearing on the kind of training teachers are bound to receive. Often, it would restrict itself to workshops. With infrastructure, the emphasis is on school connectivity to the Internet and related academic areas such as libraries. The policy also banks on supply of ‘surplus’ and used computers by government and private entities. As regards maintenance, the proposal is two pronged: computers are to be fixed in the schools by trained personnel without jobs and this is a form of job creation for these individuals.

2.10 Current education reforms and policy direction

Botswana’s education system is currently undergoing major reforms. At the centre of these reforms are efforts to address the declining quality of education and develop the human resource with the requisite 21st century skills. It is expected that effective human resource development will foster Botswana’s economic transformation from a resource led to a knowledge-based one. Notable reforms include the establishment of the Human Resource Development Council (HRDC) (<https://www.hrdc.org.bw/about-human-resource-development-council-hrdc>) and the Botswana Qualifications Authority (BQA) in 2013 (<https://www.bqa.org.bw>) and the formulation of a five year framework, the Education and Training Sector Strategic Plan (ETSSP, 2015-2020). HRDC’s mandate is to ‘turn around Botswana’s education and training system from a supply-led into a demand driven system’ (HRDC, 2015) by driving effective human resource development. The BQA’s mandate is to develop national qualifications framework (NQFs) to establish a common understanding of educational outcomes and link national education systems to knowledge-based economies (Boikhutso & Molosiwa, 2016). The ETSSP seeks to guide decision-makers and planners to

improve the performance of the education sector in Botswana (Republic of Botswana, 2015). The country has also developed its latest vision, Vision 2036 (Republic of Botswana, 2016). The new vision is aligned to the global agenda for Sustainable Development as well as the Africa Agenda 2063 (Republic of Botswana, 2016). All these new reforms highlight the significance of ICT in improving the quality of education. Central to each of these is the need to equip learners with the 21st century skills required in the global economy and guarantee skills match between supply and demand. Specifically, ETSSP recommends an outcome based education and envisages increased integration of ICT and e-Learning across the education system. It identifies utilisation and integration of ICT as one of the critical sector strategic priorities. Successful integration of ICT in education and the anticipated improvement to the quality of education largely depend on successful implementation of *Maitlamo*.

2.11 Past studies on ICT: Botswana context

Past studies (Kyeleve, 2000; Kyeleve & Chakalisa, 2001) on ICT in Botswana focussed primarily on the use of ICT in education. Kyeleve (2000) demonstrated that the use of computers for instruction in mathematics is limited. The use of computers is limited to spread sheets, number patterns, sequences, generation and interpretation of graphs and solving simultaneous equations. Kyeleve and Chakalisa (2001) for their part, shed light on the administrative and instructional use of computers. Administratively, computers can be used for routine work such as preparing memoranda, duty rota, class and teacher lists and statistical analysis. The computer speed would be useful in generating these leading to increased productivity and efficiency. Kedar (2001) demonstrated the use of computers for presentation and visual bank development. Teachers can collaboratively develop dynamic, realistic and captivating presentations using visuals and store them in compact discs to clarify curriculum content. Ngoma (2010) reported that in Botswana, CAP is integrated into different

subjects with varied aims. Unfortunately, Ngoma's study was fraught with methodological weaknesses. The study was not evidence based but drew largely from a single secondary source, World Bank report.

Akiyemi et al., (2000) conducted a needs assessment study to inform the establishment of an educational technology programme at tertiary level. In their study, Akiyemi et al., (2000) indicated that successful implementation of ICT is dependent on categories of variables such as national, state, district context, school organisation and external support. Within the national or district context, this study refers to legislation and regulation, educational policy decision making, time, resources and proclaimed values and aims about an innovation as well as the significance of teacher training. Akiyemi et al., (2000) noted that school organization includes experiences and innovation, the role of school leaders and decision making procedure. Finally, the study underscores the importance of external support; staff coaching, technical support and collaboration among teachers. To some extent, this study made an effort to highlight the connection between different variables: inputs, processes and results. Batane (2004) study specifically focussed on the role of teachers in the process of ICT integration in classrooms and argued for teacher training with respect to ICT integration. Similarly, Mafuraga and Moremi (2017) focussed on factors constraining teachers from integrating ICT in English. In a case study, Batane (2006) reports inadequacy of computers, making access to the few extremely difficult. In a qualitative study that included teachers from 8 junior secondary schools, Sithole and Lumadi (2012) highlighted a similar challenge including internet connectivity as some of the challenges facing the use of computers in Business Studies.

Two studies (Batane & Ngwako, 2017; Nkhwilume, 2013) reported that successful integration of ICT into the classroom requires more than teacher training. These studies give credence to Akiyemi et al., (2000) study that a set of related variables need to be properly

aligned. Nkhwalume (2013) study revealed other challenges such as lack of access to computers, limited time allocated to mathematics and lack of administrative support. This study points to curriculum organisation and timetabling implying that the use of ICT in the teaching and learning process requires extended time. Batane and Ngwako (2017) lamented lack of an established ICT culture within a school environment and supportive management.

The study by Garegae (2012) refers directly to the role of the national ICT policy as it relates to ICT use in mathematics. It criticises the *Thuto Net* initiative as inadequate to support classroom use of ICT. Nonetheless, it also shows bias towards inputs, accentuating issues such as inadequate teacher training, inadequate resources and lack of technical support. Though it does not address itself to the two critical components of the current study: core curricula integration of CAP and *Maitlamo*; a recent country wide study on declining learning results specifically reflected on the interaction between policy and practice in secondary schools (Republic of Botswana, 2014). This study reveals intriguing mismatches between the policy and practice environments: (a) education policy intentions and actual outcomes, (b) curriculum goals and teaching and assessment practices, (c) teacher training and expected curriculum delivery and (d) curriculum change and resources. In sum, this study underlines lack of alignment of related education variables as the source of these multiple mismatches and declining learning performance.

The studies highlighted above remain relevant and significant. However, most of them focused on inputs such as availability and accessibility of resources and teacher training. None had yet looked into the synergy or lack of, between policy inputs, processes and envisioned outputs and outcomes with specific reference to the integration of CAP into the mainstream school curriculum. This study intended to fill this gap within local studies. This study held the view that the challenges facing the integration of ICT in education as

unearthed by the studies, were directly linked to the ICT policy. Resultantly, this study tried to address the integration of CAP across the curriculum at JSSs from a policy dimension.

Chapter Summary

This chapter presented generic and specific literature for this proposed research study. It highlighted how globalization manifests itself and ways in which transmission of global ideas is done, those instrumental leading to different global reforms. The critical role played by technology was also closely looked into. The impact and effects of globalization in education, how education transformations and ICT policies are exported and imported across the globe were examined. Simultaneously, the effects of these on education in the world, the African continent particularly sub-Saharan Africa were also gleaned. Further, global literature relating to technology integration in education was reviewed. A critical observation made in this study is the treatment of ICT inputs in isolation, marginalization of their intricate relationship and consistent peripheralization of desired outcomes. Finally, the transformations within the Botswana education context with specific reference to ICT use were discussed. The following chapter will present the proposed methodology for this research study.

CHAPTER THREE: METHODOLOGY

3.1 Overview

This study applied the concurrent mixed method approach involving a combination of qualitative and quantitative approaches. It explored various research paradigms such as positivism and critical theory. More importantly, it utilized pragmatism to allow the researcher to study the problem more deeply.

This chapter presents the study population, sampling procedures, research instruments, issues of rigour and trustworthiness, data collection, data analysis and ethical considerations.

3.2 Research Paradigm

This study was informed by the pragmatist paradigm which draws on and integrates qualitative and quantitative, numeric and narrative approaches (Cohen, Manion & Morrison, 2011; Johnson & Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2005; Teddlie & Yu, 2007; Wahyuni, 2012). Krauss (2005) defines research paradigm as a world view and basic belief system that directs investigation. Ponterotto (2005) adopts Filstead's (1979) definition of a paradigm as a "set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organized study of that world" (p. 127). In other words, a paradigm is a theoretical perspective which attempts to define and explain reality.

Two major aspects distinguish research paradigms: ontology and epistemology (Wahyuni (2012). Ontology refers to the view of how individuals perceive reality. Epistemology is the acceptable beliefs regarding the generation and use of knowledge. Epistemology is affected by axiology and methodology. Axiology is concerned with

research ethics and values while methodology deals with models for understanding the research process.

Over the years, different paradigms have been used to explain reality. These include positivism/positivist empiricist, post positivism/anti positivism, critical theory and pragmatism. Some paradigms such as positivism and constructivism have dominated most social science research such as medical health (Bunniss & Kelly, 2010). As the latest paradigm, pragmatism rejects paradigmatic fixation, polarization of research into either quantitative or qualitative in favour of methodological convergence and pluralism (Cohen et al., 2011). Brannen (2005) reports increased pressure for convergence in order for research to inform policy and for practical than scientific research. These paradigms differ in their application of theoretical lenses as they try to define reality. Each paradigm is briefly discussed in the next section.

3.2.1 Positivism

To understand human behaviour, positivism relies on observation and reason. “Positivism strives for objectivity, measurability, predictability, controllability, patterning, the construction of laws and rules of behaviour, and the ascription of causality” (Cohen et al., 2011, p.31). Positivism therefore explains human behaviour using scientific descriptions (Wahyuni, 2012). The ontological position of positivism is that only one objective truth and reality independent of human perception exists (Sale, Lohfeld & Brazil, 2002; Wahyuni, 2012; Wong, 2014). It is argued that true knowledge is based on experience which can only be understood through observation and experimentation by the researcher (Johnson & Onwuegbuzie, 2004; Krauss, 2005; Ryan, 2005; Sale et al., 2002; Wong, 2014). Ponterotto posits that as a form of philosophical realism, positivism relies on the hypothetical deductive method and “focuses on efforts to verify a priori hypotheses that are most often stated in quantitative propositions that can be converted into mathematical formulas

expressing functional relationships” (Ponterotto, 2005, p. 128). As a result, the main aim of positivistic enquiry is to explain, predict, control a given phenomenon and generate generic laws guiding human behaviour (Plack, 2005).

Quantitative methodology shares philosophical foundation with the positivist paradigm (Firestone, 1986; Sale et al., 2002) in upholding the view that there is only one true accessible reality. However, according to Cohen et al., one of the salient areas where positivism is less successful is in its application to the study of human behaviour owing to the immense complexity of human nature. In their view, this is more apparent in the contexts of classrooms and schools and problems of teaching, learning and human interaction. The positivist paradigm has been criticised for undermining life and mind and for its mechanistic and reductionist view of nature. It essentially defines life in measurable terms thus neglecting hermeneutic, aesthetic, critical, moral, creative and other forms of knowledge (Cohen et al., 2011; Ryan, 2005). Such criticism and others that followed resulted in counter paradigms such as post positivism.

3.2.2 Post positivism

Post positivism is an umbrella for multiple philosophically related though not necessarily identical paradigms referred to as naturalistic approaches (Cohen et al., 2000, 2011; Gray, 2013). In support, Giddings and Grant (2007) observe the diversity of opinion among post positivists. However, collectively, these related paradigms challenge the empiricist viewpoint that there is one objective truth or what Groff (2004) terms a universal norm and posits that knowledge is conjectural (Creswell, 2003) and that there are multiple realities (Krauss, 2005). In the view of post positivists, reality is socially and culturally constructed which makes objectivity impossible (Giddings & Grant 2007). Consequently, post positivists contend that subjective truth is equally valid and that knowledge is contextual (Krauss, 2005; Ryan, 2005; Wahyuni, 2012).

Similarly, while post positivists do not dispute the belief that laws and theories can explain various realities (theory verification) they contend that these have to remain open for verification. In line with this thinking, post positivists argue that the purpose of evidence is to establish highest probability than certainty (Giddings & Grant, 2007). Invariably, this translates into the conclusion that post positivists hold that the truth can only be approximated and theory cannot be universal and generalizable.

Further, post positivists believe that human behaviour is complex (Cohen et al., 2000; 2011; Ponterotto, 2005; Ryan, 2005) and “human intellectual mechanisms are flawed and that life’s phenomena are basically intractable” (Ponterotto, 2005, p.129). In the light of this, true reality can never be captured. Consequently, post positivists question the adequacy of the scientific approach in providing complete explanation of the social world as well as over reliance on one research paradigm to answer all types of enquiry about human behaviour (Plack, 2005). In turn, post positivists advocate the use of multiple methods in conjunction with the scientific methods to provide a holistic picture about a phenomenon under investigation (Giddings & Grant, 2007; Guba & Lincoln, 1994; Krauss, 2005; Ryan, 2005).

Also, post positivists argue that the social world can best be understood from the perspectives of independent and real individuals who are part of an enquiry (Cohen et al., 2000; 2011; Giddings & Grant, 2007; Johnson & Onwuegbuzie, 2004; Krauss, 2005). This, according to Krauss can be achieved through dialogue and interaction between the researcher and the researched. In this context, the researcher becomes the learner (Ryan, 2005).

Ryan (2005) also notes that post positivism has raised ethical issues in enquiries and its contributions towards changing the world and bringing social justice are critical. As Ryan exemplifies, post positivism emphasizes ethical considerations such as respect for

participants as sources of information and cordial interaction between researchers and participants. Similarly, post positivists believe that research is not only about problem solving but also about problem setting (Ryan, 2005).

As an alternative paradigm, post/anti positivism derives its view of reality from the social sciences (Cohen et al., 2011). Nonetheless, there is seeming polarisation regarding the extent to which post positivism departs from positivism. While some commentators view the departure as mild (Bunniss & Kelly, 2010; Giddings & Grant, 2007; Guba & Lincoln, 1994; Plack, 2005; Wahyuni, 2012), others view it as extreme (Groff, 2004; Lapid, 1989). Yet others, such as Creswell (1993) treat positivism and post positivism as similar. Those who hold the view that the departure is mild argue that the two paradigms are similar in ontological and epistemological stances but differ in axiology and methodology. In fact, Giddings and Grant argue that the emergence of post positivism was a moderate development of positivism while Plack views post positivism as a way of softening positivism. Conversely, those who view the departure as radical equate post positivism with relativism; there is no absolute but relative truth. Seemingly, this is the source of contention. Aptly, Cohen et al., explain that:

although the opponents of positivism within social science itself subscribe to a variety of schools of thought each with its own subtly different epistemological viewpoint, they are united by their common rejection of the belief that human behaviour is governed by general, universal laws and characterised by underlying regularities (Cohen et al., 2011, p.15).

In sum, post positivism is premised on the recognition that research is broad, theory cannot be divorced from practice, researchers play a central role and the inadequacy of the notion that research is only concerned with correct techniques for collecting and categorising

information (Ryan, 2005). Ryan also observes that through its principles, post positivism stresses meaning and creation of knowledge and thus offer support to social movements aspiring to change the world and contribute towards social justice. However, post positivism has not gone unchallenged. Groff (2004) posits that post positivists' argument that all beliefs are valid has political implications and discourage critical analysis and exchange. In the view of Groff, post positivism's claim that knowledge is relative is false. Lapid (1989) views post positivism as an incoherent philosophical platform which embraces other equally confusing philosophies. Besides these criticisms, most of the critics of post positivism are inherent in the arguments held by critical theorists.

3.2.3 Critical Theory

Like post positivism, the critical theory hosts numerous other paradigms with similar beliefs (Plack, 2005). In the view of Plack, critical theorists believe that knowledge and reality are historical and shaped by multiple factors such as social, political, cultural, ethnic, racial, economic and gender. Critical theorists claim that in most instances, reality remains unchallenged and is often inappropriately accepted as natural and immutable truth, reified and crystallised over time. Critical theorists aim to challenge and expose social injustices and inequities that occur owing to uncritical and acquiescent acceptance of the dominant cultures (Gray, 2013; Plack, 2005; Wong, 2014).

Precisely, critical theorists challenge the significance of understanding situations and phenomena without changing them for the emancipation of the disempowered and also advocates for equality and democracy (Cohen et al., 2000, 2011; Creswell, 2003; Plack, 2005; Ponterotto, 2005; Wong 2014). As described by Creswell (2003), critical theorists take the advocacy or emancipatory route and hold that investigations must be carried out with the aim to change the status quo. Hence their mandate is 'explicitly prescriptive' detailing what behaviour social democracy should embrace (Cohen et al., 2011).

Also, according to Creswell, these critics contend that research must be linked to politics and political agenda. They also refute claims of neutrality and ideological or political innocence in research (Cohen et al., 2011). As Plack (2005) observes, critical theorists' interest lies in understanding how power relations and other external forces and struggles such as race, gender, political and economic ideologies transform individuals and their social consciousness. In turn, they wanted research to specifically address the day to day social issues such as empowerment, inequality, oppression and domination (Creswell, 2003) through interaction and discourse to arrive at knowledge (Plack, 2005). Thus, like post positivists, critical theorists argue that the inquirer cannot be divorced from the studied and that the values of each must be equally respected (Plack, 2005). Importantly, critical theorists wanted the voice of the participants to be heard and be used to advance an agenda for change for the improvement of the lives of the participants.

However, like other paradigms, the critical theory has had critics. One such critique is that critical theory has not been tested. For example, the connection between ideology critique and freedom is unclear and illogical (Cohen et al., 2011). Most significantly, the critical theory has been accused of harbouring a political agenda. Such criticism gave rise to the pragmatist paradigm which assumes neutrality and flexibility; it advocates practicality and the use of qualitative and quantitative approaches to solve an identified research problem (Cohen et al., 2011). The current study was specifically guided by the pragmatist paradigm.

3.2.4 Pragmatism

Pragmatism is an approach to theoretical and practical knowledge that attempts to consider multiple viewpoints, perspectives, positions and standpoints (Johnson, Onwuegbuzie & Turner, 2007). As a worldview, pragmatism focuses on the research problem and the applications of what works (Creswell, 2003; 2008; Wahyuni, 2012). Slightly differently, Giddings and Grant hold that "pragmatism is an ideological position

available within any paradigm rather than a paradigm in its own right” (Giddings & Grant 2007, p. 2). Thus, pragmatism is practical rather than idealistic (Brannen, 2005; Cohen et al., 2011) focussing on ‘getting the job done’ rather than epistemological integrity (Giddings & Grant, 2007).

Pragmatism acknowledges the possibility of the co-existence of singular and multiple versions of the truth and reality. It resonates with the notion that some versions of the truth are objective, scientific and humanistic while others are subjective (Cohen et al., 2011; Wahyuni, 2012). Pragmatism is the philosophical underpinning for mixed method studies (Cohen et al., 2011; Descombe, 2008; Johnson & Onwuegbuzie, 2004). In the view of Cohen et al., and, Johnson and Onwuegbuzie, pragmatism emphasizes the exploration of the problem using pluralistic approaches to provide the best understanding of and derive knowledge about the research problem. In this regard, Firestone (1986) and Wahyuni (2012) observe that qualitative and quantitative approaches are not antithetical and have more overlaps than differences (Brannen, 2005). Creswell adds that “for the mixed researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as to different forms of data collection and analysis in the mixed methods study” (Creswell, 2003, p. 12).

In a nutshell, Cohen et al., state that “pragmatism adopts a methodologically eclectic, pluralist approach to research, drawing on positivism and interpretive epistemologies based on the criteria of fitness for purpose and applicability, and regarding ‘reality’ as both objective and socially constructed” (Cohen et al., 2011, p. 23). In the view of Cohen et al., methodological pluralism permits the identification and rectification of errors in single approaches, enables meanings in data to be probed and corroboration and triangulation to be practised. The current study was partly influenced by the practical approach of pragmatism and adopted a mixed design.

The preceding discussion indicated that each paradigm has its strengths and weaknesses. Invariably, these strengths and weaknesses are inherent in the approaches associated with each paradigm. For instance, the strength of positivism lies on its reliance on empirical evidence derived from precise mathematical measurements, observation and experimentation. However, its mechanistic view of the social world is its main undoing.

The strength of anti-positivism on the other hand seems to be its view of reality as not only objective but also highly subjective and contextual. Nevertheless its weakness seems to be methodological in that its methods are prone to bias which gives room to multiple interpretations, meanings and truths. This stance is equated with the denial of universal truth and treatment of truth as relative.

The critical theory and the critical education research have their strength in advocating action for the betterment of all individuals; it appeals for focused reflection. However, its application has not been fully explored and tested and its hard stance is not appreciated yet.

Finally, the strength of pragmatism is its practical approach by taking advantage of the strengths of the trio: positivism, post positivism and critical theory. It prefers the across use of methods to solve a problem. However, as a fairly recent paradigm in research, its weakness appears in establishing itself as trustworthy. With all these in mind, this study found the practicality of pragmatism more appealing particularly in view of the nature of the problem under investigation in this study. Similarly, the mounting pressure for convergence (Brannen, 2005; Bryman, 2006) in researches meant to inform policy compelled this researcher to adopt pragmatism as the basis for this project. Such studies are reported in a language understood by all (Brannen, 2005).

This study applied the pragmatist paradigm which draws on and integrates qualitative and quantitative, numeric and narrative approaches (Cohen, et al., 2011; Johnson &

Onwuegbuzie, 2004; Onwuegbuzie & Leech, 2005; Teddlie & Yu, 2007; Wahyuni, 2012). Pragmatism is useful to this study in a number of ways. Firstly, the study tried to find solutions to existing problems. Secondly, it sought to provide a model to inform curricular reforms and specifically the integration of ICT into Botswana's school curricula. Thirdly, the study focussed on in depth analysis of the phenomenon under investigation.

3.3 Research design

The study adopted the concurrent multilevel sampling strategy combining probability and non-probability sampling techniques in which the qualitative data carried more weight than quantitative data. Teddlie and Yu (2007) describe research design in mixed method studies as a phase of a study that includes the conceptualization, experiential and inferential stages. This study involved multiple units of analysis. Teddlie and Yu write that a combination of multilevel mixed method sampling with concurrent mixed method sampling entails "...combinations of multiple strands of a research study with multiple levels of sampling within strands" (Teddlie & Yu, 2007, p. 96).

3.3.1 Mixed Method Approach

This study applied the mixed method approach. The mixed method approach combines aspects of quantitative and qualitative approaches (Onwuegbuzie & Leech, 2005). According to Wong (2014), research design entails organising research activities in order to attain the predefined research aims.

Conducting mixed method research entailed collecting, analysing and interpreting qualitative and quantitative data in a single study or in a series of studies investigating the same phenomenon (Onwuegbuzie & Leech, 2005). These two traditional approaches were thus used in a complimentary fashion where the weaknesses and biases of one were 'cancelled out' by the use of the other approach.

On the one hand, quantitative research is explanatory in nature aimed at answering the ‘what’, ‘who’, ‘how much’ and ‘how many’ questions. On the other, qualitative studies are exploratory aimed at answering the ‘why’ and ‘how’ questions (Wong, 2014).

Mixed method design resulted from the realisation that each methodology, qualitative or quantitative, has limitations which can be ‘cancelled out’ by employing the other approach. Resultantly, mixed methods approaches permitted the researcher to inter alia seek convergence across quantitative and qualitative data referred to as triangulation (Creswell, 2003). Green, Caracelli & Graham (1989) contend that “From its classic sources, triangulation refers to use of multiple methods, with offsetting or counteracting biases, in investigations of the same phenomenon in order to strengthen the validity of inquiry results” (Green et al., 1989, p. 256). On a different note, Bell (1999) asserts that triangulation concept advocates cross-checking of findings in extensive studies during which more than one method is used.

To achieve an in-depth assessment of integrating computer awareness across the curriculum at junior secondary schools in Botswana, the study applied the mixed method approach as already stated. This study used components of the quantitative approach to answer questions about the extent of integrating computer awareness across the curriculum. The qualitative approach sought to understand the impact of prevailing circumstances on implementation.

3.3.2 The Concurrent Mixed Method Approach

This study specifically applied the concurrent mixed method approach within the mixed method research to seek triangulation and complementarity of the research results and some degree of expansion. This approach is where the qualitative and quantitative phases occur at approximately the same time independent of each other as opposed to the sequential

approach in which one component follows the other (Onwuegbuzie & Collins, 2007). Green et al., (1989) and Onwuegbuzie and Leech (2005) identify five purposes for mixing research approaches: a) *triangulation*: seeks convergence and corroboration of the findings from different methods studying the same phenomenon b) *complementarity*: seeks elaboration, illustration, enhancement, and clarification of the results from one method with those from the other method c) *initiation*: helps discover paradoxes and contradictions resulting in re-framing of research questions d) *development*: refers to using results from one method to inform the subsequent method and e) *expansion*: seeks to expand the breath and range of the investigation by using different methods for different inquiry components. As mentioned earlier in this section, the purpose of using the mixed method approach was to enhance the results of one method by employing other methods to collect data.

Green et al., (1989) submit that in complementary mixed method designs, qualitative and quantitative approaches are applied to measure different facets of a phenomenon which also overlap. In the view of Green et al., such combination yields an enriched, elaborated understanding of that phenomenon.

3.3.2.1 *Application of the mixed method design*

The mixed study approach was applied at different stages of this study: research questions, methods, sampling, data collection and analysis (Johnson et al., 2007). The mixed method design was embedded within the goal of this study. This study used the cross curricular integration of the computer awareness programme in junior secondary schools to assess the adequacy of *Thuto Net* in supporting meaningful integration of computer awareness into Botswana's education system. Integrating technology into existing curriculum is a complex process (Mishra & Koehler, 2008) involving interaction between policy and practice. Therefore the rationale for mixing the two approaches was primarily to use the results in a complementary manner (Onwuegbuzie & Collins, 2007; Sale et al.,

2002). This enabled this study to attain a comprehensive understanding of policy performance in the integration of computer awareness across the junior secondary school curriculum in Botswana. To achieve this, the study used multiple sources to gather data: survey questionnaire, interviews, focus group discussions, analysis of documents and observations.

The research questions were designed such that they embedded both qualitative and quantitative components; largely open ended and non-directional with the aim to explore the integration of computer awareness across the curriculum in Botswana junior secondary schools. These questions allowed this study to interrogate qualitative and quantitative data (Onwuegbuzie & Leech, 2005). This assisted this study in preserving each approach's counteracting biases (Green et al., 1989) and offset the weaknesses of each individual approach (Driscoll, Appiah-Yeboah, Salib & Rupert, 2007).

The concurrent approach was also employed during data collection. The investigator physically visited each of the 12 sampled schools. At each school, after due introductions, the sampling process commenced followed by distribution of questionnaires to selected participants. Data collection continued with other methods such as interviews and lesson observations at any convenience. In most cases, participants volunteered to share information and their experiences. For example, a deputy school head would immediately share information following introductions. However, with participants who were not readily available for discussions, arrangements were made.

3.4 Sampling Frame

Teddlie and Yu (2007) define the sampling frame as a formal or informal unit from which samples are drawn. This study focused primarily on JSSs, clustered according to eleven (11) regions. Participants in the schools included students, teachers, senior

management team members, school-based computer programmers and ICT coordinators. Other stakeholders were college lecturers in one of the secondary colleges of education, one officer at the Botswana Examinations Council (BEC) and the Department of Curriculum Development and Evaluation (CD&E). The justification for this study's population per target group follows in the next section.

3.5 Study Population

The study population included Botswana junior secondary schools students, teachers, computer programmers, ICT coordinators, senior management teams (SMT), college lecturers, one officer from Botswana Examinations Council (BEC) and another from Department Curriculum Development and Evaluation (CD&E) drawn from the sampling frame highlighted above. Below are the details and justification for inclusion of the various segments of the study population.

3.5.1 Students

Students in junior secondary schools are the primary consumers of the revised curriculum. They were selected to provide feedback on whether or not they had been taught the computer awareness in other subjects as prescribed by some of their syllabi, the skills they acquired and share their experiences regarding the computer awareness integration. They also shared their thoughts on other ways in which the computer awareness can be integrated in the curriculum.

3.5.2 Teachers

Teachers are fundamental stakeholders in the implementation of the school curriculum. Among other things, teachers facilitate the learning process by providing guidance to students towards achieving curriculum goals. They also evaluate students' attainment of curriculum goals. As such, teachers are expected to integrate computer

awareness across the curriculum. Teachers provided first-hand information on the progress they were making in integrating computer awareness in their respective subjects. They also provided information about their competencies in carrying out this mandate, availability of resources such as computer hardware and software, access to these resources, school connectivity and how these impacted on their mandate. Further, they shared insights into the overall impact of integrating computer awareness in their subjects on the learning and teaching processes.

3.5.3 College Lecturers

Lecturers in secondary colleges of education are charged with the responsibility of preparing teachers for junior secondary school teaching. Invariably, there is a direct relationship between teacher preparation at colleges of education and teaching at JSSs in Botswana. As a result, feedback from lecturers in a secondary college of education was expected to shed light on how student teachers are prepared during in-service and how this would impact on the implementation of integrating computer awareness across the curriculum at junior secondary level. This was critical in view of the observation that the implementation of integrating computers across the curriculum requires that teachers are adequately prepared.

3.5.4 Senior Management Teams

These members were selected on account of their roles and responsibilities as overseers of junior secondary schools' operations. At the school level, they are involved in some policy making processes. They were expected to be more knowledgeable about *Maitlamo* ICT policy than anybody else in the school. School heads oversee the integration of computer awareness and ensure that school conditions support effective teaching and learning. In addition, members of the senior management teams were expected to provide information on issues such as staff competencies, availability of the relevant hardware,

software and peripherals and accessibility of resources for the implementation of the cross curricular integration of computer awareness.

3.5.5 ICT Coordinators and Computer programmers

ICT coordinators and school-based programmers were selected because they coordinate ICT activities which include the use of computers in learning and teaching, in-house orientation of teachers and the general upkeep and management of ICT equipment including computers and other important peripherals. They also provide a crucial link between teachers and senior management on matters relating to the use of ICT and procurement of related resources. ICT coordinators and programmers provide data about the availability and adequacy of resources, accessibility of resources and technical support offered to teachers who use computers.

3.5.6 Curriculum Development and Evaluation Unit

One officer responsible for ICT integration in education in the Curriculum Development and Evaluation Unit was purposively selected for an interview. The officer charged with overseeing ICT integration in education provided background leading to the cross curricular integration of computer awareness, theoretical frameworks informing the decision, progress regarding teacher professional development and perceived usefulness of the implementation of the integration of computer awareness across the curriculum. This officer also highlighted aspects associated with the implementation process as well as their impact.

3.5.7 Ministry of Education and Skills Development (MoESD)

At least one (1) officer in the Ministry of Education and Skills Development was expected to partake in this study. Personnel in MoESD spearhead the implementation of the *Maitlamo* policy and specifically the *Thuto Net* initiative. It was hoped that they were key

stakeholders in the policy formulation process. It was anticipated that the officer responsible for policy implementation in the ministry would share insights into policy design and the theoretical framework behind it. Again, the officer could provide insights into policy goals and relate policy connection with practice in view of the cross curricular computer awareness integration at junior secondary schools level. In particular, the officer could help this study reflect on policy performance regarding the achievement of milestones: teacher training, availability of resources and their access and internet connectivity as outlined in the policy and the impact current performance had on the implementation process. This investigator wrote to the ministry to arrange for an interview with the appropriate officer. No response was forthcoming. A follow up letter was submitted to no avail. This was followed by telephonic calls without success. The investigator finally gave up on the officer.

3.5.8 Botswana Examinations Council (BEC)

The council deals specifically with assessment. The council would have been part of the policy formulation. The officer responsible for assessment relating to ICT use or Computer Studies shared insights into their role in policy design and their response to policy at implementation through assessment. Also, the officer shared information on the council's expectations from teachers and type of skills students' must exhibit in responding to assessment questions.

3.5.9 Documents

The RNPE, NDPs (from 7 to 10) and the country's Vision 2016 documents were subjected to continuous examination. The RNPE, Vision 2016 and NDPs form critical policy documents informing *Maitlamo*. The RNPE sanctioned the introduction of the Computer Awareness Programme (CAP) at junior secondary schools in 1999. To date, there is continued implementation of most recommendations from the RNPE, making this

document critical for this study. *Maitlamo* and its *Thuto Net* component were subjected to further scrutiny as the core document of this study. It informs the integration of ICT in education and invariably computer awareness in the junior secondary schools. Also, a sample of junior secondary subjects' and college syllabi were scrutinised in relation to the purpose of this study. The syllabi inform practice with respect to the integration of computer awareness across the curriculum. The document analysis section later in this section describes how the analysis of these documents was carried out.

3.6 Sampling Procedures

This study targeted multiple stakeholders and used the concurrent mixed methods sampling design (Onwuegbuzie & Collins, 2007; Teddlie & Yu, 2007) also referred to as parallel mixed methods sampling (Cohen, et al., 2011). Multilevel mixed methods sampling strategy was adopted to allow comparison between different groups drawn at various levels (Cohen, et al., 2011). Aspects of probability sampling techniques such as stratified and random sampling were used. Applying the probability sampling techniques implied randomization and ensured that all participants stood a chance of being selected for participation in the study (Vehovar, Toepoel & Steinmetz, 2016). Stratified sampling was used at different phases of the study beginning with the selection of schools. At the same time aspects of non-probability sampling techniques such as purposive sampling strategy were used (Cohen, et al., 2011). Non probability sampling techniques imply arbitrary selection of those who partake in the study such that not all participants were eligible for selection (Vehovar et al., 2016). Schools used in this study were purposively sampled on the basis of their location. The sampling techniques were used independently and at different levels of the study due to multiple units of analysis. Sampling serves to inform the quality of inferences the researcher makes owing to the underlying findings (Onwuegbuzie & Collins, 2007). That is, the suitability of samples allowed this investigator to draw

conclusions on other similar areas on the basis of research findings from the subset of the entire population.

Probability samples were drawn randomly from the wider population and stood an equal chance of being picked (Cohen et al., 2011). In turn, probability sampling increases external validity (Teddlie & Yu, 2007). Conversely, in non-probability samples, the selection of the research participants was determined by the investigator. The selection of the sample population was deliberate and based on typicality (Cohen et al., 2000; 2011) or fitness for purpose (Onwuegbuzie & Collins, 2007). More specifically, purposive sampling techniques were preferred as they increased the transferability of data from one context to the other (Teddlie & Yu, 2007). Sampling techniques are discussed in the following section.

3.6.1 Quantitative Data

Multilevel sampling technique was used to sample schools, students and teachers. Stratified purposive sampling was used to select schools on the basis of the East and West corridor division. Two observations guided the purposive selection of regions and schools. First, the western districts remain less populated while majority of people live in the fertile eastern region (Republic of Botswana, 2010). This can be attributed to more attractive developments in the eastern corridor. Second, reading and literacy rates decline with further movement away from the railway line (Republic of Botswana, 2013). Six educational regions falling within these divisions were purposively selected: Central, Kgalagadi, Kgatleng, North East, Southern and South East. These regions were categorised into three subsets: urban, rural and remote. Increasingly, the division of these areas is getting blurred as a result of developments (Moepeng, 2013). In the context of this study, an urban area was defined as highly accessible with highly improved infrastructure and public services (Moepeng, 2013). Remote and rural areas are physically removed from other population areas and major urban centres, often characterised by a lack of variety in the ways people make a living and thus

economically disadvantaged (Moepeng, 2013; Molosiwa & Boikhutso, 2016). Specifically, remote areas are often inhabited by small, marginalized ethnic minority groups (Pansiri, 2011). Purposive sampling guided by the theory of maximum variation was used to select a total of 12 schools across the 6 regions 2 of which formed a nested sample for the qualitative phase of the study: four (4) from three urban areas, five (5) from rural settings and three (3) from remote areas.

A total of 192 participants completed the survey questionnaire: 159 teachers, 9 ICT coordinators, 15 senior management team members and 9 school-based programmers. 114 females and 78 males with age range between 24 and 57 participated in the survey. The larger portion of participants (89) possessed diploma in secondary education, 77 had degrees. Participants' work experience ranged between 2 and 29 years and 13 subjects were represented.

3.6.1.2 *Selection of participants*

The quantitative phase of this study utilized stratified random sampling technique to select one hundred and thirty (136) teachers and senior teachers. Table 2 shows the demographic data of teachers and senior teachers selected for the quantitative phase.

Table 2: Senior teachers and teachers' demographic data

Participants	Gender		Age	Experience
	F	M	Range	Range in yrs
Teacher	37	25	23 - 49	1 - 22
Senior Teacher	48	26	28 - 54	4 - 29
Total	85	51		

The schools' establishment register for each subject offered in each school was used to select teachers. For each subject, teachers' names were divided into two groups according to gender. Pieces of paper containing teachers' names were cut out and placed into a container. From each group, a name was randomly pulled out such that each subject was represented by at least two members. The process was followed across schools. However, in smaller schools with fewer teachers, each subject was represented by any one member. The investigator administered a questionnaire to the selected teachers. Nine (9) ICT coordinators, nine (9) school-based programmers and 15 senior management team (SMT) members were purposively to complete the questionnaire. The two groups of coordinators and programmers had five males and four females while the SMT group comprised nine females and six males. The coordinators' ages ranged from 31 to 51, those of the programmers from 25 and 43 while those of SMTs' ranged from 47 to 57.

3.6.2 Qualitative Data

Purposive, convenience and total population sampling were used to select some of the school participants who participated in the quantitative phase to also partake in the qualitative phase of the data collection process. A total of 63 participants were conveniently picked as shown in table 3.

Table 3: Other participants' demographic data

Participants	Gender		Totals
	Male	Female	
ICT Coordinators	5	4	9
Programmers	5	4	9
Teachers & Senior teachers	14	22	36
Deputy School Heads	3	2	5
School Heads	1	1	2
CD&E	1	0	1
BEC	1	0	1
Totals	30	33	63

The ICT coordinators, school-based programmers, deputies and School Heads were selected on the basis of their availability and willingness to partake in the interviews. The two officers, from CD&E and BEC were specifically selected for this investigator by the organisations. A total of 63 interviews which lasted between 15 and 60 minutes were conducted.

Stratified purposive sampling was used to pick schools using maximum variation (Teddlie & Yu, 2007) specifically for focus group discussions. Two schools, one from an urban setup and another from a remote setup were purposively selected with allowance for snowballing pending data saturation. Stratified random sampling was used to select 60 learners from each of the two schools as depicted in table 4. A register for students across form groups (1, 2 and 3) was requested. To avoid gender bias, each list was divided into two according to gender. Pieces containing students' names were cut out and mixed.

Table 4: Students' demographic data

Students	School A		School B		Grand Totals
	Gender		Gender		
	Female	Male	Female	Male	
Form 1 (<i>Grade 8</i>)	5	5	5	5	20
Form 2 (<i>Grade 9</i>)	5	5	5	5	20
Form 3 (<i>Grade 10</i>)	5	5	5	5	20
Totals	15	15	15	15	60

Each form formed a focus group. This provided three (3) focus group discussions in one school and a total of six (6) in the two schools. During the focus group sessions, the students were divided into two groups of three and one of four. Each group was given a set of five questions and an answer sheet to write down their responses. The written answers

were followed by discussion during which students presented their group answers while the researcher noted the responses and probed for clarity on some answers. The purpose of a random selection of students was to ensure reasonable representation of these groups.

Stratified purposive sampling was used to sample a total of 12 teachers, seven females and five males. Two schools, one in a remote set up and the other in an urban environment were purposively selected. Six subject strata used in schools (English and Setswana, humanities, practicals, generals, sciences and Agriculture and Home Economics) were identified. For each stratum, a teacher representative was purposively selected and total of six teachers per school generated for focus group discussions. From the two schools, two focus group discussions were conducted.

Stratified purposive sampling was used to select four (4) lecturers, two males and two females from one secondary college of education to form focus groups. Subjects offered at college were divided into four (4) main categories: Foundation, Practical, Technical and Humanities. A lecturer was purposively picked from each of the strata to take part in the focus group discussion. In total therefore, nine focus group discussions were conducted.

3.7 Instrumentation

This study employed five data collection instruments: survey questionnaires (appendix K), focus group discussions (appendix O), interviews (appendix L), observations (appendix M) and document analysis (appendix N). The investigator singly administered the questionnaires to participants: teachers, ICT coordinators, programmers and SMTs. Similarly, the investigator conducted face to face interviews with the same participants and other officers who included one representative from the CD&E and BEC. In addition, the investigator conducted focus group discussions with teachers, students and college lecturers.

3.7.1 Questionnaires

Self-completion questionnaires were used to collect quantitative data from a sample of participants such as teachers and SMTs. A questionnaire is widely used and a useful tool for collecting and recording survey information which is often numerical (Cohen et al., 2011). Its merits include that it is more reliable, encourages greater honesty because of its anonymity, is comparatively economic in terms of time and can be administered without the presence of the researcher and often relatively straightforward to analyse (Cohen et al., 2011). However, a questionnaire takes time to develop and refine, can be limited in scope, can be interpreted differently by different respondents, respondents have no chance to ask for clarification, probing is difficult, respondents must be fairly literate and can be expensive with respect to posting and printing (Cohen et al., 2011).

Questionnaires comprised of closed ended questions and one open ended questions for additional comments or observations. Closed-ended question included mostly (5 questions) statements rated on a five-point Likert- type scale ranging from “Strongly Agree”, “Agree”, “Not Sure” and “Strongly Disagree” and “Disagree”. Each option was assigned a number from one to five (1-5) as per their order. In other words, the “Strongly Agree” option was represented by 1 while the “Strongly Disagree” option was represented by 5. One question each used Yes/No options, a three-point Likert scale consisting of options “Very Much”, “A little” and “Not At All” and a frequency with options “Daily”, “Weekly”, “Fortnightly”, “Monthly” and “Never”. Questionnaires provide the best option to gain access to and input of teachers as key participants in this study. The questionnaires solicited information about the extent to which teachers were CAP in their respective subjects and at the same time promote effective learning and teaching processes. Four sets of questionnaires with mostly similar questions were distributed to teachers, senior management team members, ICT coordinators and school-based programmers. Members

were given a week to complete the questionnaires after which the investigator physically collected them.

3.7.2 Interviews

Interviews are defined as systematic ways of conversing with individuals for purposes of collecting data (Karjonboon, 2005). In depth face to face interviews were used with participants identified as key informants in this study. The use of interviews assumes that knowledge is generated by human beings and hence permits interaction between the interviewer and the respondent and at the same time takes into account the social context (Cohen et al., 2011). Interviews can be used to tap a person's knowledge, preferences and values and thoughts or explain variables and relationships or to validate other methods or to go deeper into respondents' motivation and reasons for their responses (Cohen et al., 2011).

In addition, interviews allow the researcher to clarify any misunderstandings experienced by the interviewee (Karjonboon, 2005) hence allowing more discussion about the research problem. This study used guided semi structured interviews with an interview guide focussing on particular themes.

Interviews were selected to permit the researcher into validating data obtained through other methods such questionnaires and check list and real life experience in the schools. Interviews accord the researcher the chance to probe for further clarification (Cohen et al., 2011; Karjonboon, 2005). However, one of weaknesses of the interview guide approach is that critical topics may be unconsciously omitted. Similarly, the interviewer's flexibility in ordering and wording questions may lead to diverse responses (Cohen et al., 2011).

Specifically, group interviews allow for discussions to develop, therefore producing a wide range of responses than individual interviews. Also group interviews may provide

insight into what can be followed up during individual interviews. As well, these can bring together people with diverse opinions providing a cross check, complementarity and thus increase reliability (Cohen et al., 2011).

3.7.3 Official Documents

Cohen et al., (2011) define a document as a record of an event or process produced by individuals or groups. Documents such as books are repositories of knowledge and documentary research methods provide access to historical events, processes of change and current behaviours and relationships shaping the future or continuity. That is, documents as sources of data provide researchers with the chance to reflect on the influence of the past and present actions on the future. Cohen et al., state that documents differ in a number of ways from private to official, written text or other forms such as electronic documents. An established distinction between documents relates to that between primary and secondary sources. Often, primary documents are direct records of an event or processes compiled by a witness or subject involved in it while secondary documents result from analysis of primary documents. In education, textbooks are an example of primary documents meant to support teachers, lecturers and students to follow a syllabus. Policy reports are cited as examples of primary documents; they reveal underlying policy reforms (Cohen et al., 2011).

It is important to pay attention to the policy background and intentions (Tatto, 2012) as well as document meanings (Cohen et al., 2011). The latter involves comprehension of conveyed information and underlying values and assumptions of the official documents. According to Cohen et al., it is critical to understand the text and its context in official documents. In relation to context of documents, this “includes taking account of broad educational, social, political, economic and other relationships that help explain the contemporary meaning of the documents...” (Cohen et al., 2011, p. 253). Appreciating the external context helps in addressing (i) broad view of the authorship of documents including

consideration of their origins, how they were created and the people involved (ii) the intended audience and its traits and, (iii) outcomes or long term impact of the document on debates, ideas and policies. Tabulawa (2013) recommends the need to scrutinise the structure of educational documents and their impact on practice and outcomes.

In the context of this study, junior secondary school and college syllabi for the different subject areas were considered as primary documents. This also included documents such as the RNPE, NDPs, National Visions 2016 and 2036, *Maitlamo's Thuto Net* initiative and a sample of junior certificate syllabi. These primary sources of data were analysed succinctly on a continuous basis during the course of this study. Specifically, the analysis highlighted the perceived match or mismatch between policy intentions and the actual practice with regard to the integration of CAP across the JSS curriculum.

3.7.4 Observation checklist

Observations entail systematically looking and noting people, events, setting and artefacts (Cohen et al., 2011), allowing a researcher the chance to gather 'live' data in its natural context. Observations can also be used to reveal things that could be missed or discover those which participants might not freely talk about. As a result, data yielded from observations is more likely to be more authentic (Cohen et al., 2011). Cohen et al., state that observations can be used to gather factual, descriptive or behavioural data sets, enabling researchers to gather data on physical, human, interactional and programme settings. One major weakness of observations is that they are contextual and depend on such variables as time, place and duration of observation. A structured observation checklist was drawn to observe and assess ICT integration in the lessons.

3.8 Rigour and Trustworthiness

Describing the twin concepts of reliability and validity as the touchstones of all types of educational research, Cohen et al., (2011) signal their importance in research efforts. In every research undertaking, researchers aim to collect data which conforms to such traits as trustworthiness, credibility, validity, consistency, reliability and legitimacy (Collins, 2006). On the one hand, reliability refers to the extent to which an instrument is consistent and stable (Plack, 2005) and dependable (Cohen et al., 2011). That is, if it were to be re used under the same conditions, results will be the same. On the other, validity is the extent to which the research instrument measures what it is supposed to measure (Kumar, 2014). “Triangulation is a powerful way of demonstrating concurrent validity...” (Cohen et al., 2011, p. 195). Cohen et al., and Johnson and Onwuegbuzie (2007) posit that using multiple methods increases researcher confidence in the collected data; there is exponential increase in confidence level with greater disparity between the methods (Cohen, et al., 2011). Triangulation permits researchers to attain a better, more substantive picture of reality, a richer array of symbols and a means of verifying the different elements (Berg, 2009). To enhance rigour and trustworthiness of the findings, this study used multiple methods for data collection commonly referred to as triangulation. Different sources of data such as questionnaires, face-to-face interviews, focus group discussion, document analysis and observations were used to collect data. Cohen et al., write that the notion of triangulation bridges the issues of reliability and validity allowing the researcher to obtain a holistic picture of a phenomenon under investigation. This study aimed to explain more fully, the complexity of integrating CAP across the curriculum in Botswana JSSs. Other than employing the triangulation approach, this study relied on expert views from the study supervision team on appropriateness of instruments. All interview guides and questionnaires were submitted to and examined by the study supervisors with their feedback incorporated

prior use. Also, the questionnaires were trial tested through piloting discussed in the following section.

3.8.1 Piloting

Cohen et al., (2011) underline the importance of the wording of questionnaires and assert that pre-testing is critical. Piloting serves to increase the reliability, validity and practicability of the questionnaire (Cohen et al., 2011). Also, it is one way of assessing the appropriateness or utility of instruments (instrument fidelity) with a view to improving them or creating new ones (Collins, 2006). Further, trial testing of research instruments ascertains their reliability, enhancing their quality (Chenail, 2011). In turn, issues such as researcher bias will be identified (Chenail, 2011; Nahm, Solis-Galvan, Rao & Ragu-Nathan, 2002). Nahm et al., state that pre testing helps assess the reliability and construct validity of questionnaire items. The questionnaires and interview protocols were pre tested before use in data collection to among others check for clarity of items, instructions and layout, consistency in asking questions, gain feedback on the validity of the questionnaire items, ambiguities or difficulties in wording and adequacy of range of responses (Chenail, 2011; Cohen et al., 2011). This is paramount because this study used study-specific sets of questions designed by the researcher as the instruments through which data for the study was generated (Chenail, 2011).

Several pre testing activities were undertaken to refine the instruments. Firstly, the instruments were given to colleagues in the college for scrutiny (Nanda, Gupta, Kharub & Singh, 2012) which among others included, proof reading, sensitivity and complexity of questions, and ambiguities and consonance between the questions and study objectives. Nanda et al., refer to this as informal test. Secondly, the instruments were sent to the researcher's supervisors or expert group (Czaja, 1998; Nanda et al., 2012) for further scrutiny on the correspondence between the instrument questions and the study objectives

as well as instrument structure. The questionnaire sets were finally trial tested in two JSSs, one in a remote environment and the other in an urban set up. The piloting exercise revealed the need to revisit different components of the questionnaire sets in terms of additional demographic data, language editing and technical aspects of the questionnaires. Some of the technical aspects addressed included reduction of the technical language to make the questions accessible to respondents, rephrasing double barrel questions, merging some questions and deleting others to reduce redundancy, rearranging some questions and reworking the questionnaires' layout. For instance, an example of a double barrel question was in section 2, part A which combined issues of computer based technology use, challenges and frequency of use. As a result, there was a need to disentangle these questions. The pilot exercise also revealed the need to think about the code book which allowed correct capture of the data on Statistical Package for Social Sciences (SPSS) for appropriate data analysis. Code books were created for different participants and questions and their individual components. For example TR_Q1a, CO_Q1a, SMT_Q1a and PR_Q1a were used as codes for question (1a) for teachers, ICT coordinators, senior management team and school-based programmer respectively. The pilot exercise further revealed the potential threat of low return output in cases where participants were given longer periods to complete the questionnaires. Consequently, where applicable, the investigator shortened the period for completion of questionnaires and regularly visited schools to issue reminders to participants. These steps were taken to enhance the credibility of the data collected for this study.

3.9 Data collection procedures

Several instruments were employed to obtain quantitative and qualitative data. Survey questionnaires were used to obtain quantitative data. A set of four questionnaires were designed for each group of participants, teachers, ICT coordinators, members of senior

management teams and school-based programmers. In total, the questionnaire for teachers and ICT coordinators contained 8 questions each with different components and demographic data. The one for SMTs contained 7 questions each with different components and demographic data and the one for programmers contained 5 questions and demographic data. The questionnaires were similar across the groups and were physically delivered and collected by the researcher (sample Appendix K).

Interviews, focus group discussion, observations and document analysis were used to gather qualitative data (Appendices M, P, N and O respectively). The initial step in data collection was piloting of data collection instruments discussed above. The following is an illustration of the data collection map.

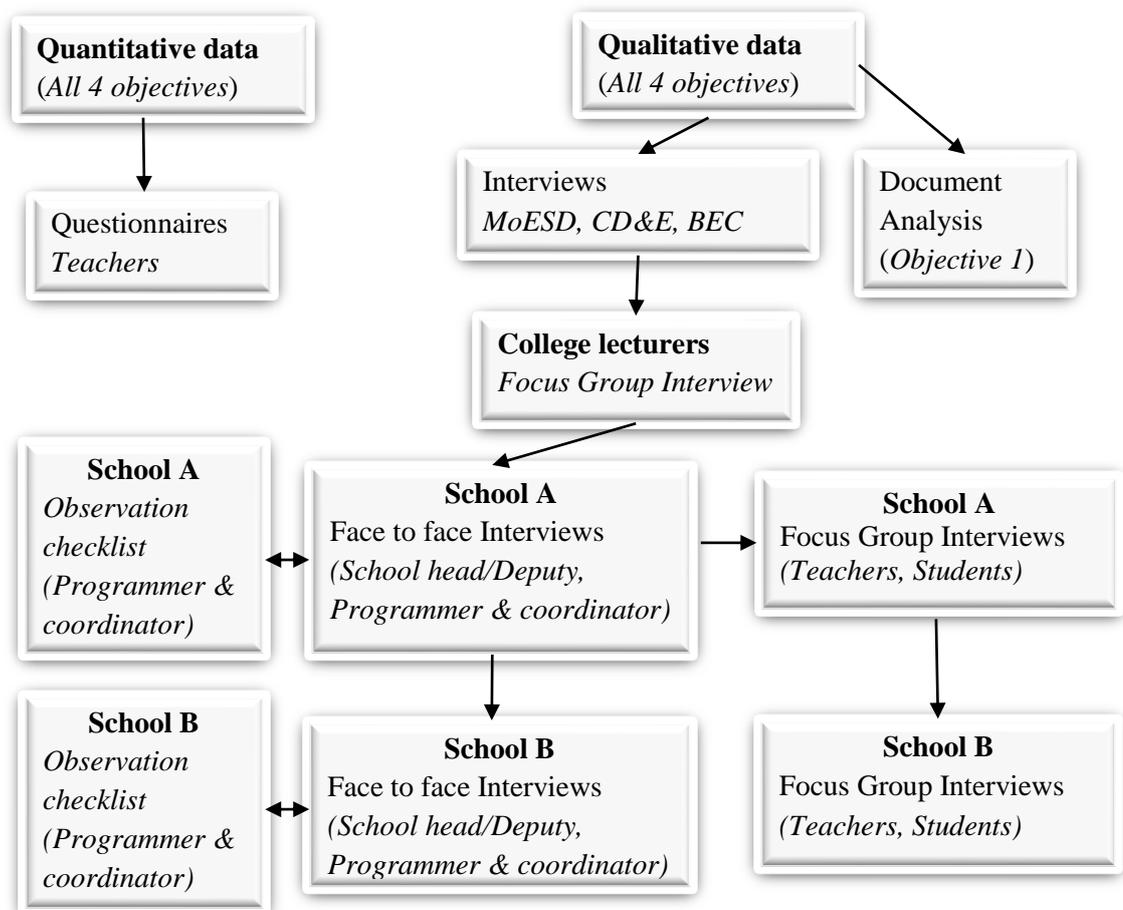


Figure 6: Data Collection Map

Primarily, the questions were contextualized to varying environments and consistently solicited similar information at different levels. This assisted in seeking convergence or disparities.

The interviews and focus group discussions were carried out at participants' work places: schools and offices. The researcher engaged in both formal and informal interviews in schools especially where participants willingly shared information. As earlier stated, a total of 63 interviews and informal chats which lasted between 15 and 60 minutes took place. Interviewees comprised teachers, senior teachers, SMTs, ICT coordinators, school-based programmers, one officer from BEC and CD&E. In addition, 9 focus group discussions were conducted. Each group of forms 1 to 3 formed a focus group resulting in six focus group discussions in two schools. From the same schools two groups of teachers participated in the group discussions, 4 teacher educators participated in a focus group discussion. 10 (ten) lessons were observed of which 5 were for CAP, three from practical subjects and two from humanities based ones. Document analysis was an on-going process which unfolded in the course of the study while observations were conducted in all schools visited.

3.10 Equipment and Gadgets

Permission was sought from the then Ministry of Education and Skills Development and different regions. Consent was sourced from all participants to electronically record proceedings during data collection. Most participants particularly teachers were uncomfortable about recorded interviews on account of security issues. In such cases, the investigator used a diary to take notes. The notes were shared with participants to confirm what was recorded. Though a Dictaphone was only limited to voice recordings, it was used where participants allowed it.

3.11 Data analysis

Data sets were analysed separately but integrated during interpretation (Hanson, Creswell, Plano Clark, Petska & Creswell, 2005). In their assessment for the nature and degree of qualitative and quantitative integration among mixed method studies, Green et al., (1989) identify four categories of data analysis: (a) no integration – both analysis and integration were independent; (b) analyses were conducted separately but some integration occurred during interpretation; (c) integration occurred during both analyses and interpretation; and (d) analysis not reported. Green et al, stress the significance of reconciling discrepancies in case of data mismatch. In their view, these may provide a chance for enriching the explanation as the researcher systematically searches for possible causes of such inconsistent results. The different instruments used for data collection contained questions asking for more or less the same information. As such, analysis was done such that information carried in each instrument was merged and weaved to show connections, similarities and disparities according to corresponding objectives. This ensured that information relating to each objective was simultaneously and collectively analysed. The use of the mixed method design in this study was for the purpose of using information collected through different sources in a complimentary manner; integration during interpretation allowed the researcher to identify areas of convergence or discrepancies in data. A full and rich description of policy performance was achieved.

Quantitative data was first coded using the framework of the main study questions (Cohen et al., 2011). Further coding was done according to participants' categories and questions and their components and entered into the Statistical Package for Social Sciences version 23 (SPSS 23) for processing and generation of statistical descriptions about demographics (frequencies and percentages) and participant responses. Data screening was done manually by this investigator. During data collection, the questionnaires were labelled

according to schools (e.g. LR: LR was used in place of school names) and counted. On their return, these were recounted to confirm that all distributed questionnaires were returned. All the distributed questionnaires ($n=192$) were returned. Each completed questionnaire was then assigned a number (e.g. LR 1 was used to denote questionnaire from the school abbreviated LR). The next step involved a manual check of whether or not there was any missing data to ensure an audit trail in case of missing values. The answers were then scanned to determine the credibility of the answers. All the questions in the questionnaires were fully completed including the question that asked participants to indicate “any other” and there was no missing data. After data entry into SPSS, individual entries were crosschecked for correctness of data capture.

Basit (2003) states that the objective of analysing qualitative data is to determine categories, relationships and assumptions informing respondents’ view of the world in generic terms and about the topic in particular. Cohen et al., (2011) write that qualitative data analysis involves data, organization, accountability and explanation. This includes noting patterns, themes, categories and regularities and, that qualitative data has multiple interpretations. They also add that since there is no correct way of analysing and presenting qualitative data, what is critical is for researchers to abide by the issue of fitness for purpose. Cohen et al., conclude that qualitative data analysis is differentiated by its merging of analysis and interpretation and usually by the merging of data collection with data analysis.

Thematic analysis approach was applied to report participants’ experiences captured through interviews, focus group discussions and lesson observations. The qualitative data was recorded and fully transcribed in a Word Processor. The investigator had to manually carry out the data analysis due to lack of access to appropriate qualitative data analysis software. Data analysis and collection were carried out simultaneously to avoid data pile up, allow

reading and interrogation of data and focus further data collection (Charmaz, 2008). First, the transcripts were read several times before coding to get a feel of the data. Subsequent to the initial readings, the investigator wrote notes on the sides of the transcripts. The data was then coded in different shades to highlight main ideas, translate the responses to specific predetermined categories and identify similar information. The first main codes were guided by the four research questions of the study representing the core themes (Cohen et al., 2011). Consequently, the codes were TP (for teacher preparation), RES (for ICT resources), IMP (for implementation) and SKI (for skills). A different highlighter was used for each code to ensure consistency. Any information related to any of the four codes was highlighted. This led to several more readings to ensure that no relevant information was left out. During the extensive reading and re reading of the data, other themes emerged and were duly highlighted in different colours. At this stage, the study supervisors were given a sample transcript to analyze. The categories were similar to the ones identified by the researcher.

The official documents that were analysed included *Maitlamo*, *Thuto Net* initiative, National Development Plans (7 to 10), the RNPE, Botswana's Vision 2016 and a sample of three junior secondary school and college syllabi. Following a self-designed document analysis guide informed by literature (Bowen, 2009; Tatto, 2012), a critical approach was used to succinctly analyse these primary sources of data on a continuous basis during the course of this study. The analysis entailed a discreet attention to contextual backgrounds of these official documents (origin, authorship and structure), meanings (values and assumptions), structure and their impact and outcomes in relation to the integration of CAP in Botswana JSSs. Specifically, the analysis highlighted congruence or lack of between the desired outcomes of these documents against practical. Table 5 shows the data analysis process.

Table 5: Data Analysis Process

QUESTION	DATA COLLECTION INSTRUMENTS	DATA TYPE	DATA ANALYSIS
i) How does the national ICT policy influence ICT curriculum implementation at Junior secondary level?	Questionnaire Interviews Focus Group Discussions Document Analysis	Quantitative & Qualitative	Statistical: frequencies & percentages Descriptive analysis: thematic approach
ii) How does the national ICT policy influence teacher preparation for ICT integration at the junior secondary level?	Questionnaire Interviews Focus Group Discussions	Quantitative & Qualitative	Statistical: frequencies & percentages Descriptive analysis: thematic approach
iii) How is the national ICT policy provision on ICT resources at junior secondary schools?	Questionnaire Interviews Focus Group Discussions	Quantitative & Qualitative	Statistical: frequencies & percentages Descriptive analysis: thematic approach
iv) How does the national ICT policy influence learner acquisition of appropriate ICT skills for labour market?	Questionnaire Interviews Focus Group Discussions Document Analysis	Quantitative & Qualitative	Statistical: frequencies & percentages Descriptive analysis: thematic approach

3.12 Ethical considerations

Adherence to ethical norms in research promotes the aims of the study, values essential for collaborative work, accountability to the public, public support and moral and social values (Resnik, 2011). The investigator ensured scrupulous adherence to all research ethics. Particularly important was that this study as an educational research, involved not only human participants but also students. Cohen et al., (2011) submit that each stage of research raises ethical issues. Further, ethics are situated and ethical issues may rise from the nature of research, the context of the research, the procedures to be adopted, methods of data collection, nature of the participants, type of data collected and what is to be done with data (Cohen et al., 2011; Powell et al., 2012). In light of aforementioned, the researcher

ensured strict adherence to ethical issues by following all legal procedures, explicitly explaining the study to potential participants and honestly and objectively reporting the findings (Resnik, 2011). The steps entailed in this process are discussed.

3.12.1 Permission to undertake research

The researcher duly submitted the proposal to the University of Botswana and the then Ministry of Education and Skills Development Research Ethics Committees and acquired research permits (Appendix A & B respectively). These two committees helped clear this study of any ethically unacceptable areas and thus allowed the researcher to be granted permission to conduct the enquiry.

3.12.2 Participants' informed consent

Once granted, the permission was used to further seek access to sampled schools and at the same time adhere to the principle of informed consent (Cohen et al., 2011; Kumar, 2014; Powell et al., 2012). In this regard, the researcher acquired research permits (sample appendix C) from regional directors (sample appendix D) following written requests. The letters used to seek permission clearly spelt out the type of information the study wanted through the purpose of the study. As overseers of school operations, school heads were informed of their freedom to seek further clarity from the researcher, the University or the Ministry or to confirm permission to conduct the study.

The letters to schools also articulated the request for staff and students' participation in the study and that their participation in the study was on voluntary basis. They also informed participants of their right to decline from participation, their freedom to withdraw their participation during the course of the study without being asked to justify their withdrawal and that they would be requested to fill in the Consent Form (sample appendices I & J) as prove of consent to partake in the study.

3.12.3 Participation of students

Powell, et al., and Cohen et al., stress the importance of observing research ethics when children take part in a study to gain their consent. Each school was sent a Parents Teachers Association (PTA) (sample appendix E) letter routed through the offices of School Heads to seek permission to have students participate in focus group discussions. This afforded parents to make consent on behalf of their children or decline their children's participation. Students were also allowed to fill the Assent form (Appendix F). At the start of the session, permission was sought with learners to record the discussions and the researcher informed them that their names would not be used in the report and that they were free to withdraw participation during the session (Powell et al., 2012).

3.12.4 Anonymity and confidentiality

The letters and the instruments such as questionnaires and interviews informed participants that there would be strict adherence to the principles of confidentiality and anonymity (Cohen et al., 2011; Powell et al., 2012). Thus, it was explained that coding systems would be used to ensure concealment of individual identities. For example, participants were not asked to provide their names in the questionnaires. At the same time, participants were informed that all information, including those electronically recorded, would be solely used for the study, safely kept and shredded after the full completion of use. As such transcribed interviews were kept safely in a password protected computer.

3.12.5 Beneficiation

The letters clearly articulated the significance of this study to teachers, students, schools and the nation commonly referred to as beneficiation (Cohen et al., 2011; Powell et al., 2012). It was made clear how the areas of policy, practice and research were bound to benefit from this study and that all these would extend to the benefit of schools.

3.12.6 Non-maleficence

The nature of the study was fully explained, detailing the methods of data collection and explanations that these would not cause harm to any participant (non-maleficence) and that all participants' dignity and privacy would be respected (Cohen et al., 2011; Powell et al., 2012). At the same time, due apologies were forwarded in advance for possible inconveniences related to the study. For example, the general interruption of the schools' normal routine would be an inconvenience for which apologies were in order.

3.13 Duration of data collection

The process of data collection lasted five months, from January to May 2017 due mainly to the distances travelled between the widely spread schools. Also much of the time was dedicated to interviews and observations.

Chapter Summary

This chapter introduced the proposed methodology for this study. The paradigm informing the study, the research design, sampling frame and procedures and data collection and analysis processes were explained. Also, the chapter discussed strategies for careful treatment and handling of issues of rigour and trustworthiness of data generation and outcomes. Ethical considerations related to this study were also discussed. Finally, the chapter provided the work plan and tentative expenditure for this study. Other documents supporting this study are included as appendices.

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.1 Overview

Chapter four presents the findings of the study. The presentation of findings is guided by research questions. The questions were derived from the technology integration conceptual model. The model was in turn informed by literature review and, importantly, by the Extended Design Actuality Gaps model (EDAG). The model assesses the failure and success of Information Systems (ISs) resulting from gaps at theory or practice levels. The Extended Design Actuality Gaps model identifies seven critical components: information, technology, processes, objectives and values, staffing and skills, management systems and structures and other resources such as time. The presentation of data and findings for this study are merged for purposes of triangulation and complementarity. Qualitative findings are presented in themes and sub themes supported by verbatim excerpts from research participants' views while quantitative findings are presented through frequency tables (percentages). Key findings are identified followed by brief summary of the chapter.

4.2 Data Screening and Cleaning

Thematic analysis and constant comparison approaches were used to analyze qualitative data. To gain general understanding and feel of the data, the researcher commenced with initial reading through transcribed data line by line numerous times. During the multiple readings of the interview transcripts, the researcher wrote notes in the transcript margins about ideas, emerging themes, meanings or patterns. Initial coding started with use of different colour shading on transcriptions to identify frequent codes and similar quotes amongst participants. Further coding was guided by research questions which constituted main themes. A data reduction table was used to manually classify data according the study themes. Data was further distilled and re categorized into sub-themes.

Data from various research participants were constantly compared for similarities and contradictions.

Quantitative data was coded using research questions as themes, categories of respondents, questions and question components e.g. TR (Q1a), CO (Q1a). Each completed and received questionnaire (n=192) was labeled using abbreviations for schools e. g. LR 1, MT 1 (e.g. LR is an abbreviation of the school name while 1 represents the first received and completed questionnaire from that school) and numbered before entry into the Statistical Package for Social Sciences version 23 (SPSS 23) for processing. Data entry was double checked by the researcher following the SPSS data entry check procedures for variables and values. For ease of presenting the results, the responses generated from the 5 point Likert scale were customized to generate a trichotomized scale (Jeong & Lee, 2016). Responses 1 and 2, Strongly Agree (SA) and Agree (A) were collapsed into one category of Generally Agree (GA). Responses for 4 and 5, Disagree (D) and Strongly Disagree (SD) respectively were collapsed into the Generally Disagree (GD) category while the Not Sure (NS) response formed a separate category. The question for the three point scale was left as is.

4.3 Demographic Characteristics of participants

Junior secondary schools were the main units of analysis. A multilevel sampling technique was used to select schools and participants. A total of twelve (12) out of 207 schools were selected from six (6) out of eleven (11) regions: The regions were: Central, Kgalagadi, Kgatleng, North East, Southern and South East. Participants for the survey included teachers, ICT coordinators, senior management team members and school-based programmers. Some of the participants also participated in face to face interviews and focus group discussions. The demographic data shows that there were more females (114) than males (78), a wide age range of 24 to 57, diverse participants' teaching experience ranging

from 2 to 29 years and participants' qualifications ranging from diploma in secondary education to Master's degree.

4.4 Maitlamo and ICT integration

Research question 1: How does Maitlamo influence implementation of the ICT curriculum at the junior secondary level?

The purpose of this study was to assess the match or mismatch between the ICT policy intentions and practical outcomes with specific reference to the integration of computer awareness into the junior secondary school curriculum. *Maitlamo* policy (2007) provides Botswana with a roadmap to help the country transform from an agro based into knowledge-based society through effective use of ICT. This is a broad based policy that covers the integration of ICT within most government sectors including education. The policy uses the *Thuto Net* component to integrate ICT into education and highlights the need to “expose children to highly effective education in ICT ...” hence “... a primary focus of the Policy is the development of ICT-related skills in children and young adults” (Republic of Botswana, 2007, p. 2).

Research Question One of this study sought to find out the extent to which *Maitlamo* influences implementation of the ICT curriculum at junior secondary level. Data for this question was concurrently collected qualitatively through face to face interviews with various participants: teachers, ICT coordinators, school senior management teams (SMTs) and one officer each from the department of Curriculum Development and Evaluation (CDU) and Botswana Examinations Council (BEC). Also, the researcher conducted focus group discussions with students and teachers and observed some lessons. Quantitatively, survey questionnaires were administered to teachers (TR), ICT coordinators (CO), SMTs (SMT) and

school-based programmers (PR). Findings from all data sources were grouped under respective themes.

4.4.1 Familiarity with *Maitlamo*

In the context of this study, teachers are key drivers in the implementation of *Maitlamo* policy at the classroom level. They are responsible for developing ICT skills among learners. In light of this, their knowledge and understanding of the *Maitlamo* and its goals is indispensable in executing this mandate. The first objective of this study was therefore to determine the extent to which participants were familiar with *Maitlamo* (TR_Q4a, SMT_Q4a & CO_Q4a). Table 6 presents a summary of participants' responses generated from a Likert scale out of 3 with choices of 'Very Much', 'A Little' and 'Not At All'.

Table 6: School participants' familiarity with *Maitlamo*

Familiarity with...	Very Much	A Little	Not At All	Total
i) <i>Maitlamo</i>	12 (6.3%)	58 (30.2%)	122 (63.5%)	192
ii) <i>Thuto Net</i>	7 (3.6%)	31 (16.1%)	154 (80.2%)	192
iii) Relation between <i>Maitlamo</i> and education	17 (9%)	73 (38.0%)	102 (53.1%)	192

The results in table 6 show that majority 122 (63.5%) of participants selected 'Not At All', a smaller number, 58 (30.2%) selected 'A Little' while the smallest number 12 (6.3%) selected 'Very Much'. A similar trend is replicated in participants' responses to their familiarity with *Thuto Net* and the relation between the policy and education. There is a notable increase in the number 154 (80.2%) of participants who generally disagreed that they were familiar with the *Thuto Net* component.

During interviews and group discussions, teachers confirmed that they were not aware of *Maitlamo* at all. They indicated that they had not heard of or seen the policy and that their schools did not have a copy of the policy. Further, teachers suggested that they were not properly consulted during policy formulation processes particularly those which affected their practice. For example, a teacher participant remarked during an interview (Excerpt 1) that:

As teachers, we are never consulted about policies relating to education. The policy you are asking us about is news to us... but we are sure as we see changes in our syllabi that they expect us to implement ICT which is probably part of the policy you are talking about... we don't know how since we have not read the policy itself...

During interviews with SMTs and ICT coordinators, it became apparent that they were only scantily aware of *Maitlamo*. Members of senior management and ICT coordinators explained that they occasionally heard about the policy in briefings, meetings and workshops with education officials. In this regard, they argued that they had not been comprehensively informed about it to claim knowledge or understanding of the policy. The participants also reiterated insufficient consultation during the policy formulation processes. They agreed and suggested that the policy be formally and properly diffused to schools. For instance, one school administrator stated that (Excerpt 2):

We... in schools generally, do not know about the national ICT policy. Of course we have heard it mentioned, you know, in passing... in meetings...but we cannot claim knowledge of it. Those responsible must fully share it with us, with teachers to help them understand it...

During focus group discussion, participants at college also revealed that they were not aware of *Maitlamo*. They insisted that (Excerpt 3): "they were never consulted during transformations in the Education Ministry... were now at least aware that such a policy

exists”. However, participants intimated that sometimes individuals were invited to activities such as curriculum review in their “own capacity” and not on behalf of the college or department. As such, participants revealed that they were “not shocked” that there was such a “huge development” of which they were unaware.

Differently, during the interview, the curriculum officer revealed much enhanced familiarity with *Maitlamo*, the *Thuto Net* component and the broader policy intentions. However, the participant pointed out that as curriculum department they did not take part in the policy formulation process and concurred that most members of staff in schools were not familiar with the policy. Apportioning the larger part of the blame to the operational structures of the Ministry of Education and school leadership for individualism and lack of information sharing, the officer mentioned that (Excerpt 4):

The greater challenge is the structure where education departments work independently. Curriculum is there, Training and Development is there, you know working in silos. There is individualism and is killing the whole thing. This is where the problem is because school heads and deputies are invited to meetings, workshops and given these documents and information is shared with them continuously but I think it’s the individuals and the zeal they have towards IT.

Referring to the *Thuto Net* policy component, the Botswana Examinations Council (BEC) officer remarked (Excerpt 5) that: “*Uh... you know I, I mean just from perusing through some documents, this document, what do they call it, Thuto Net, this is a programme where the Ministry wants to improve ICT skills of...*”

Analysis of the *Maitlamo* document indicated that over 1200 people representing a cross section of the Botswana society were engaged in the development of the policy. Specifically, the policy formulation team comprised a national steering committee and seven

task forces comprising experts from around the country. Similarly, the *Maitlamo* document showed that it was developed by "...a cross section of our society..." (p.4)

4.4.2 Implementation of Computer Awareness in Junior Secondary Schools

The Revised National Policy of Education of 1994 (RNPE) highlighted computer literacy as one of the critical skills to make the work force ready to make the best use of ICT. Following the recommendation 32, section 5.5.13 (c) of the RNPE, the computer awareness programme (CAP) was introduced into the junior secondary school (JSS) curriculum in 1998 as a compulsory core subject for the three years. Its aim was to "... introduce learners to the use of the computer as a tool...in the world of work. The intention of the programme is... give them basic computer knowledge and basic skills..." (Republic of Botswana, 1998, p. i) and reduce their technophobia. Its syllabus covered two basic computing skills of keyboarding and productivity tools which include Word Processing, Spread sheet, Databases and Graphics. Subsequently, through National Development Plan (NDP 9), CAP was to be integrated into the core curriculum. A year following the approval of *Maitlamo* (2007), the JSS curriculum was reviewed. The reviewed curriculum (2008) introduced the integration of the CAP and general ICT across the JSS curriculum. This curriculum was implemented in 2010.

This study observed that the introduction of the CAP in 1998 preceded the development of *Maitlamo*. This is not peculiar to Botswana. At the same time, the study observed that during the 2008 review of the JSS curriculum, the CAP was retained. This study sought to find out the extent to which the CAP was implemented in JSSs.

The findings revealed at the beginning, schools did not implement the CAP. During the interview, the curriculum officer revealed that schools were unwilling to implement the programme resulting in non-use of the provided ICT resources. Further, the officer revealed

that non-implementation of the CAP extended even to schools with comparatively best ICT resources. For example, the officer indicated that (Excerpt 6):

At the start, for many many years most computers were gathering dust and not used. They were used once in a while... Government replaced computers across schools...last year. But funny enough, not all schools are teaching CAP. Other schools...with best facilities...still the same problem of non-use.

Interestingly, the curriculum officer explained that the unwillingness by schools to implement the CAP was a characteristic trend not only in junior secondary but also across senior secondary schools. To this extend (Excerpt 7): “Curriculum had to remind schools through saving grams several times about this obligation and the fact that they are denying students the chance to learn. And there are reports indicating what schools are doing with respect to CA”.

Also, it was evident from the findings that the CAP was never uniformly implemented. The curriculum officer revealed that while some schools continued to resist implementing the CAP, others started implementing the programme. The officer explained that in schools which implemented the CAP, individual teachers and management were passionate about ICT and used it regularly. Citing an example of schools in an urban environment, the officer remarked that (Excerpt 8): “But then if you come to... for example, all the schools in that region taught CAP. I was impressed with what was happening... students could write full reports and write magazines, do research...”

However, in most cases, implementation of the CAP was short lived in most JSSs. The curriculum officer opined that teachers were frustrated through non reduction of their

workloads and transfers. The result, according to the officer, was that teachers abandoned the programme (Excerpt 9):

So the teacher will have a full load of this other subject and having to run CAP again. It became an overwhelming job. Some teachers then volunteered to teach CAP in the afternoons but it was a nightmare... Frustration among teachers not allowed to teach the subject after promotions led to teachers abandoning the subject and some were transferred and all that.

Additionally, ICT coordinators shared past experiences of continued computer breakdowns earlier in the programme with some not functioning at all. Other cases included where students were not allowed to use the computers at all or attend computer awareness lessons. For example, one ICT coordinator revealed that (Excerpt 10): “In extreme cases, the computer lab was locked and students were not allowed to attend computer awareness lessons. These were cases where the server was not working although by then the computers could work as independent work stations.” The curriculum officer confirmed this experience during some of their spot checks and stated (Excerpt 11): “You would find students are not attending computer awareness lessons. They are literally barred from going into the labs; it’s like going to a sacred place...”

In yet another scenario, ICT coordinators revealed that due to smaller number of computers, lessons were abandoned. In other cases, computer awareness lessons were mostly not taught during summers due to nonfunctional air conditioners in the computer laboratories. The coordinators further explained that extreme hot summer days were bound to continue affecting lessons. For example, one ICT coordinator explained that (Excerpt 12):

The lab air conditioners have not been working for more than 3 years. They were reported and follow ups made. We are told the replacement parts are not available. For some reason, they can't replace the air cons. Now, during summer, the lab is so hot...computers also generate heat and becomes unbearable and unhealthy for students. So we stopped lessons and this is likely to happen in the coming summer...

Further and somewhat surprisingly, the results suggest that the CAP was never considered an important part of the JSS curriculum. During the interview, the BEC officer revealed that as the assessment body they did not consider the subject as part of the curriculum. For example, the officer said that (Excerpt 13):

As far as we are concerned, there is no *eh...* curriculum or learning programme *eh* computer studies or the subject is not one of those done at, at *eh...* junior secondary...So, of course there is that void of content from primary up to junior. It just started, there is a formal curriculum computer literacy but at lower levels it's just informal.

Meanwhile, interviewed ICT coordinators agreed that the CAP was never considered a useful component of the JSS curriculum. They also indicated that this view had not changed. For example, one ICT coordinator complained that (Excerpt 14):

Computer awareness is still considered less important. For example, its lessons are still cancelled to give way to meetings such as those of Parents Teacher Association (PTA) or tendering committee. This is very common in summer if the air conditioner is working. Literally, the lab becomes a meeting room.

Similarly, students confirmed during a focus group discussion in one of the visited schools that they had not been attending CAP lessons for a long time. One participant student

aply summarised their experience and remarked that (Excerpt 15): “We have not attended any computer awareness lessons...our teacher told us that the computers were not working”. Meanwhile, students showed anxiety to learn how to use computers but were losing hope that they would get the chance to do so.

4.4.3 Cross curricula ICT integration

The revised JSS curriculum of 2008 introduced the integration of CAP and general ICT across the curriculum. The curriculum was implemented in 2010. The development conforms to the critical aim of the CAP that: “After the acquisition of the skills at this level, the students will be expected to use them in other subject areas” (Republic of Botswana, 2008, p. i). It also resonates with one of the aims of the ten year basic education programme that on completion: “... students should have developed competency and confidence in the application of computational skills in order to solve day to day problems” (Republic of Botswana, 2008, p. ii). To integrate ICT into the JSS curriculum, specific computer awareness and general ICT related objectives were included across different subjects. The ICT related objectives cover the use of different Microsoft applications such as Word and Excel and the internet. For example, the syllabuses for the two subjects of English and Setswana cover identical computer awareness objects involving the use of Word and use of E-mail. Mathematics deals with use of Spreadsheet. Other subjects have mostly general ICT objectives. Different subjects have different objectives ranging from 1 to 12. For instance, Mathematics has 3, one per year group while Setswana has up to 12 objectives repeated for forms 2 and 3 (Republic of Botswana, 2008).

This study sought to establish whether or not schools integrated ICT in different subject areas as prescribed by the curriculum. Participants were asked for their views about the extent to which teachers were obliged to integrate ICT (Questions 5c & 6c). A summary

of the results are presented in table 7. The results indicate that a majority 83 (45.1%) of participants generally disagreed (GD) that teachers were obliged to integrate ICT, a smaller number, 56 (30.4%) generally agreed (GA) while a smaller but sizeable number, 43 (23.4%) said they were not sure (NS).

Table 7: School participants' views on obligation to integrate ICT

	GA	GD	NS	Totals
Teachers	44 (29.4%)	62 (45.6%)	30 (22.1%)	136 (100%)
SMTs	11 (29.7%)	15 (40.5%)	11(29.7%)	37 (97.4%)
ICT coordinators	1 (11.1%)	6 (66.7%)	2 (22.2%)	9 (100%
Totals	56 (30.4%)	83 (45.1%)	43 (23.4%)	182 (99.5%)

Teachers were further asked about the extent to which the purpose of integrating Computer Awareness into their respective areas was clear to them. A slight majority 58 (42.6%) of them generally disagreed (GD), 51 (37.5%) generally agreed (GA) while 27 (19.9%) were not sure (NS).

All participants agreed during interviews and focus group discussions that ICT was not integrated into the school curriculum. They further agreed that there was still much to be done to get schools ready for ICT integration into the curriculum. There was also a clear indication that ICT resources alone were insufficient to warrant ICT integration. For instance, a deputy School Head declared during an interview that (Excerpt 16): “The integration of ICT into the school curriculum is a non-starter... literally speaking there is no integration... even in schools where ICT resources are abundant, integration is not done...” Echoing a similar sentiment and making reference to schools s/he had visited, the curriculum officer agreed that

(Excerpt 17): "... ICT integration should be a daily thing you know, but it's not happening. They are given new computers, latest technologies but it's not utilized".

During focus group discussions, students confirmed that ICT was not integrated into their school curriculum. They expressed their desire to use computers for learning in different lessons and subjects but agreed that they had not been provided with that opportunity. In their small groups, students wrote that (Excerpt 18): "We want to use computers for learning in other subjects... use the Internet for researching on topics we do not understand during lessons but this is not happening in our school".

During lesson observations, it also was observed that the use of ICT was not part of classroom practices. Of the five non computer awareness lessons observed in different schools, only in one was ICT use witnessed. In this lesson, an Art teacher used a personal laptop to share downloaded images with a small group of nine students.

Continued interviews with teachers and analysis of official documents revealed that although the ICT related objectives were never taught, some teachers included them in their planning. For example, teachers of practical subjects such as Design and Technology, Art, Agriculture and Business Studies included the ICT objectives in their lesson plans and schemes of work. These subject teachers explained that they were motivated by lack of textbooks for their subject areas. As a result, they wanted to use ICT to bridge this shortage and possibly enhance students' understanding of the concepts. For instance, a participant teacher stated that (Excerpt 19):

There are no textbooks for this subject. Most of my students have never seen some of the things I teach them about... sculptures, statues etc. ICT can be very helpful to bring these things closer to the students and help them better understand the concepts...

On the contrary, teachers of non-practical subject such as Setswana, Guidance and Counselling and English did not include the ICT objectives in their planning. During interviews and focus group discussions, teachers revealed that they were confused about how to integrate the ICT objectives into their subject areas. During focus group discussions, participants claimed that it was resolved at a cluster meeting and in liaison with the regional office to “shelve” ICT integration “until it was practical” to do so. During an interview, a participant teacher reported that (Excerpt 20):

When we saw the ICT objectives in our syllabuses, we consulted regional office as a cluster. It was agreed that we leave the objectives until further notice for practical reasons... for example we understood integration differently, some felt that we are being asked to teach two subjects at the same time, most of us could not contextualize the objectives...

4.4.4 Junior Secondary School curriculum and ICT Integration

Integrating ICT into existing curriculum is complex. Importantly, the curriculum must support the use of ICT in the learning and teaching process. Table 8 presents results on participants’ views on the extent to which the school curriculum supported integration of ICT into learning and teaching (Questions 5e & 6e).

Table 8: School participants’ views on curriculum support for integrating ICT

	GA	GD	NS	Totals
Teachers	51 (37.5%)	65 (47.8%)	20 (14.7%)	136 (100%)
SMTs	6 (15.8%)	26 (68.4%)	6 (15.8%)	38 (100%)
Totals	57 (32.8%)	91 (52.3%)	26 (14.9%)	174 (100%)

The results show that a majority 91 (52.3%) of participants generally disagreed (GD) that the current curriculum supported integration of ICT. A sizeable number 57 (32.8%) of participants generally agreed (GA) while the remaining minority, 26 (14.9%) said they were not sure (NS).

Both teachers and SMTs agreed during interview discussions that the existing JSS curriculum has too many subjects (minimum of 9). This left the timetable congested to allow teachers time to integrate ICT. For example, a participant teacher observed that (Excerpt 21): “Students go for a lesson after another at times without a break in between... the day is short... use of computers by students would require more time and fewer subjects”.

Participants further agreed that most subjects contained too much content. In this regard, participants explained that a sizeable number of subject teachers were unable to complete their syllabi within the available time. As a result, they expressed fear that using computers for learning would delay completion of the syllabuses. For example, a deputy School Head said (Excerpt 22):

Most of our teachers are unable to complete their syllabi using traditional methods... computers in teaching and learning require more time than our traditional lessons ... our students do not have good computing skills to use computers during lessons ... realistically, we will not complete most of our syllabi....

Similarly, teachers, SMTs and ICT coordinators further agreed that the current curriculum followed the dictates of examinations. As a result, schools tended to focus on examinations and performance. They explained that the curriculum discriminated against non-examinable subjects such as computer awareness, emphasizing the significance of school results. For example, a deputy School Head remarked (Excerpt 23): “It’s known even by parents that examinations are important... I have to account for them. I can lose my job for

poor results, you see how it is? So, it's my responsibility to ensure syllabus completion in readiness for examinations..."

The curriculum officer concurred that the school curriculum did not support the ICT integration and was overloaded with subjects as well as subject content. The officer lamented that the latest curriculum review of 2008 did not cater for the practical aspect of integrating CAP. For example, during the interview, the officer, expressing hope in the proposed outcomes based education system, stated that (Excerpt 24):

Our curriculum concentrated for a long time on theory and knowledge but no skills...

This needs to be revisited and hopefully with the coming in of Outcomes Based Education, we will see the need to reduce it... to combine knowledge and skills to have a product.

4.4.5 Assessment and ICT integration

The national ICT policy emphasizes the need to equip learners with ICT skills but does not clearly articulate how assessment will be done in the integrated approach. Research participants were asked to share their views regarding the extent to which assessment practices in schools adequately supported the integration of ICT across the different subject areas.

All participants agreed during interviews as well as focus group discussions that CAP was not meaningfully assessed at school or at the national level. Also they opined that the CAP was disadvantaged by its non-assessment. In turn, they suggested that it should be nationally assessed. For instance, an ICT coordinator stated that (Excerpt 25): "True, for now we don't assess it... It's not possible. Unless and until Computer Awareness is assessed at national level, it will continue to be sidelined..."

During group discussions, students confirmed that they were never assessed in computer awareness. Summarizing their views on assessment and general progress, students wrote that (Excerpt 26): “We are just told to work... we never our work for the teacher to mark...we never get marks in computer awareness.” These were generally repeated during oral discussions.

During focus group discussions, teachers indicated that current national assessment focused only on subjects that contributed to schools’ overall performance. They further pointed out that non-examinable subjects such as Computer Awareness were viewed as adding no value and were ignored. During interviews, members of school management teams confirmed this. For example, a deputy School Head summed this through the following rhetorical questions (Excerpt 27): “... does integrating Computer Awareness contribute to overall school performance ... can we risk concentrating on it when key subjects suffer...?” Reiterating the same sentiment, a School Head provided a typical example of the treatment accorded non-examinable subjects and explained that (Excerpt 28): “... Just like Moral Education, we will not concentrate on it, wasting time on it now that Botswana Examinations Council has discontinued its examination”.

From an administrative point of view, the curriculum officer agreed that lack of assessment of computer awareness negatively affected its teaching. During the interview, the officer criticized the Government for establishing school league tables. The league tables are used to rank schools according to their performance in final examinations. Schools with high pass rates occupy top spots and the reverse is true for schools with low pass rates. Often, the ‘high performing schools’ are showered with accolades and sometimes rewarded with ICT resources while their counterparts are scolded. The officer contended that these were counter successful implementation of the ICT curriculum (Excerpt 29):

With league tables, schools which find themselves at the bottom of the regional and national league tables are often the subject of ridicule by both education authorities and the public in general. School Heads are fearful... they have to account for poor results... Students are denied opportunity to learn just because the subject is not part of final examination.

Further, the curriculum officer alleged that unfortunately (Excerpt 30):

...lack of assessment of the subject breeds bad attitude towards it by teachers, management and even in regions. In some regions...they were not sure why some teachers were promoted to teach a non-examinable subject... they reassign teachers to their other subjects such as Mathematics, English etc... the subject is left without a full time teacher.

Meanwhile, the BEC officer confirmed during the interview that they did not assess computer awareness at national level because nothing was learnt in the CAP (Excerpt 31):
 "...there isn't that prescription, then there is no way we can quality assure what has not been learnt, you get it?"

4.4.6 School-based policy guidelines for integration of Computer Awareness

Maitlamo operates at the national and school levels. School-based ICT policies are a way to cascade the *Maitlamo* policy to the schools. This study sought to find out whether or not schools had formal ICT policies to guide implementation of the ICT curriculum (Questions 7c & 8c). A summary of responses in table 9 is evidence that a majority 90 (49.2%) of participants generally disagreed (GD), a smaller number 38 (20.8%) of participants, generally agreed (GA) while a substantial number 55 (30.1%) said they were not sure (NS).

Table 9: School participants' views on policy guideline for integration of CAP

	GA	GD	NS	Totals
Teachers	22 (16.2%)	70 (51.5%)	44 (32.4%)	136 (100%)
SMTs	10 (26.3%)	17 (44.7%)	11 (28.9%)	38 (100%)
Coordinators	6 (66.7%)	3 (33.3%)	0 (0%)	9 (100%)
Totals	38 (20.8%)	90 (49.2%)	55 (30.1%)	183 (100%)

During interviews, teachers verified the lack of school-based guidelines for integrating CAP or general ICT into learning and teaching. To teachers, curriculum developers were guided by two possible assumptions: teachers were trained on how to integrate ICT into learning and teaching and that the ICT objectives would suffice as guidelines. For instance, a participant teacher guessed that (Excerpt 32): “I think the curriculum department thought the objectives they included in the syllabuses were enough guidance... or perhaps that we know how to integrate ICT into teaching and learning from tertiary institutions...Otherwise, there is nothing else to guide us”.

Confirming the similar observation, SMTs explained that they had not been guided on drawing localized ICT policies due to lack of proper guidance. For example, a deputy School Head observed that (Excerpt 33): “There is no proper policy guidance for integrating ICT...we cannot just do things haphazardly...it’s difficult to draw our own policy without proper guidance. These have to be uniform, isn’t it?”

4.4.7 Culture and vision of classroom ICT use in schools

The existence of a culture and vision of classroom ICT use are useful indicators of ICT integration or preparedness to do so. The next questions (Questions 7b & 8b) sought to

find out about the existence of a culture and vision of classroom ICT use in schools. Table 10 presents the results.

Table 10: School participants' views on existence of culture of and vision for classroom ICT use

Existence of...	GA	GD	NS	Total
i) culture of ICT use	128 (69.9%)	18 (9.8%)	27 (14.7%)	183 (100%)
ii) common vision for ICT use	89 (48.6%)	43 (23.5%)	51 (27.9%)	183 (100%)

The results in table 10 show that a majority 128 and 89 (69.9% and 48.9%) of the participants generally disagreed (GD) that their schools had a culture and vision of ICT use respectively. Comparatively smaller numbers 18 and 43 (9.8% to 23.5%) of participants generally agreed (GA) that a culture and vision of ICT use existed in their schools respectively. The remaining sizeable numbers 27 and 51 (14.7% to 27.9%) of participants indicated that they were not sure (NS) about the existence or lack of a culture and vision of ICT use respectively in their schools.

During interviews, participants confirmed that schools had no established culture of classroom ICT use let alone a common vision. Teachers and ICT coordinators agreed that the use of ICT during lessons was rare and largely dependent on individual teacher's passion for ICT. For example, a participant teacher said that (Excerpt 34): "In classrooms, we are far from talking about culture of use of ICT... I often use my personal laptop because I believe in ICT especially these days... ICT helps my students understand some concepts better..."

However, teachers revealed that they commonly used ICT for administrative purposes as per school policy. During interviews, they shared that they used it specifically for entering students' continuous assessment marks and developing assessment activities such as tests and quizzes. For example, a participant teacher shared that (Excerpt 35): "Of course in the admin side... we are expected to enter assessment marks on templates in computers... the school policy also is such that assessment pieces must be typed. So that's how we use computers.

During interviews, school administrators corroborated teachers' observations. They explained that they were expected to send most reports such as student intake using ICT. However, they complained that they still had to revert to the old system because they often encountered problems when using the prescribed systems. For example, referring to the Government Budgeting and Accounts System (GABS), a deputy School Head stated that (Excerpt 36):

Our GABS system is very, very unreliable especially those of us in the rural areas. We were supposed to use it to send information to regions...number of enrolled students, school needs and so forth etc. As I speak to you, we have given up on it and gone back to our old ways... we physically go to regional offices.

During the interview, the curriculum officer confirmed that schools neither have a culture or vision of classroom ICT use. However, the officer was not surprised because the lack of culture of ICT use was a nationwide challenge. For example, the officer stated that (Excerpt 37): "I mean it's a mindset thing. Even here it's happening. Some officials are not keen on IT. They still resist the use of ICT, even government email system. They do not understand the capability and uses of IT".

Additionally, the curriculum officer blamed lack of school-based vision for ICT use on centralized curriculum. As a result, the officer explained that schools depended on the government to provide a guiding vision (Excerpt 38):

I think by far we are the only country in Africa where curriculum is run by government. This kills the whole thing. Schools have no mandate to think about what they want to achieve with ICT and expect government to tell them...

4.4.8 School leadership and ICT use in schools

Maitlamo observes the importance of school management teams (SMTs) for the successful integration of ICT into the JSS curriculum. Participants were asked to reflect on the level of support offered by their SMTs regarding the integration of ICT into the curriculum (Question 8e). The results revealed that the level of support offered by school management was not sufficient to promote effective use of ICTs in teaching and learning. For example, a majority, 76 (55.9%) of the teachers generally disagreed (GD) that the school management was supportive, a smaller number, 36 (26.5%) generally agreed (GA) while 24 (17.6%) said they were not sure (NS). However, responding to same question (Question 7e), a small majority 18 (47.4%) of SMTs generally agreed (GA) that they provided adequate support to teachers in their efforts to use ICTs in teaching and learning. A more or less equal number, 14 (36.8%) generally disagreed (GD) while a smaller number, 6 (15.8%) said they were not sure (NS).

During interviews and focus group discussions, teachers expressed general dissatisfaction with the support they received from SMTs. The reasons for this conclusion were many and diverse. For example, participants revealed that members of school management and in particular School Heads were “against the use of computers for planning”. They cited instances where teachers were reprimanded for using computers to

design lesson plans and schemes of work. During an interview, a participant teacher who shared personal experience said that (Excerpt 39): “We are not allowed to use computers to prepare lesson plans and schemes of work. We are told that we want to copy and paste... that computers promote laziness. The regional office agrees with management...” This was confirmed during interviews with ICT coordinators. One ICT coordinator shared a similar experience and remarked that (Excerpt 39):

School Heads insist on the so called official booklets... you try to explain to them how the use of a computer will solve issues such as shortage of such booklets as it is common but no. How do we talk about integrating ICT into the curriculum?

Similarly, participants reported that school management was reluctant to make follow ups on Government promises relating to ICT issues. In this regard, teachers described school leadership as “not proactive”, “aloof” and “disinterested”. For instance, during an interview, a participant teacher commented that (Excerpt 40): “When you raise issues of ICT in meetings... say asking about internet, they shut you down...literally.” This sentiment was shared by ICT coordinators and school-based programmers during interviews. For example, a school-based programmer observed that (Excerpt 41): “School management is not very helpful... especially when we ask for their voice on what we were promised... they leave everything to us and later complain that we are always away”.

In addition, teachers revealed during further interviews that leadership in schools was uncomfortable and skeptical about use of ICT for teaching and learning. They argued that most members of senior management lacked exposure to ICT use particularly in learning and teaching. For example, a participant teacher remarked that (Excerpt 42): “ICT is a new thing to them... sometimes they look like they hate IT... it was not there during their time... we can't blame them for position”.

Further interviews with ICT coordinators and teachers revealed that management support for ICT use in schools varied from one school to the other depending on individuals. For instance, an ICT coordinator who had different experiences in two schools commented that (Excerpt 43):

Management here rejoices when we experience technical computer related problems... they accuse us wanting luxury... for example when we ask for CCTV cameras to secure the ICT resources... they don't know how many computers the school has. In my previous school, the School Head was very supportive and we made good progress.

For their part, members of SMTs alleged support. During interviews, they indicated that they were handicapped by sometimes conflicting expectations and policies from education authorities (Excerpt 43):

We are doing the best possible. Look, we just happen to hold leadership positions here... in schools. We are also controlled by different and sometimes conflicting policies... it's the Ministry that sets priorities... not me... So for now, computer awareness is not a priority yet...

In addition and somewhat justifying their lack of support for ICT integration, SMTs agreed that they were skeptical about the potential of ICT in enhancing students' performance. Similarly, they expressed concern regarding the sustainability of such development. For example, a School Head said that (Excerpt 44): "I am not yet convinced about the potential of ICT in enhancing students' learning... Again, is it sustainable? We'll have to wait and see".

Interestingly, lack of adequate management support was also identified as a problem at secondary colleges of education. During the focus group discussion, participants indicated that college management was “not proactive” in supporting the use of ICT in learning and teaching. One area which according to participants indicated “weak management support” was when departments requested for “ICT resources such as computers and appropriate software”. In this area, management support was described as “way below expectation”.

During the interview, the curriculum officer was highly critical of gravely low management support for ICT use nationally, regionally and locally. For example, during the 1 hour 45 minutes long interview, the officer referred to lack of management support 17 times. The officer was convinced that management support for ICT use had a lot to do with their attitude towards ICT, regional support and to some degree, school location. For example, the officer remarked that (Excerpt 45):

After promotions teachers wanted to start teaching CAP but the first challenge was negative attitude by school administrations and regional management... the teacher will have a full load of this other subject and having to run CAP again became an overwhelming job... In urban areas, headmasters were understanding and very supportive so CAP was fully taught. I was impressed with what was happening.

At the national level, the curriculum officer concurred that school leadership were uncertain and seemingly unsupportive of ICT use because of conflicting Government policies (Excerpt 46):

...policy issue is still a problem. I think it's contributing to the issue of school heads' resistance because they look at the policies, they look at 'Am I safe, Am I doing the right thing, Am I securing my job, you know, the results and all that.

Finally, the curriculum officer asserted that lack of knowledge about ICT among administrators contributed to weak management support. At the same time and making further reference to ICT policies, the curriculum officer accused the Government of lack of specific ICT policies, concluding that this constituted the greatest impediment to ICT use in the country (Excerpt 47):

Lack of management support for ICT use still persists... It's a challenge of how ICT should be done. They don't understand the capabilities of IT... We lack ICT policies... the other policy is users' policy, people using ICT wrongly, promoting wrong things, hacking etc... and we need security policy standing on its own... The other one is e-Learning policy, we don't have that one... even e-waste policy...

4.5 Maitlamo and ICT teacher preparation

Research Question 2: How does Maitlamo influence teacher preparation for ICT integration at the junior secondary level?

Maitlamo highlights professional training and support as an important component of ICT-enhanced education. The policy aimed to provide professional training to school heads, school IT managers and teachers so that they have “greater understanding of ICT and how it can be used both as a classroom tool and as educational content” (Republic of Botswana, 2007. p.13). The policy action plan suggests a three-phased professional training: Phase 1 would target a group of teachers and school administration to serve as ICT managers/coaches. Phase 2 would be an intensive programme “focussed on basic computer use and maintenance, the use of the Internet and school network, and basic ICT education...” while later phases would seek to broaden the number of teachers and administrators with basic ICT skills and to integrate ICT's into all aspects of the curriculum and educational management system” (ibid).

This study sought to find out the extent to which *Maitlamo* influences teacher preparation for ICT integration at the junior secondary level. Data for research question 2 was solicited quantitatively and qualitatively. Questionnaires were administered to teachers, ICT coordinators and SMTs. Teachers and a curriculum officer were also interviewed. Focus group discussions were conducted with selected teachers and lecturers in one of the secondary colleges of education.

4.5.1 Implementation of *Maitlamo* professional training plan

The findings suggest that *Maitlamo* plan to provide professional ICT training for teachers and SMTs had not been fully implemented. The training plan had only been piloted in one school. Participants confirmed this during interviews and focus group discussions.

Interestingly, teachers revealed during interviews and focus group discussions that they were learning about the ICT training plan from the researcher. They confirmed that the training plan had neither been communicated to them nor started. For example, during an interview, a visibly disgruntled participant teacher observed that (Excerpt 48): “This is how we learn about some of these things. They affect us you know... but nobody tells us..., we don’t know whether or not we are in the training plan.” Sharing the same sentiment and being pessimistic about the execution of the plan, another participant teacher observed during an interview that (Excerpt 49): “We always hear about plans very late... they are like rumours to us. The plan might not even take place especially if it involves training teachers”.

Somewhat, the interviewed curriculum officer, basing on past experience, confirmed that teachers might not receive the ICT training (Excerpt 50):

Today when you say benchmarking trips, who goes? The actual officers who do the spade work don't go. If you go, you would be very fortunate. It is the big guys, you know looking at the per diem but what about the guy who has to deliver? It's prestige thing...

This observation was also confirmed by interviewed school-based programmers. For example, one frustrated programmer remarked (Excerpt 51):

When it comes to workshops, officers in the Ministry or regional offices would rather prefer to go than allow us to. You see, we work with these challenges on daily basis unlike them. Some of them have no idea whatsoever about ICT but still they go. When they come back, they can't share anything with us...

Registering a similar expression of pessimism, one of the participants (a teacher) questioned the logistics of organising training for teachers for more than two hundred JSSs. The participant doubted the possibility of the training taking place and concluded that otherwise it would be rushed (Excerpt 52):

There are more than 200 junior secondary schools across the country. How are they going to effectively train all of them? They are likely to rush the training or start complaining about it being expensive. It might also truly prove to be too expensive...

Members of SMTs' agreed that they were also anxious for the ICT training plan to begin. Like teachers, some of them were slowly beginning to lose hope on the training plan taking off and being a success. For example, a deputy School Head remarked that (Excerpt 53):

We are looking forward to receiving ICT in-service training from the Ministry... not only teachers require training in ICT. As their immediate supervisors... expected to oversee ICT integration, we also should be trained. We are still waiting and hoping that one day the training will come... some of us... honestly, are tired of unfulfilled promises.

A School Head, equally cynical of the success of the plan, corroborated this observation. The Head specifically criticized the plan for not being systematic (Excerpt 54): “I personally am doubtful about the success of the training. I thought they would have started by conducting a needs analysis. We are not there yet and it looks like it would be a one size fits all”.

Likewise, a curriculum officer echoed the same observations and doubts about the successful implementation of the training plan. The officer revealed that the proposed plan was faced with challenges some of which emanated from lack of coordination within the Education Ministry. The officer expressed anger that the original plan designed by Training and Development (T&D) department had been ignored (Excerpt 55):

Now the funny thing was that even though T&D had a plan which we had had helped them develop, the plan of training teachers, in teaching computers in the curriculum, but because of the way we work in the Ministry, the whole thing delayed... (*T&D refers to Training and Development department*).

In addition, the curriculum officer identified a lack of capacity in terms personnel to effectively implement the ICT training plan as a challenge (Excerpt 56): “We still have a problem of manpower on the ground particularly for trainers. Those guys are having a time tough because they are very few, two actually: T&D and the other one is for Media Centre”.

Further interviews with participants revealed inadequacies of the ICT training plan. In one of the sampled schools, it emerged that two teachers were invited and attended a training workshop organized by personnel from Media Centre in a pilot school. Of the two, one had since been transferred. The deputy School Head confirmed this development but was quick to dismiss the training as not useful (Excerpt 57): “Yes, two of our teachers attended a workshop organized in one of the pilot schools... *Um...* based on their feedback, the workshop was not helpful... they just learnt about media creation”. A follow up interview with the teacher who attended the workshop replicated this observation (Excerpt 58):

To me, it was not very useful and insightful ...it was rushed and focused on creation of media for classroom use... I had expected it to focus on various issues... ways of using computers in teaching Science concepts... use of various software, Internet, assessment...teaching methods etc...

4.5.1.1 *School-based ICT professional development programme and policy*

The existence of school-based ICT professional development policy and programme are frameworks through which schools cascade *Maitlamo* to the school level. In this study, participants were asked about the extent to which they agreed that their school had a staff ICT professional development policy and programme (Questions 3a & 3d). The summarized results are presented in table 11.

Table 11: School participants' views on the existence of ICT professional development policy and programme

	GD	GA	NS	Total
ICT professional development policy	123 (67.2%)	33 (18.0%)	27 (14.8%)	183 (100%)
ICT professional development programme	125 (68.3%)	23 (12.6%)	35 (19.1%)	183 (100%)

The results indicated that a majority 123 and 125 (67.2% and 68.3%) of participants generally disagreed (GD) that their schools had an ICT professional development policy or a professional development programme respectively. Smaller numbers, 33 and 23 (18.0% and 12.7%) generally agreed (GA) while a substantive number, 27 and 35 (14.8% and 19.1%) said they were not sure (NS) about the existence of either respectively.

During focus group discussions and interviews, teachers agreed that their schools did not have a school-based ICT professional development policy or an ICT professional programme. Group members attributed lack professional development to unavailability of such policies, expressing concern that generally most teachers had not been professionally developed since they left tertiary education. However, they further agreed that the school policies should be Government led so that they are “effective and sustainable”. Corroborating the absence of ICT professional development policies and programmes in schools, a participant teacher remarked during an interview that (Excerpt 78): “if it was there, it would have been shared. Or at least we would have known about it during its implementation. I am not so sure we are so much into ICT to have a policy in this school”. Reiterating the same observation, another participant teacher stated that (Excerpt 79): “It’s not just schools that

don't have a professional development policy... even the government doesn't have any such general policy. I was last trained at college years back and have not received any professional development since then..."

Similarly, interviewed school-based programmers reiterated the lack of professional development policies or programmes in schools. One programmer shared that (Excerpt 80): "I wanted training on server 12 because I was beginning to experience problems with it. So I checked with the School Head about the policy and other arrangements. That's how I learnt that our school doesn't have that".

Members of SMTs and ICT coordinators confirmed this during interviews. At the same time, they expressed uncertainty about use of ICT for classroom practices to warrant an ICT professional development policy. In addition, SMTs and ICT coordinators raised several concerns regarding policy design and professional development at school level. These concerns included their lack of in depth knowledge in policy design, inadequate knowledge relating to ICT use in education, shortage of skilled personnel to lead professional development in schools and schools' general potential to implement the policy. For example, a School Head remarked (Excerpt 81):

There are a lot of issues. For example, we don't have the knowhow to design a policy. And when we design a professional development policy, we must implement it, isn't it? Otherwise it may just be in theory. Besides, we are still lost about this ICT thing...its use in lessons...

ICT coordinators confirmed the observations, explaining the need for good understanding of how individual subject areas use ICT so that the diversity was catered for. The ICT coordinators pointed out that the current proposed ICT integration differed across subjects, making the situation complicated. For example, an ICT coordinator observed during

an interview that (Excerpt 82): “I don’t know anything about policy design. We should be assisted in this area to make sure that the policy caters for all subjects. It can’t be assumed that we know how to integrate ICT in all subjects”.

In a related development, different participants expressed concern that any professional development activities were often attended by officers such as those in the regions and Ministry headquarters. During interviews, programmers suggested that they hardly attended ICT workshops organized by the Ministry locally or those organized outside the country. For example, a programmer remarked that (Excerpt 83): “Usually when ICT workshops are organized, it is the officers in the regions who attend such workshops instead of us. But these officers never share information with us...” This observation was shared by the curriculum officer who expressed concern about the trend and that it disadvantaged practitioners. The officer blamed this on financial gains and mentioned that (Excerpt 84):

... the actual officer who do the spade work doesn’t go. If you go you would be very fortunate. It is the big guys, you know looking at the per diem but what about the guy who has to deliver, it’s prestige thing that people are going overseas sometimes even to countries that are not even relevant.

4.5.2 Pre-service ICT teacher training

Secondary colleges of education prepare teachers who ultimately teach in JSSs. In the context of this study, pre-service training is a critical stage where teacher trainees are supposed to receive comprehensive ICT training. However, *Maitlamo*’s focus is on in-service ICT professional development. Participants (teachers, SMTs and ICT coordinators) were asked if they received ICT training during pre-service training. A majority 122 (66.7%) of participants said ‘Yes’ while a smaller number 61 (33.3%) of participants said ‘No’.

During interviews and focus group discussions, various participants confirmed the above results but also revealed glaring disparities in ICT training among participants. Some participants suggested that they received some ICT training particularly computer use skills during their pre-service training. For instance, a participant teacher remarked during an interview that (Excerpt 59):

The ICT training at college was mainly the computer awareness programme offered by the Communication and Study Skills department to all students for three years. We learnt computer skills so that we could type assignments and projects... and how to search for information on the internet.

Another participant teacher reiterated this observation adding that a similar course was offered at the University of Botswana (UB) (Excerpt 60): “I did computer awareness at UB. It looked like all of us had to complete the programme to complete our degree. This is also where I learnt how to use the Moodle e-learning platform”.

Further interviews revealed that some teachers received more exposure to the use of ICT in learning than others. On the one hand, some teachers got exposure to ICT use in a number of subject areas. For example, during an interview, an Art teacher indicated to have benefitted from computer awareness lessons, Art and Computer Education. The participant concluded that exposure to ICT training at college seemed to depend on one’s subject combinations and whether or not the CAP was still offered or not during training. For example, an Art teacher observed (Excerpt 61):

I would say exposure to ICT training depended on one's subject combinations. I guess I was lucky to have gone to college while there was CSS which taught all students basic computer application skills through the computer awareness programme. Again I did computer education as a minor and there was an ICT course in Art. There was also a one year media creation course in the Learning Resource for all of us. So you see, I am one of the lucky few.

On the other, some teachers had not received any ICT training at all. Somewhat, their experiences confirmed the earlier observation; exposure to ICT during pre-service training depended on subject combinations and or the existence of the CAP programme within the Communication and Study Skills (CSS) department. For example, during an interview, a participant teacher who had never received ICT training during pre-service remarked that: (Excerpt 62) "Computer Awareness was stopped at college a year into my studies. We had not done much really... I did not benefit from this programme. The lecturers didn't seem to have knowledge of computers". Reiterating a similar experience, another teacher who studied at a different college shared that (Excerpt 63):

I studied Maths major and Science minor. We didn't learn anything about ICT in those subjects. But then we learnt that the college had stopped offering the computer awareness programme. Those ahead of us told us that they learnt some computer skills and they could at least type their work...

In an interview with an ICT coordinator in one school, the participant further verified lack of ICT training among some teachers. The participant shared a colleague's experience in Mathematics. The teacher had not received any ICT training and realizing the Spreadsheet objective in their syllabus, the colleague (Excerpt 64): "...asked me to teach a Spreadsheet

topic for his/her classes. S/he told me that he had never received ICT training and didn't want to be embarrassed in front of his/her students”.

During interviews, members of school administration agreed that they never received ICT training during tertiary education programmes. They revealed that they depended on colleagues to work with ICT. For example, a deputy School Head remarked (Excerpt 65): “I have never received formal ICT training. That was then...no computers, nothing...now have to use it. I always ask for help.” A head of department shared a similar experience and said that (Excerpt 66): “I still depend on colleagues often asking them to do the job. I am trying... it's not easy ...at my age”.

During a focus group discussion, participants in colleges of education declared that not all college graduates received uniform exposure to ICT use and that a lot left without any exposure to ICT training at all. They unanimously agreed that this was highly likely to negatively impact on ICT integration at junior secondary level. In fact, members strongly felt that until such a time that ICT integration is modeled at college level, it was “impossible” that ICT integration could take place in JSSs. On this note, members emphasized “the need for alignment between college and junior secondary practices” since colleges were responsible for training teachers who subsequently teach in junior secondary schools. Meanwhile, the group members revealed that it was only through the CAP offered by the Communication and Study Skills (CSS) department that the ICT teacher training at colleges of education could be trusted to equip all student teachers with uniform computer skills. They were convinced that students gained “basic but useful computer use skills”. Unfortunately, group members confirmed during the discussion that the two secondary colleges of education had stopped offering the CAP.

On the whole, participants further agreed that individual departments were under no obligation to equip student teachers with ICT training skills. Aptly, a group member summarized the college ICT programme and stated that (Excerpt 67):

Honestly, ICT training for teacher trainees in colleges is not mandatory to different academic departments... it is not a standard practice across departments, you know... exposing trainees to ICT remains individual department's initiative... This also is reliant on individual members' interest and passion for ICT...

It was evident during the discussion that some members were dispassionate about ICT use in teaching and learning and generally had limited knowledge of ICT use in these processes. This was confirmed by other members that they made no effort to integrate ICT at all. To clarify this, a member within the group detailed that their department observed that the junior secondary curriculum had introduced "some form of ICT integration" with the expectation that their department would work on it at college level. According to this member, the department could not do anything about this due to lack of ICT resources and competency among department members. The member described that (Excerpt 68):

Our department noticed the Computer Assisted Learning programme within the previous JC syllabus. There was nothing we could do about it because none of us had been trained on it...there were no resources. Now, it's Computer Awareness objectives... Still, we can't do anything about it because of lack of ICT skills...and resources.

At this point, members agreed that college lecturers were "incapacitated" in terms of training to expose trainees to ICT training. They also emphasized that lecturers' ICT competency must be considered during curriculum reforms relating to ICT integration. The participants argued that introducing ICT related reforms through the curriculum does not guarantee that the reforms would be implemented. In this regard, participants highlighted that

they should be consulted during curriculum reformations not in their “individual capacities” as it was often the case but “formally as college and departmental representatives”.

In the meantime, participants agreed that pre-service training was the most suitable time for students to receive ICT training. They argued that ICT training should have long been part of teacher training so that student teachers appreciate its place in teaching and learning. In this regard, they suggested that teacher trainees should be equipped with ICT integration skills, teacher training institutions must be provided with adequate ICT resources and that ICT competency should be made part of student teachers’ requirement to qualify as teachers.

4.5.2.1 *Adequacy of pre-service ICT training and ICT integration*

Effective ICT integration into school curriculum requires that teachers are adequately trained technically and pedagogically. Teachers were asked about the adequacy of the training they have received in relation to integrating ICT into the curriculum. Table 12 presents teachers’ responses to question 3(b) on adequacy of training in various competency areas.

Table 12: School participants’ views on adequacy of training in different competency areas

<i>I was adequately trained in...</i>	GA	GD	NS	Total
i) Appropriate approaches for integrating ICT	53 (39%)	74 (54.4%)	9 (6.6%)	136
ii) Lesson plan design for integrating ICT	47 (34.6%)	73 (53.7%)	16 (11.8%)	136
iii) Designing appropriate ICT integration tasks	51 (37.5%)	65 (48%)	20 (14.7%)	136
iv) Solving basic computer technical problems	38 (27.9%)	78 (57.4%)	20 (14.7%)	136

The results reflect a pattern where majority of participants between 48% and 57% generally disagreed (GD) that they received adequate training in some of the key areas to effectively integrate ICT into the school curriculum. Small number between 38% and 53% of teachers generally agreed (GA) while smaller number between 6.6% and 14.7% of teachers said they were not sure (NS).

During interviews and focus group discussions, teachers generally agreed that the training they received was not adequate to enable them to meaningfully integrate ICT. They consistently emphasized that the ICT training was “elementary” and meant for their “personal use and awareness”. Similarly, they confessed that “they thought the skills were simply for them to be able to type their academic work and especially the project”. During an interview, a participant teacher clarified that (Excerpt 69): “We were not trained to integrate ICT into our lessons. We just learnt how to use a computer... for use while at college. It was basics really...” Another participant teacher reiterated the same observation and added that (Excerpt 70):

I know how to use a computer but not how to use it during teaching. I am not confident to teach students how to use a computer in learning my subject. I was not taught how to do that. Yes, some of lecturers used ICT tools and we sort of realized that these can be used in teaching. I don't think our lecturers expected this development.

Further discussions with teachers corroborated sentiments by lecturer participants that colleges of education were not modeling ICT integration. For example, during an interview, a participant teacher stated that (Excerpt 71): “Colleges are not training teachers on how to use ICT in teaching and learning. This is what should have happened... or happening...you know... something like a general course for all students like they do with Foundations of

Education.” During focus group discussion, college participants confirmed this observation revealing that student teachers were not expected to use ICT and that this included during their Teaching Practice (TP) process. Members revealed that student teachers who used ICT in teaching and learning during TP were “marveled at” and that this “did not make so much of a difference in their final mark”.

Although acknowledging that colleges offer some ICT training to student teachers, the curriculum officer concurred that the colleges were not doing enough and that this was not a requirement for them. During the interview, the officer stressed the need for effective teaching of ICT integration at teacher training institutions. However, the officer raised suspicion that teacher training institutions could not achieve this objective. One of the reasons the officer provided was that student teachers came to colleges without background knowledge of ICT (Excerpt 72):

It’s a challenge for teacher training institutions. Students enter colleges without any knowledge of using a computer. To start teaching the basics at that level delays progress in teaching them how to use it in teaching and learning... learning about ICT should start early in the education system so that colleges continue... not starting the process.

On a different note, it also emerged during interviews with school-based programmers that they did not receive adequate training during pre-service. As a result, the programmers declared that they were not able to solve all technical problems reported to them by staff members. In addition, they revealed that they were never exposed to server 12 during pre-service training (Excerpt 73): “We never used server 2012 during training. Mostly, we worked with older version like 2003 and 2008. Now, we have to deal with in schools. It’s complicated and prone to technical faults”.

4.5.3 Other modes of ICT training adopted by participants

Participants were asked to share other modes of training they used to acquire ICT use skills apart from the proposed *Maitlamo* policy training plan and tertiary training (Questions 2a, c & d). Table 13 presents results for other modes of ICT training through which different participants acquired ICT use skills.

Table 13: Other modes through which school participants acquired ICT skills

	School-based Workshops		Self-Tutorials		Attending online courses	
	Yes	No	Yes	No	Yes	No
Teachers	33 (24.3%)	103 (75.7%)	69 (50.7%)	67 (49.3%)	8 (5.9%)	128 (94.1%)
SMTs	0 (0%)	38 (100%)	21 (55.3%)	17 (44.7%)	5 (13.2%)	33 (86.8%)
ICT Coordinators	2 (22.2%)	7 (77.8%)	4 (44.4%)	5 (55.6%)	2 (22.2%)	7 (77.8%)
Totals	35 (19.1%)	148 (80.9%)	94 (51.4%)	89 (48.6%)	15 (8.2%)	168 (91.8%)

The results in table 13 indicated that only 35 (19.1%) participants said that they acquired ICT skills by attending school-based workshops while a majority 144 (80.9%) said they did not. For Self tutorials, a good number 94 (51.4%) said ‘Yes’ and a more or less same number, 89 (48.6%) said ‘No’. On attending online courses, a very small number, 15 (8.2%) said ‘Yes’ while a majority 168 (91.8%) of participants said ‘No’. Of the three other modes of learning to acquire ICT skills, self-tutorials were identified as the most common.

During interviews and focus group discussions, participants agreed that they preferred self-tutorials particularly for their convenience. Even those who acquired some ICT skills during pre-service confirmed that they were engaged in self-tutorials or assistance from

colleagues to acquire further skills. Teachers who had not received any form of ICT training revealed that they were obliged to engage in self-tutorials due to school policies. While some used ICDL books, others adopted the ‘trial and error’ approach. For example, during an interview, a participant senior teacher shared the grueling experience of learning how to use a computer on your own (Excerpt 74):

I learnt the hard way. The school policy requires us to type our own tests. When this computer was free, seven of us share it you know, I would learn, punch a key, search for the next and so on... by the end, my shoulders would be aching... I am getting there.

The interviewed teachers also explained that school-based ICT workshops were rare and not very effective. Teachers agreed that school-based workshops were disorganized and that internal resource persons did not have good knowledge of computer use. A participant teacher who claimed to have attended only one workshop in the school observed that (Excerpt 75):

I remember my first days here, there was an ICT workshop. It’s a long time back. At the time, a lot of computers were not working, the ICT coordinator didn’t seem to know what he was doing...Frankly, I didn’t learn much from the workshop.

During interviews, ICT coordinators agreed that school-based ICT workshops were not a common practice in schools. Some admitted that they had not thought about organizing ICT training workshops for staff in their schools. They raised issues such as lack of teacher interest, busy school schedules and inadequate funds to run workshops. For example, an ICT coordinator remarked during an interview that (Excerpt 76):

Teachers are involved in so many activities. Some don't seem to have interest. But importantly, we are always told funds are not available when we try to organize workshops... for snacks or even lunch for staff. Truly speaking, I also think that most of teachers don't need workshops but full training... they fear computers.

On online courses, participants indicated that they were mostly prohibited by the high costs of internet connection. A deputy School Head who reported having tried online courses remarked (Excerpt 77): "I used my personal internet connection at home and my... I couldn't afford it so I stopped. I think if school internet was available, I would still be learning".

4.6 Maitlamo and provision of ICT resources

Research Question 3: To what extent does Maitlamo influence provision of ICT resources at the Junior Secondary School level?

Maitlamo prioritizes provision of efficient ICT infrastructure and resources in schools and learning centres. Through the *Thuto Net* programme, the policy aimed to provide the following essential ICT infrastructure components: electricity, computers and network services, telecommunication services, Internet connectivity and technical support. Meanwhile, Botswana's vision 2016 stated that "All schools will have access ...to computer-based communications such as the internet" (p.6).

This study sought to find out the extent to which *Maitlamo* influenced the provision of ICT infrastructure and resources in the junior secondary schools. Data for research question 3 was solicited quantitatively through questionnaires administered to teachers, ICT coordinators, school-based programmers and SMTs. Some of the above participants also participated in face to face interviews and focus group discussions. The interviews were extended to the curriculum and BEC officers while focus group discussions included students as well as lecturers in one of the secondary colleges of education.

4.6.1 Provision of ICT resources to schools

Maitlamo emphasises provision of increased schoolroom computers in schools. This augments one of the aims of Botswana's Vision 2016 which stated that "All schools will have access to a computer ..." (p. 6).

Participants were asked whether or not their schools had been provided with ICT resources. They revealed that the ICT resources recently provided to schools were replacements of old ones specifically for the CAP and school administration. During focus group discussions, teachers explained that the provided resources were confined to the computer awareness lab and the administrative area. Participants angrily took turns to question Government's "seriousness about ICT integration". They strongly felt that they were "discriminated against as key implementers" and wondered who was going to integrate ICT if they were left out. They opined that ICT integration "was only possible" if they also had ICT resources so that they could "conveniently plan on integrating ICT". Similar sentiments were shared by different participants during interviews. For instance, a participant teacher remarked that (Excerpt 85): "ICT resources in the school are mainly for computer awareness and administration block. That's where all ICT resources are found. Teachers have nothing...but they are supposed to integrate ICT". Another participant teacher concurred and stated that (Excerpt 86):

I wouldn't say that our school has been provided with ICT resources... they are not meant for the whole school but for a specific subject, computer awareness... and for administrative purposes. Even us who are expected to integrate the same ICT ... I mean...have no resources.

ICT coordinators corroborated that the ICT resources were replacements for old computer awareness ICT resources which were no longer useable. For example, during interview, an ICT coordinator revealed that (Excerpt 87):

The old computers for the computer awareness programme were too old and no longer working. These were replaced last year with 20 thin client computers, a server, backup tapes, a data projector and a printer. The computers use the *N*-computing system. All the computers are connected to the main server. These are the only ICT resources provided and they are all in the lab.

During further interviews, ICT coordinators made it abundantly clear that the Government provided ICT resources were specific replacements for teaching the CAP. For instance, one ICT coordinator emphasized that (Excerpt 88): “This was simply a replacement of the old computers we had for computer awareness. It’s not like the schools were provided with additional ICT resources”.

Although the curriculum officer could not confirm the restricted use of ICT resources provided to schools, the participant confirmed the replacement of the old computers. The officer further revealed that all schools were provided with a standard ICT resource package (Excerpt 89): “I think it was in last year... Government took the initiative to replace computers across schools Government and network systems upgraded last year ...”

In addition, the curriculum officer criticized Government’s decision to settle for personal computers (PCs) for schools. Blaming this on lack of consultation, the officer argued that this also contradicted the broad curriculum intentions (Excerpt 90):

It was a decision that was made without consulting us. Even right now 99% of the computers we are using are PCs and you ask yourself but where are Apple computers? You will be told Apples are too expensive. Yes they are expensive but they are stable.

Explaining one of the disadvantages of introducing students only to personal computers, the officer observed that (Excerpt 91):

...The worst thing, we are teaching our students, from one to form five using PCs and Microsoft. When the students graduate and go to colleges and do say multimedia, and front computer is Apple. Now here is a student who's barely been using computers and is now faced with an Apple computer and the software is not even Microsoft. And what do they do, they are stuck.

4.6.2 Provision of software

Maitlamo aimed to provide ICT resources and specifically computers to schools to enhance access and promote effective ICT driven innovation in the classroom. Computers constitute the hardware component of ICT. However, the policy is silent on software.

During group discussions, various participants indicated that schools only had the standard Microsoft Office applications. The discussion regarding software was dominated by representatives of practical subjects. Mainly, while they appreciated the standard software package, they expressed concern that it did not effectively cater for the needs of their subjects. They claimed that some topics within their syllabi could only be “effectively taught with specialised software” not provided to schools. The participants proposed that such specialised software should be centrally provided or that schools be provided with funds to purchase the software.

During interviews with different practical subject teachers, they corroborated the opinion that the available software package did not meet the requirements of all subject areas. Interviewees generally appreciated the standard package. However, teachers took turns to emphatically argue that they needed additional and specialised software. For example, during an interview, an Art teacher observed that (Excerpt 92): “The MS package is good and meets general computer use requirements. But for some of us, like our subject, Art, we need up to date software such as Photoshop. It has more capabilities than the old Paint. Students need exposure to current software”. In a separate interview and echoing a similar sentiment, a Business Studies participant teacher stated that (Excerpt 93): “While Spread sheet is useful in teaching some business concepts, it has shortcomings for example when we have to teach computerised accounting. We are currently not teaching that topic because of lack of software”. Finally, a Science teacher lamented that they also needed specialised software (Excerpt 94): “Our case is slightly different. We mostly require simulation software to model experiments. Some experiments are better modelled than done practically, like dangerous ones. Besides, we often don’t have materials for experiments and they are important in Science”.

The observation that MS Office package was the only available software package provided to JSSs was confirmed by other participants such as the school-based programmers and the Curriculum Officer. Reiterating this observation however, the curriculum officer argued that this was prescriptive, stereotypical and antagonised the broad intentions of the CAP (Excerpt 95):

...it's like stereotyping students. The syllabus is not specific for example saying teach Microsoft. It's open, for example give them keyboard skills, understanding of the basics, where computers come from and open up... Microsoft is not the only computer application available. Doing this, you are now prescribing to schools what they should buy...

During visits to the computer awareness laboratories by this investigator, however, it emerged that some schools had unique and additional software, Ed-Admin, installed in computers in the laboratories. Asked about this software during interviews, ICT coordinators explained that it was administrative software used for analysing students' continuous assessment grades. Importantly, the ICT coordinators revealed that the unique software was not provided to all schools but individually bought by schools from specialised providers (Excerpt 96): "We bought this as a school. We pay an agreed fee to renew its licence. It's a contract between the school and the company". Alerted to this by the investigator during interviews, other ICT coordinators showed awareness of the software. However, they clarified that their schools did not have sufficient funds to purchase the software. However, the ICT coordinators shared that they had to improvise to achieve the same objective (Excerpt 97): "We learnt about the software but management said there were not enough funds. We met as a cluster and agreed to merge Spread sheet and Word to analyse the results and produce reports... *yah*...more or less like what that software does".

4.6.3 Equity of ICT resource provision

Other than providing 'new' computers to schools, *Maitlamo* through "The Computers for Schools (CFS) Programme", aimed to "examine the feasibility of Government and private sector organisations donating surplus for use in schools..." (p. 13).

During interviews, ICT coordinators and members of school management revealed that generally, schools depended on the government to provide the ICT resources. For example, one deputy School Head remarked that (Excerpt 98): “We wait on Government to provide us with ICT resources. These are public schools. But again the funds provided to schools are very limited to allow us to buy much. So we depend wholly on Government to provide...”

However, during interviews, ICT coordinators disclosed that other schools benefitted from other dispensations such as donations. As a result, they revealed that there were disparities in number of ICT resources across schools. During interviews with ICT coordinators, they revealed that on the one hand, some schools received extra ICT resources through school initiatives from parastatal entities such as Citizen Entrepreneurial Development Agency (CEDA). For example, an ICT coordinator shared how they lost 16 computers explained that (Excerpt 99): “After losing about 16 computers due to an electricity problem, the school approached CEDA and they donated quite a number of computers to the school. We have not fully recovered as you see we only have 23 computers”.

On the other hand, other schools received donations from parastatal organizations and government initiated policies. For example, one interviewed ICT coordinator stated that (Excerpt 100): “We received 5 computers from Debswana last year and another 5 earlier this year as donations. I am not sure but I believe it’s part of the Adopt A School programme.” Further illustrating how some schools had slightly more ICT resources, one interviewed School Head in another school explained how they benefitted both from two Government initiated programmes (Excerpt 101):

We have been very lucky. We earlier last year received 5 computers from local mine through the Adopt-A-School programme. A few months later again last year, we received 50 tablets through the ESP programme. They just dropped the tablets in the school, told us our school was one of the beneficiaries of the ESP and left. (ESP stands for Economic Stimulus Package).

Further interviews with ICT coordinators and members of school management revealed that they were disgruntled with the way ICT resources were donated to schools. For instance, one ICT coordinator whose school only received the standard Government package remarked that (Excerpt 102): "... some smaller schools have been supplied with tablets...we haven't. There are no criteria except that the school was used as a pilot school..." A visibly angry deputy School Head shared the same observation and observed that (Excerpt 103): "It now depends where you are, you know, who is there to help you... even politically. It's very unsystematic and uncoordinated".

During the interview, the curriculum officer confirmed that while Government provided all JSSs with a standard ICT package, a few schools also benefitted from donations. Unequivocally, the officer condemned Government's parallel initiatives which discriminated against other schools, arguing that they created inequities in the provision of ICT resources to public schools. The officer lamented that the curriculum department was not informed about the developments and cautioned that such developments complicated curriculum implementation. For example, the officer remarked that (Excerpt 104):

The other problem which surfaced and gave us a problem was this thing of donors, companies donating. Everybody was coming up with donation of computers with the school of their choice... Curriculum was never involved in these things... everything was now being coordinated by what you call this, eh Botswana Education Hub through this thing of ‘adopt a school policy thing... So with the issue of tablets, it’s eh, they decided on it, it came through this ESP programme, the funding was coming from I think DIT. (*DIT stands for Department of Information Technology*).

In addition, the curriculum officer expressed grave misgivings about the coordination of donations to schools and blamed this on politics (Excerpt 105):

Now you go into a school and you find they are doing something completely different, it might be good or bad but you find books in schools that we don’t know. Many books are in schools, donated, some through agencies, others through politicians, big guys etc.

Finally, the curriculum officer warned against the use of old computers in schools when the Government does not have an e-waste policy in place (Excerpt 106):

The other thing forgot to mention with ICTs is lack of policies, we lack policies. One policy that is lacking is the E-waste policy...electronic waste is covered under another policy of waste but it’s a nightmare right now, disposing electronic waste, gadgets are on the streets, some toxic...

Meanwhile, during the focus group discussion, college lecturers declared that they had not received any donations but were aware of donations through Government programmes. Participants agreed that they “learnt from schools when on teaching practice that schools receive donations”. Interestingly, the discussion among group members revealed

that not all schools benefitted from the donations. In this regard, members expressed uncertainty about the extent to which the donations were objective and systematic. However, they expressed hope that colleges would also benefit from the same arrangement.

4.6.4 Adequacy of ICT resources

Maitlamo highlights the importance of providing students with greater access to schoolroom computers. One way of increasing access is to increase the number of ICT resources. Participants were asked about the extent to which available ICT resources were adequate to support ICT integration into different subject areas. Table 14 presents participants' responses to question 1(b).

Table 14: Adequacy of available ICT resources for ICT integration

	GA	GD	NS	Totals
Teachers	30 (20.11%)	94 (69.1%)	12 (8.8%)	136 (100%)
SMTs	6 (15.8%)	31 (81.6%)	1 (2.6%)	38 (100%)
ICT Coordinators	3 (33.3%)	6 (66.7%)	0 (0%)	9 (100%)
School-based programmers	1 (11.1%)	8 (88.9%)	0 (0%)	9 (100%)
Totals	40 (20.8%)	139 (72.4%)	13 (6.8%)	192 (100%)

The results in table 14 show that a majority 139 (72.4%) of participants generally disagreed (GD) that available ICT resources were adequate to support ICT integration into the school curriculum, a smaller number, 40 (20.8%) generally agreed (GA) while an even smaller number, 13 (6.8%) said they were not sure (NS).

Interviews and focus group discussion with teachers confirmed this observation. Teachers agreed that the ICT resources were not adequate to support ICT integration. In fact,

they revealed that the available ICT resources were never meant for ICT integration but for CAP hence the small numbers. They further argued that integration required more ICT resources in different areas of the school such as classrooms, the library or other laboratories. For example, a participant teacher observed during an interview that (Excerpt 107): “The available ICT resources in our school are far from enough to support integration. A set of 20 or so computers can never be enough if we, in all subjects, are to integrate computer awareness or ICT”.

This was confirmed by ICT coordinators and SMTs during interviews. These participants also concluded that the ICT resources provided to schools would never reach adequacy level. A School Head observed that (Excerpt 108): “Look at how long it takes Government to replace old computers? The replacements did not come with an increase...It’s just not promising despite endless promises...” Adding their voices, the ICT coordinators strongly argued that the resources were not even adequate to support effective teaching of the CAP. One ICT coordinator explained that (Excerpt 109):

The ICT resources are far from enough even for teaching computer awareness. Our computer awareness classes are very large, at times more than 50 students per lesson against 20 computers. Mind you not all computers are useable all the time. The lab gets really crowded. At times students can’t even share a computer... there is no room for individual work.

For their part, students shared the same sentiment in writing and in follow up focus group discussions. In their written responses, different groups emphasized that they (Excerpt 110): “need for more computers...they always shared a computer during lessons...and always pushed each other to touch the keyboard...some of us leave computer lessons without having touched the keyboard”. During follow discussions, they openly complained about

sharing computers “all the time” during computer awareness lessons. Visibly unhappy about sharing computers, student participants also reiterated that the few computers meant that most of them left lessons without having done anything on the computers. Lesson observations by this investigator confirmed the overcrowding during computer awareness lessons. In all the lessons, sharing was a cross cutting characteristic. Students shared not only the computers but chairs and it was visibly difficult for students to do any meaningful learning activity.

During the interview, the BEC officer used the example of low enrolment for Computer Studies to confirm the inadequacy of ICT resources in schools (Excerpt 111):

Eh... it's usually because of inadequate resources. I believe they will need to eh...provide computers for schools... our enrolment or let me say our candidature for Computer Studies is very low, very low. I think we have we have less than two thousand the whole country out of around 36 thousand candidates. So you can see that the enrolment is still very low.

In a similar outcome, lack of adequate resources emerged during the focus group discussion with college lecturers. Participants agreed that “the colleges don’t have ICT resources” to the extent that those who attempted to use ICT in teaching and learning “depended on personal resources or bank on students using their own”.

4.6.5 Teachers’ access to available ICT resources

Maitlamo, states that “Government will expose children to highly effective education in ICT...” (p.11). In close relation to this, it highlights that “Providing students with greater access to schoolroom computers will facilitate skills development and help prepare them for life and work in the digital economy” (p. 13). However, the policy is silent on teacher access to ICT resources. In this study, teachers were asked about the extent to which they had easy

access the computer laboratory where ICT resources are housed. The results are presented in table 15.

Table 15: Teachers' views on their access to ICT resources

As a teacher,	GA	GD	NS	Total
I have easy access to ICT resources	60 (44.1%)	70 (52.5%)	6 (4.4%)	136

Table 15 shows that a slight majority 70 (51.5%) of teachers generally disagreed (GD), a small number 60 (44.1%) generally agreed (GA) while 6 (4.4%) said they were not sure (NS).

During interviews and focus group discussions teachers agreed that they had limited access to the computer laboratory. They also revealed that their access to the computer laboratory was not for teaching their lessons but for administrative work such as entering students' continuous assessment marks. The interviewed teachers further revealed that the only time they had free access to the laboratory was in the afternoons when there would be no lessons. Nonetheless, they indicated that they still forced their way into the laboratory during lessons when under pressure. For example, one of the participant teachers stated during focus group discussion that (Excerpt 112):

The computer lab is the only place where we can access computers. We often use afternoons, you know, respecting the lessons. But when under pressure, we force our way in. We disturb students of course but is it our fault? I don't think so. We compete.

The teachers also declared that the "one computer laboratory per school standard" is no longer tenable especially in the era where increased technology use across subjects is

envisaged. For example, during an interview, a participant teacher remarked that (Excerpt 113):

We need more labs than one. This is long overdue or at least if we had our own computers in the staffroom. But no! I think you saw it yourself. We only have access to computers in the computer awareness lab for all our needs...marks entry, printing, you name it. Sometimes we form queues there.

Echoing a similar sentiment, participant teachers unanimously observed during focus group discussion that (Excerpt 114): “it was impossible for them to borrow the projector because it is only one in the whole school...since it was always in use by the computer awareness teacher”.

This sentiment was shared by ICT coordinators during interviews. For instance, one ICT coordinator compared the computer laboratories in the JSSs to a “bee hive” and remarked (Excerpt 115):

Come to the lab when teachers are under pressure... for example, when they have to meet deadlines for entering marks, preparing end of month tests, printing and so on. The lab gets so busy... lessons are disrupted...teachers come in and go out endlessly. Don't think this happens here alone...it happens in most schools.

This pattern was consistently observed by this investigator in most of the sampled schools. In fact, the competition for the few ICT resources extended to server rooms. Not surprisingly, school-based programmers even complained about missing devices such as USB connecting cables and mice. For example, during an interview, a school programmer stated that (Excerpt 116): “Teachers access ICT resources in the computer lab. They also use the

server room when the lab is full. Unfortunately we end up losing some ICT peripherals such as mice, USB cables and others”.

Similarly, students were disturbed by what they described as “teachers’ continued in and out movements.” They equally complained about their competition for the available computers with their teachers. The students decried that they always lost to their teachers “out of respect” suggesting that “we don’t have the power to refuse with the computers”. Repeatedly, they indicated that they needed more computers particularly “so that we don’t share computers”.

4.6.6 Students’ access to ICT resources

As stated earlier in this study, *Maitlamo* highlights enhanced access as one of the critical components for effective use of ICT in schools. In this regard, the policy aimed to provide greater access to schoolroom computers for students. Question 1(g) asked teachers about the extent to which there was a system in place to ensure fair access to ICT resources by different student classes.

Table 16: Teachers’ views on learner access to ICT resources

<i>There is a system in place to ensure that...</i>	GA	GD	NS	Total
Learners have fair access to ICT resources	34 (25%)	75 (55.1%)	27 (19.9%)	136
Students have access to ICT resources outside lessons	26 (19.1%)	88 (64.7%)	22 (16.2%)	136

Table 16 indicates that in each case majority of teachers generally disagreed. For instance, 75 and 88 (55.1% & 64.7%) of teachers generally disagreed (GD), smaller numbers,

34 and 26 (25% & 19.1%) generally agreed (GA) while substantial numbers, 27 and 22 (19.9% & 16.2%) said they were not sure (NS).

During focus group discussions and interviews with teachers, they agreed that students were prohibited from using computers outside lessons. There was however, a debate when it emerged that some practical subject students were allowed to use the laboratories in the afternoons to type final examination projects. The first part of the argument suggested that the laboratory could not accommodate all the practical subjects offered in the school. As such, some practical subject teachers expressed concern “favouritism” for select practical subjects. The second part revolved around the same argument but in this case, “discrimination against non-practical subjects”. Non practical subject teachers questioned the criteria used to only allow practical subjects access when the same was not extended to non-practical ones. As such, there were visible misgivings about the arrangement with ICT coordinators blamed for “favouritism and discrimination”. During a follow up interview, a participant teacher remarked that (Excerpt 117):

Most students don't get the chance to use computers unless during computer awareness lessons. Only some practical subject students have a chance to use them for typing their projects once a week in the afternoons. Mind you, this is only when students work on projects... and gives a few students um... some better access although still not enough.

While they agreed that only practical subject students were allowed access to the computers in the afternoons, interviewed ICT coordinators explained that it was due to resource constraints. For example, one coordinator remarked that (Excerpt 118): “We have limited computers. BEC expects these projects to be typed. Um... this is why we combine two subjects at a time where possible... classes for these subjects are often not large”.

During focus group discussions, students raised similar complaints. In their small groups, students wrote such comments as (Excerpt 119): “Not all of us can use the computers in the afternoon...This is not fair because during lessons we always share...Our classmates get the chance not to share a computer for their project work”. However, during the focus group discussion with students in another school, they complained they had no access at all because the computers were not working. Their written comments included that (Excerpt 120): “Our computers are not working...We have no access to the computers...We are not typing our projects...this will affect our performance”. Visibly disappointed, participants suggested that they should be provided with working computers enough for them not to share.

4.6.7 School-based ICT policies and deployment of resources

Maitlamo accentuates provision of ICT infrastructure and resources to schools. It would be assumed that the available ICT resources in schools are carefully and systematically deployed to ensure their accessibility, effective and optimal use. In this study, participants were asked about the existence of school-based ICT resource deployment policy.

During interviews and focus group discussions, participants agreed that distribution and deployment of ICT resources was the prerogative of school management. They also explained that there was no system in place to fairly distribute ICT resources. For example, during an interview, one participant teacher remarked that (Excerpt 121):

Management decides what goes where. There is nothing to refer to in terms of priorities. Before they take the decision, the computers remain in boxes. Along with the staff development teacher, I am trying to work out how we can develop some instrument to manage deployment of ICT resources.

Teachers and ICT coordinators consistently complained about the inequitable distribution of ICT resources in their schools. During interviews, teachers felt that school management always allocated themselves ICT resources even when they did not need them. For example, one interviewed participant teacher said (Excerpt 122): “We are not pleased with deployment of ICT resources in our school. Management has everything. Anything new is theirs. We have nothing and have to compete for the same resources with students”. ICT coordinators confirmed this observation, evidently unhappy about the arrangement. For instance, during an interview, one ICT coordinator posited that (Excerpt 123): “As schools we can’t leave the deployment of ICT resources to senior management... at times they want to keep everything to themselves. Teachers are always left out as you see in the staffroom... we need binding policies”.

The absence of clearly articulated school-based ICT policy is aptly highlighted by the situation in one of the sampled schools. During fieldwork by this investigator, old computers (but still useable as per the coordinator’s report) and new computers were stock piled in the server room. According to the ICT coordinator, the 10 new computers were donated by CEDA in 2016 and 2017. The ICT coordinator explained that the decision to stock pile the computers was beyond his/her control as a technical officer. During the interview, the ICT coordinator remarked that (Excerpt 124):

We are waiting for management to decide where the computers are to be deployed... the School Head decides... there is no established committee that would look at needy areas. One feels helpless especially when one realizes these could be helpful.

This observation was further confirmed during an interview with a School Head in another JSS visited by this investigator. The School Head revealed that the school had benefitted from two Government initiated programmes: 10 computers and 50 tablets. The

Head argued that as management they needed to ensure safety of the ICT resources. During the interview in which this investigator was shown a tablet still packaged, the School Head remarked that (Excerpt 125):

Suppliers just dropped these (showing this investigator a box containing a tablet) and did not explain anything... how they are used... what they contained and said they expected better performance. We can't use them... what if something happens to them? ...we are waiting for them to come and train us...

Observations by this investigator however revealed that some schools had made internal arrangements to redeploy old but still useable computers. In those schools, the interviewed ICT coordinators explained that the old computers were redistributed to different departments and the staff room. For instance, one ICT coordinator explained that (Excerpt 126): “We realized that some of the computers were old but still useable. Instead of piling them in storerooms, we decided to place them one per department and a few in the staffroom”.

Although this was appreciated by teachers, they still felt unhappy with some arguing that they were treated as ‘dumping ground’ for old computers. For example, an interviewed teacher pronounced that (Excerpt 127): “The best we can get are old and very slow computers with sticky keys. There is very little one can do with this unless of course you are really desperate”.

4.7 Provision of ICT infrastructure in schools

As highlighted earlier in this section, *Maitlamo* underscores the significance of providing schools with efficient infrastructure to successfully implement *Thuto Net* programmes. The ICT infrastructure components include electricity, computers and network services, telecommunication services, Internet connectivity and technical support. However,

the ICT infrastructure does not include classrooms yet they are the central areas for learning and teaching. This study aimed to investigate the extent to which ICT infrastructure had been provided to schools. Participants were asked about the extent to which available classrooms support the use of ICT (Question 1 j). Table 17 presents school participants' responses.

Table 17: School participants' views on suitability of available classrooms for ICT use

	GA	GD	NS	Totals
Teachers	14 (10.3%)	116 (85.3%)	6 (4.4%)	136 (100%)
SMTs	3 (7.9%)	32 (84.2%)	3 (7.9%)	38 (100%)
ICT Coordinators	2 (22.2%)	7 (77.8%)	0 (0%)	9 (100%)
Totals	19 (10.4%)	155 (84.7%)	9 (4.9%)	183 (100%)

The findings in table 17 indicate that a majority 155 (84.7%) of participants generally disagreed (GD) that available classrooms were suitable for ICT use, a smaller number, 19 (10.4%) generally agreed (GA) while an even smaller number, 9 (4.9%) said they were not sure (NS).

During interviews and focus group discussions, teachers agreed that available classrooms were not suitable for ICT use. Teachers revealed that the furniture in the classrooms was unsuitable and inadequate. For instance, an interviewed teacher indicated that (Excerpt 128): "We don't have enough furniture in the classrooms. Our students share chairs and small desks. The furniture itself can't be used with computers".

In addition, teachers decried that the classrooms were vandalized and not maintained. Further, they indicated that the classrooms were insecure for ICT use especially desktop computers. For example a participant teacher observed during focus group discussion that

(Excerpt 129): “Most of our classrooms have been vandalized... broken sockets and chairs. Besides, the classrooms are not safe for keeping valuable ICT resources”.

Members of senior management and ICT coordinators shared these observations and recommended additional computer laboratories. They suggested that a few classrooms could be converted into laboratories. For example in an interview, one School Head said that

(Excerpt 130):

In their state, our classrooms are not ICT friendly. Some sockets don't even have electricity and are unsafe. It certainly would be too expensive to make all classroom ICT use friendly. Instead, a few classrooms could be refurbished and turned into labs. Different classes can use those at different times.

In the meantime, participants suggested and agreed during focus group discussions that tablets could be more suitable for use in classroom learning. For example, a participant teacher observed that (Excerpt 131): “For now and perhaps even in the future, tablets can be used. You see, our schools need solar charged tablets. They are mobile, don't require much space and can be used in our normally congested classrooms”.

4.7.1 Provision of electricity

Maitlamo highlights electricity as one of the essential ICT infrastructure components for implementing *Thuto Net* programmes. Research participants were asked to reflect on the extent to which electricity supply was reliable in their schools. Table 18 presents participants' responses. These results indicate that a slight majority 95 (49.5%) of participants generally agreed (GA) that electricity supply was reliable, an almost equal number, 88 (45.8%) generally disagreed (GD) while a smaller number, 9 (4.7%) said they were not sure (NS).

Table 18: School participants' views on the extent of reliability of electricity supply

	GA	GD	NS	Totals
Teachers	68 (50%)	62 (45.6%)	6 (4.4%)	136 (100%)
SMTs	17 (44.7%)	18 (47.4%)	3 (7.9%)	38 (100%)
ICT Coordinators	4 (44.4%)	5 (55.6%)	0 (0%)	9 (100%)
Programmers	6 (66.7%)	3 (33.3%)	0 (0%)	9 (100%)
Totals	95 (49.5%)	88 (45.8%)	9 (4.7%)	192 (100%)

The results in table 18 were confirmed during various interactions with different participants across the schools. During interviews and focus group discussions, participants agreed that compared to previous years during which experiences of load shedding were regular, electricity supply had stabilized substantially. However, the group members still felt that electricity supply was not completely reliable citing “sudden unexpected” power cuts. This opinion was substantiated by a participant teacher during an interview who agreed that (Excerpt 132): “Compared to last, 2016, electricity supply is much more reliable. We have not experienced load shedding this year”.

Meanwhile, other interviewed participants corroborated the experiences of power cuts with some indicating that they were rather common especially when least expected. In an interview, a participant teacher indicated that (Excerpt 133): “These days we experience brief power cuts... it disappears for a short time and comes back at times only for it to disappear again... you know that kind of on and off situation. It can be disturbing”. School-based programmers and ICT coordinators shared the same observation. During interviews, ICT coordinators explained that snap power cuts caused inconveniences regarding the use ICTs in schools (Excerpt 134): “Students have to wait for the server to reboot and reconnect to the

server. It takes times and often lessons are abandoned”. Meanwhile, one school-based programmer added that (Excerpt 135): “These sorts of power cuts are disruptive. For example when you are in the middle of downloading something power goes off, you have to start all over again when it comes back. And such power cuts disturb our servers”.

Additionally, interviewed participants indicated that power supply was still affected by harsh weather conditions and rainy seasons. Even of greater concern to school-based programmers was the destruction of ICT gadgets due to power cuts. During interviews, the programmers shared experiences of power cut related losses of ICT gadgets (Excerpt 136): “Rainy and windy conditions still affect power supply leading to outages... Power cuts destroyed most of our computers, internet switches, printers and the server. Replacement for some of the gadgets has proven to be difficult”. Echoing a similar sentiment, another school-based programmer shared their experiences with the new server 2012 (Excerpt 137):

Server 2012 is susceptible to technical errors resulting from power cuts. Often during rainy or windy days, power goes off and the server automatically switches off as well. On rebooting it, the server shows a technical error which is not easy to clear. This is why now our computers are not working.

4.7.2 Computer networking in schools

Maitlamo accentuates network services as an essential component of ICT infrastructure. Ideally, this would facilitate efficient access to information and information sharing and distribution.

During interactions with various participants, they agreed that networking in schools covered only two areas: the computer awareness laboratory and the administration block. During interviews and focus group discussions, teachers complained that they had not been catered for in the school networking system. They strongly felt that the network should have

been extended to all parts of the school. For instance, during focus group discussion, teachers who were provided with old computers shared their experiences of using computers not connected to the school network. During an interview with one of the teachers sharing the computer, the participant indicated that (Excerpt 138): “We only access the network in the computer awareness lab. After using the computers, you must be prepared to take a long walk across the school to the lab for printing. We do the same for entering marks and so on”.

Interviews with ICT coordinators and school-based programmers also revealed complaints that the limited network prohibited maximum sharing of ICT resources such as printers and efficient sharing of information. During an interview, a school-based programmer observed that (Excerpt 139):

The network should reach all corners of the school so that all staff can share files and ICT resources. The current network only extends to the lab, the server room and the admin block. As it is, files which could easily be shared as soft copies have to be printed until we run out of printing paper. It also causes unnecessary congestion.

On a related matter, further interviews with ICT coordinators and the school-based programmers revealed that they generally appreciated the newly introduced *N*-computing network system introduced in the computer awareness laboratory. These participants appreciated that the system ensured minimal damage to computer parts by students. However, they also argued that its major limitation was total dependence of the monitors on the server. For example in 3 schools where the servers were down, ICT coordinators shared their experiences with the *N*-computing network system. One ICT coordinator observed that (Excerpt 140):

When the server is down like now and has been down for over a year, all the computers in the lab can't be used. In the lab, it's just monitors; the central processing unit and everything are hosted in the server. Now everything has come to a standstill.

4.7.3 Internet connectivity and connection speed

Maitlamo prioritizes high speed internet connectivity in schools as one of the essential ICT infrastructure components. The policy further aimed to provide broadband connection to most schools with more than 80 students for increased connection speed. In this regard, *Maitlamo* policy envisaged to provide “school connectivity through a central educational network with which builds upon the Government Data Network (GDN) that is currently in place” (p.13). In this study, research participants were asked to share their views regarding internet reliability and speed. Table 19 depicts summarized responses from various participants.

Table 19: School participants' views on internet connection reliability and speed

	GA	GD	NS	Totals
Internet connection is reliable	46 (24%)	142 (74%)	4 (2%)	192 (100%)
Internet speed supports classroom use	26 (13.5%)	152 (79.2%)	14 (7.3%)	192 (100%)

The results in table 19 show that majority of participants generally disagreed with both statements. For instance, a majority 142 (74%) of participants generally disagreed (GD) that internet connection was reliable. A smaller number, 46 (24%) generally agreed (GA) while an even smaller number, 4 (2%) said they were not sure (NS). Similarly, a majority 152 (79.2%) of participants generally disagreed (GD) that internet connection speed supported

classroom use. A smaller number, 26 (13.5%) generally agreed (GA) while an even smaller number, 14 (7.3%) said they were not sure (NS).

During various interactions with participants, it emerged that not only was internet connectivity unreliable and too slow but also that it was not always available. For instance, one deputy School Head who was found by this investigator fiddling and trying to connect to the Government Data Network (GDN) system remarked during the brief interview that (Excerpt 141): “It takes a long time to connect to the internet ... when it’s there, you better connect, wait patiently as the wheel turns or be ready to wait for some days...”. Reiterating similar and worse experiences, another deputy School Head concluded that (Excerpt 142): “We have given up on the Government Data Network system and gone back to making physical trips and phone calls. When it’s there, it’s just hopelessly slow...”

Interviews with the school-based programmers revealed that internet connectivity in schools was provided mainly through two network systems: the Government Data Network (GDN) and satellite dishes each with a unique Internet Protocol (IP) Address. The programmers explained that only the administration block and the server room used by the ICT coordinator and the programmer were connected to GDN. The computers in the computer awareness laboratories used satellite dishes. Other than that, the programmers revealed that in some selected schools, internet connectivity was also provided through donated third generation (3G) modems and dongles by internet service providing companies such as Orange and Mascom. Explaining how the systems worked during an interview, a school-based programmer stated that (Excerpt 143): “The GDN system connects the admin block and server room, the satellite dish is meant for students’ connection while modems are used by teachers. We lend them the modems at different times”.

Further interviews with the programmers revealed that schools did not have broadband connectivity. For example, one school-based programmer observed that (Excerpt 143): “We still are waiting for broadband connection. For now we get internet connection but it’s still very slow especially during peak hours when everybody is serving the net”. During the interview, the curriculum officer concurred that broadband connectivity had not been delivered to JSSs to enhance internet connectivity speed hence connection was still slow (Excerpt 144): “The junior schools it was there even though it was very slow because of the bandwidth. I know of places like ... they are using more of satellite where schools can link with each other and can share information”.

It also emerged that not all schools had internet connectivity. Of these, one school had no internet connectivity infrastructure at all while the rest had the infrastructure but no connection. In the school without internet connectivity infrastructure, the ICT coordinator and school-based programmer lamented at unfulfilled Government promise. For example, during an interview, the ICT coordinator remarked (Excerpt 145):

We have been told that our school is outside the internet connection grid. They promised to include us and drop fibre optic cables for us for broadband connection. It’s been more than a year. Surprisingly, the village library a few metres away from the school has internet connectivity.

In some schools provided with internet infrastructure, ICT coordinators and school-based programmers disclosed that connections were incomplete. Participants generally blamed the companies responsible for incompetence. For instance, one school-based programmer observed that (Excerpt 146): “... For example, the satellite dish was installed but not connected. They were also supposed to connect a radio transmitter to increase internet connection speed and since then, we have not heard from them”. Echoing a similar concern,

another school-based programmer remarked (Excerpt 147): “They ran trial connection and tested with two computers and left. We are still waiting and it’s now over a year”.

During interviews and focus discussions, teachers revealed that lack of internet connectivity was a disadvantage and an inconvenience. Teachers explained that they depended on other schools to help students. For example, during focus group discussion, one Design and Technology (D &T) participant teacher shared their harrowing experience with students’ final examination projects. This experience was agreed to by group members (Excerpt 148):

Our students suffer during the start of final examination projects. BEC sends a common theme to schools. We then have to identify colleagues in other schools with internet connectivity to help us research around the theme and send us notes. We then print these notes for our students... our students always begin projects late while we wait for information on the theme...

4.7.4 Internet accessibility by students and teachers

Maitlamo aimed to provide schools with high speed internet connectivity. Ideally, internet connectivity would be accessible to students and teachers in the wake of ICT integration into the school curriculum. At the same time, this would be in congruence with and has implications for the Education and Training Strategic Sector Plan’s (ETSSP, 2015-2020) intention of introducing e-Learning programmes throughout basic education.

During interviews and focus group discussions, teachers indicated that they had limited internet access. They revealed that internet access in most schools was confined to the computer awareness laboratory. Amongst other things, participants complained that most subjects did not have required textbooks and that the available ones were too few to be reasonably shared by students. As such, they argued that access to the internet would allow

them chance to search for relevant information for their lessons. Similarly, they indicated that access to the internet would allow them to search for other teaching and learning materials such as videos and images. Further, they suggested that this would allow them the opportunity to share information with their colleagues in other schools. Echoing a similar concern during an interview, a participant teacher remarked that (Excerpt 149): “It’s either you go into the lab or its surrounding areas. We often converge in some spot near the lab to connect to the internet... We feel we are not part of the school”.

During focus group discussions with students, it emerged that students also did not have access to the internet. This was irrespective of whether or not their schools had internet connectivity. Although students expressed keen desire to have access to and use internet, they all agreed that they had not been able to access internet at school. For example, during focus group discussions, participating students whose school did not have internet connection wrote that: (Excerpt 150): “There is no internet connection in our school...We want to use internet to research...Internet will help because we don’t have books...We don’t have internet at home ... We thought we would get the chance at school”.

On the other hand, participating students whose school had internet connection wrote the following remarks (Excerpt 151): “We only access internet at home not at school. Teachers come into the lab to access internet. We don’t think we are allowed to access internet in school”. During oral discussion, noticeably dissatisfied about the development, the students confirmed the observations. They not only wondered why they were not allowed to access the internet at school but also showed a lot of knowledge about internet and how it can benefit them in learning. Literally, they hailed the usefulness of internet with some taking the opportunity to share their experiences of using the internet at home. For example, different participating students described how they researched on topics using home internet. Mostly, participants indicated that they used “You Tube” and “Google” to search for information on

topics they did not understand in class. They praised “You Tube” for including videos which helped them understand the topic much better. Students further shared experiences of how they used internet based social media applications such as WhatsApp, Twitter and Face book to (Excerpt 152): “set up groups and discuss academic work... Ask brothers and sisters in senior schools about some of the things which are difficult”.

In one of the schools with comparatively ubiquitous internet access, the ICT coordinator in the school reported that internet could be accessed in most parts of the school except the school hostels. However, students were not allowed to access internet on their own due to lack of knowledge and skills and lack of school internet policy. For example during the interview, the coordinator explained that (Excerpt 153):

Although slow, we can access the internet in most parts of the school. Teachers have been connected through personal laptops and tablets. With students, teachers have to research for them and share information with them. Most don’t know how to use it. We still have to teach them but time is limited and resources of course. But we also need to have a policy to manage their access.

4.7.5 Provision of ICT technical support

Maitlamo identifies technical support as one of the essential components to be provided through the *Thuto Net* programme. This study sought to find out about what is in place regarding technical support to promote ICT integration into the school curriculum.

School visits during the data collection process revealed that each school had been provided with a school-based ICT programmer. During interviews with some of the programmers, they revealed that they were responsible for maintaining the school network. For example, one school-based programmer remarked that (Excerpt 154): “I maintain the

school network, fix networking problems and provide general technical assistance to school staff’.

Teachers were asked about the sufficiency of ICT technical support they received (Q1k). A majority 70 (51.5%) of teachers generally disagreed (GD) that technical support was sufficient, a sizeable number 55 (40.4%) generally agreed (GA) while 11 (8.9%) said they were not sure (NS).

During interviews and focus group discussions, teachers agreed that the school-based programmers and ICT coordinators did not provide sufficient technical support. Teachers felt that one programmer per school resulted in the programmers not offering adequate support. They also opined that the situation might be more evident if ICT integration takes off. Interviews with individual teachers produced similar opinions. For example, during an interview, a teacher participant argued that (Excerpt 155):

We experience ICT technical problems on regular basis. Now, when the programmer is away, everything comes to a standstill. Imagine if we had started integrating ICT into different subject areas! At least two would do so that when one is not in the other can provide the assistance we need.

Interviews with school-based programmers produced no different results. They agreed that they needed more manpower. For example, one programmer stated that (Excerpt 156): “I am always away searching for assistance in the region. It means nobody is left to assist them in case they experience difficulties”.

Similarly, teachers revealed that both the school-based programmers and ICT coordinators were not adequately trained to deal with technical problems. According to teachers, this had negative implications for ICT integration into the school curriculum.

During focus group discussion, a participant teacher remarked that (Excerpt 157): “I doubt if the programmers can solve all the technical problems they are confronted with. Right now, they have failed in a long time to solve some server problem which is why the computers are not working”. Other participants took turns to cite examples in agreement.

Sharing a similar observation, an interviewed teacher observed that the programmers and the coordinators were equally not comfortable with computer applications to offer sufficient assistance. For example, a participant teacher shared their experience and remarked (Excerpt 158): “We don’t have readymade software for recording and analyzing marks and creating student reports like other schools. So we asked for their assistance during the design of the template. They couldn’t assist until we formed a team as a cluster to design that”.

Interviewed school management teams confirmed this observation. They felt that the school-based programmers and ICT coordinators needed more training on server related problems and computer applications to sufficiently assist staff members in the event that ICT integration into the school curriculum take off. For example, a deputy School Head suggested that (Excerpt 159): “Our programmers and ICT coordinators still can’t solve the ICT challenges we face in our schools. I don’t know, but I doubt if they were satisfactorily trained... perhaps they were not trained on some of these areas”.

In response to question 2 (e) which asked them about the extent to which they were able to solve all technical problems, 6 of the school-based programmers generally disagreed (GD) while a smaller number, 3 generally agreed (GA). Technical problems related to server 12 were among other technical problems cited by the programmers as beyond their expertise. During an interview, one programmer stated that (Excerpt 160):

We still are unable to solve most technical problems we experience with server 12. It's sensitive to harsh weather condition and often automatically switches off during these conditions. When rebooted, it shows a technical error that we are unable to resolve.

The programmers further revealed that external technical assistance particularly regarding servers was not sufficient and consistently slow, often taking more than a year. For example, in one school where the server had broken down for over a year, the school-based programmer remarked that (Excerpt 161): “We experienced a technical fault with our server more than a year ago. Although we reported and made several follow ups, we have not received any assistance”.

On a slightly different note, the interviewed programmers claimed that comparatively, external technical assistance was more forthcoming and fairly quick when reported faults concern the administration block. For example, one programmer remarked that (Excerpt 162): “I have observed that assistance is much better when I report faults with the admin block server. They try their best and restore the server quickly. When it affects students, it's rather very slow”. Sharing a similar observation, another interviewed programmer cited the example of air conditioners in the computer laboratory (Excerpt 163): “I think external assistance is quicker when I report cases dealing with the admin block. I reported the air conditioners in the computer lab years ago, nothing has been done. When we reported the one in the bursar's office, it was quickly attended to”.

4.8 Maitlamo and learners' acquisition of ICT skills

Research Question 4: How does Maitlamo influence learner acquisition of appropriate ICT skills for labour market?

Maitlamo emphasizes the transformation of the country from agro based to knowledge-based economy. Effectively, *Maitlamo* forms the confluence of multiple important policy documents: RNPE (1994), Visions 2016 and 2036, ETSSP (2015-2020) and NCAF (2015). These policy documents resonate with *Maitlamo* and recognize the critical role of technology in the envisaged economic transformation. In different ways, these policy documents heighten the importance of skills development among learners in readiness for the world of work.

Specifically, *Maitlamo* aimed to develop local skills and expertise “... with particular emphasis on development of ICT skills in children and young adults... Government will expose children to highly effective education in ICT.” (p.13). The policy aimed to equip learners with technical and application skills. ICT use in learning and teaching is associated with the promotion of 21st century skills.

This study sought to find out about the extent to which *Maitlamo* influences learner acquisition of appropriate ICT skills for labour market at the JSS level. Data for research question 4 was solicited quantitatively and qualitatively. Questionnaires were administered to teachers, ICT coordinators, school-based programmers and SMTs. Some of the above participants simultaneously participated in face to face interviews and focus group discussions. The interviews were extended to the curriculum and BEC officers while and focus group discussions included students.

4.8.1 Provision of opportunities for learner acquisition of ICT skills

The first objective of this study was to find out the extent to which teachers provided students with opportunities to use ICT in learning to acquire ICT skills specifically and 21st century skills in general. Table 20 presents results.

Table 20: School participants' views on opportunities for students' acquisition of ICT competencies

	GA	GD	NS	Totals
Apply computer skills	49 (36.0%)	78 (57.4%)	9 (6.6%)	136 (100%)
Use ICTs collaboratively	53 (39%)	74 (54.4%)	9 (6.6%)	137 (100%)
Communicate using ICTs	25 (18.4%)	101 (74.3%)	10 (7.4%)	138 (100%)
Demonstrate creativity	29 (21.3%)	93 (68.4%)	14 (10.3%)	139 (100%)
Use ICTs in problem solving	31 (15.4%)	91 (66.9%)	14 (10.3%)	140 (100%)
Acquire skills and competencies	29 (21.3%)	93 (68.4%)	14 (10.3%)	141 (100%)

The findings in table 20 indicate a clear trend that a majority of teachers generally disagreed that they provided students with opportunities to use ICT in different activities for them to acquire ICT competencies. For example, 78 (57.4%) teachers, 101 (74%) and 91 (66.9%) generally disagreed (GD) that they provided students with opportunities to apply computer skills, use ICTs for communication and solve problems respectively. A small number of teachers generally agreed. For example, 49 (36.0%), 25 (18.4%) and 31 (15.4%) generally agreed (GA) that they provided students with opportunities to apply computer skills, use ICTs for communication and solve problems respectively. In the same areas, a smaller number of teachers indicated that they were not sure (NS) whether or not they provided students with opportunities to use ICTs in a variety of ways: 9 (6.6%), 10 (7.4%) and 14 (10.3%).

During interviews and focus group discussions, teachers corroborated the survey results, agreeing that they did not provide students with opportunities to use ICTs in their learning. In fact, they raised the same issues discussed earlier in the previous questions, insisting that individually and or collectively each of the issues impacted negatively or positively on learner acquisition of ICT skills. As a result, teachers maintained that integrating ICT into teaching and learning was prematurely introduced in junior schools. For example, one participant teacher summed it up during an interview observing that (Excerpt 164):

I think ICT integration was prematurely introduced in schools. I don't think the curriculum developers know about the situation in schools. They should have asked us or visited schools to find out. We need a system change in the way things are done now. Training on ICT integration is very important...management must fully support ICT use in all activities...curriculum content should be reduced...

During further interviews, teachers insisted that the use of computers in various ways also demanded that students have sufficient skills to work with computers from grassroots. For example one Art teacher involved in final examination projects for practical subjects observed that (Excerpt 165):

Typing projects is one chance during which students get to use computers in different ways depending on the student's project. We normally assist them and... well, literally do most of the work for them because they don't have computer use skills. I think a lot has to be done to equip learners with basic skills at lower levels.

Reiterating a similar view, another teacher revealed during an interview that using computers in the learning process would reduce the pace at which students work. The participant stressed that subject content should not be conflicted with ICT skills. For instance,

the participant highlighted that (Excerpt 166): “Using computers for learning requires knowledge of computer use. Otherwise we would spend time teaching computer skills and compromise content which is also important. I should use computers to enhance learning of what I teach and not teach computers”.

During focus group discussions, teachers made particular reference to reduced class sizes for effective learning and acquisition of skills by learners. Participants emphasized careful monitoring and evaluation of learner skills insisting that dealing with large classes might not permit these. Participants further agreed that classroom management might be a challenge when too many students are involved especially because “students are excited by ICT”.

During interviews, coordinators concurred that students did not have adequate computer skills to effectively use them for learning. They emphasized that the projects activity should not be misconstrued for ICT integration and that students hardly learnt during that time. For example, one ICT coordinator averred that (Excerpt 167):

This is a once in a while activity, only in form 3 when students work on projects. At the time, the students are not learning... it's not time for learning...they focus on getting the work done. And, yah, how much really can they learn one afternoon in a week.

On a slightly different note, one interviewed School Head underscored the importance of continuity in the use of ICT for learning. The participant argued that use of computers should extend to home use for sustained learning and skills acquisition. To illustrate students' use of internet in learning, the participant used the analogy of the old slate arguing that access to the internet should not end at school. For instance, the participant described that (Excerpt 168):

These are issues of sustainability. Use of internet should not be like our slate in which you wrote and when it gets filled you erase everything...Home internet access should be possible for learning to continue outside school and students can show progress in acquiring ICT skills through assignments...I hope it will be possible.

Somewhat verifying the assertions, the interviewed curriculum officer expressed optimism that developments in education resulting in new policies would provide solutions to current challenges. For example, the officer referred specifically to the Education and Training Sector Strategic Plan (ETSSP) and National Curriculum and Assessment Framework (NCAF) stating that (Excerpt 169):

... But I think all these problems will be solved with the ETSSP approach... and NCAF...they emphasize ICT... students will be working on their own and at their own pace. Teachers will be facilitators... reduction of class sizes which will have to be resolved... because supervising students' projects requires smaller groups. This will also require teacher training and change mindset. Outcomes based education will drive us there.

4.8.2 Computer Awareness programme and learner acquisition of ICT skills

This particular objective of the study aimed to find out the extent to which the CAP promoted learner acquisition of ICT skills.

Different participants disclosed during interviews and focus group discussions that students left JSSs without having adequate ICT skills. Further, they revealed that since inception, the CAP had never been effectively taught to equip learners with any useful ICT skills. During an interview, one ICT coordinator detailed how the CAP had been besieged by

problems since it started in 1998. The participant argued that the challenges affected effective teaching of the programme and invariably, learner acquisition of ICT skills. The participant explained that (Excerpt 170):

Most of the computers worked for a while and started signalling troubleshooting problems while others got very slow often freezing. ..., some of them reached the end of their life span... Gradually, more computers were lost forcing students to share in extremely large numbers of up to 8 students per computer...schools resolved to stop computer awareness lessons completely until recently when the old computers were replaced. Even then, they still experience problems of some of them not working, making sharing unavoidable yet inconveniencing students and affecting effective learning.

In another school, an ICT coordinator who confirmed the observation retorted that (Excerpt 171):

In our school, our computers are not working as you can see. Before the arrival of these new ones, the old ones had stopped working. Obviously, these students will complete junior secondary education with no ICT skills...computer awareness is not taught. There is no how we can integrate it and it's obvious they will not acquire any ICT skills.

Echoing a similar observation, an interviewed deputy School Head remarked (Excerpt 172):

Students don't have enough ICT resources to learn with. Teachers are not trained. As management, we can't do much because we have no idea how computers should be appropriately taught. I don't think the Government is serious about the computer awareness subject and students' ICT skills.

During focus group discussions, students confirmed that they were not acquiring any ICT skills. In fact in one school, the investigator found a bold notice on the computer awareness entrance written “THE COMPUTERS ARE TEMPORARILY NOT IN USE UNTIL FURTHER NOTICE. THANK YOU”. Students in this school confirmed that the notice had been there for close to two years and that the computers had not been working for the same period. Students showed awareness of the importance of computer literacy, expressing the concern that they were disadvantaged. The following include summarized comments they wrote (Excerpt 173):

“We found the notice when we started form one...We have attended any computer awareness lessons...Computer skills are important for future careers...We are not learning anything in computers...Without the computer skills, we will not be able to compete with others who will have the skills”.

During focus group discussion with another group of students who attended computer awareness lessons, they complained that they were not acquiring any satisfactory ICT skills. They suggested mostly (Excerpt 174): “We learn theory...Sometimes we are asked to do what we like...We never complete practical activities...We miss a lot of computer awareness lessons”.

The interviewed curriculum officer also confirmed that students completed basic education without any ICT skills. The officer concurred that students were mostly taught theory. For example, the officer observed that (Excerpt 175): “In most cases, its theory and theory, no practical. At times through spot checks in schools, we find form one students in the lab yearning to learn how to use computers. But there will be no one to guide them”.

Somewhat confirming this observation, ICT coordinators and teachers revealed during interviews that the CAP had never had qualified and dedicated teachers. The general

consensus among participants was that reliance on volunteering teachers contributed to ineffective teaching of the programme. Further, participants indicated that most of these teachers had since lost interest in teaching the subject while some with relevant ICT competency were not allowed to teach it. Some of these teachers indicated during interviews that they had studied Computer Education at MCE and were competent to teach computer awareness. However, they blamed the Teaching Service Management (TSM) employment policy which they suggested employed them on the basis of their major subjects. They explained that as a result, this denied them the opportunity to teach their minor subjects such as the CAP and Library Studies even if they wanted to. Incidentally, these were the teachers who claimed to have offered assistance to teach the programme. For example, a participant teacher stated that (Excerpt 176):

“First of all, we are employed and posted to schools on the basis of which subjects we majored in. So, we are not allowed in schools to teach our minor subjects unless we volunteer like I used to ... not anymore because of my workload... um...and a lot of other things...no one appreciates our efforts...our workload is not reduced...they prefer people who have done two week computer courses...”

Similarly, all participants revealed that as a consequence of this development and across schools, the CAP was only taught by a senior teacher who also served as the ICT coordinator. Meanwhile, ICT coordinators revealed that most of them benefitted from a two week long Government organized course on coordinating the CAP. The latter admitted that the two week course was far from sufficient to enable them to effectively carry out their mandate. A few others however, revealed that they did additional computing short courses on their own. In the meantime, confirmed the criteria used by TSM to employ teachers, charging that it needed to be reviewed as worked to their disadvantage and the programme. Likewise,

they admitted that there were teachers in schools who were sufficiently trained to teach computer awareness. According to the coordinators, these were mostly teachers who volunteered to teach the programme. Similarly and in agreement, ICT coordinators vehemently argued that the work was overwhelming and compromised effective teaching of the programme as well as students' acquisition of ICT skills. For example, a participant ICT coordinator said (Excerpt 177): "...teachers with appropriate skills for teaching Computer Awareness have stopped assisting... it's really difficult doing it alone and it suffers a lot when I am not in... for example when I am on leave...students are not taught".

Further interviews with ICT coordinators asserted that since its inception, the subject had never been taken seriously in schools by both teachers and management. For example, one ICT coordinator lamented that (Excerpt 180):

Computer Awareness lessons are sacrificed and allocated to other subject areas when the subject teachers are unable to complete their syllabuses... and lessons are constantly disrupted so that the lab can be used to host meetings... This affects students' learning and acquisition of skills.

During lesson observations, this investigator witnessed the ineffective teaching of the CAP. All the five (5) computer awareness lessons observed in 5 schools, none was effectively taught. Teachers had not planned for the lessons, theory dominated the lessons, teachers never checked on students' progress and no activity was successfully completed.

4.8.3 Stakeholders' perceptions and Computer Awareness

Maitlamo states that one of the ways of harnessing the potential of ICT is to impart skills and expertise amongst young children. In JSSs, the CAP was prescribed through the RNPE (1994) as one way through which ICT skills should be imparted to learners. The results from interviews revealed that the critical stakeholders in the schools and education sub

sector such as teachers, members of school management teams, ICT coordinators, curriculum and Botswana Examinations Council (BEC) officers do not hold the same understanding regarding the role of the CAP.

During interviews, teachers agreed that, properly taught, the CAP was important for equipping learners with basic computer skills. For example, a participant teacher argued during an interview that (Excerpt 181): “Computer awareness, if taught well, can equip learners with basic computer skills. It’s unfortunate that this is not happening...compromising students’ acquisition of these skills”.

Students concurred with most groups writing that (Excerpt 182): “We like computer awareness because we can learn how to use computers...They are used everywhere these days.” Interviewed ICT coordinators agreed but regretted the differences they have with school management and regional offices. They concluded that these differing perceptions stifled effective implementation of the CAP and negatively affected students’ acquisition of computer skills. For instance, one ICT coordinator revealed that (Excerpt 183):

We always differ with school leadership and regional education officers on the purpose of Computer Awareness... the syllabus and that it’s meant to equip students with computer skills. I think they are stuck with the word awareness and limited to that narrow understanding...that’s why they don’t support it... it’s students who suffer because they don’t acquire any computer skills.

During the interview, the curriculum officer corroborated the same observation. The officer explained that the diverse perceptions of the role of computer awareness epitomized similar diversity of perceptions about the role of ICT in the country particularly within Government circles. According to the officer, the diverse perceptions regarding the role of computer awareness inversely impacted on implementation of the ICT curriculum.

Conclusively, the officer pronounced that these contributed immensely to negative attitude towards ICT use, lack of administrative support for ICT use nationally, regionally and at local schools and non-achievement of the goal of equipping learners with ICT skills. For example, the officer observed that (Excerpt 184):

We are far from technology use due to negative of top administrators. At the lower levels, the first challenge was negative attitude by school administrators and regional management. The reason I am saying this is because in some regions you could be told that ... the subject is not examinable. Some school heads transferred teachers willing to teach the subject and all that...Computer Awareness was abandoned. This destroyed student's chance of acquiring IT skills...

At BEC, the interviewed officer's view of the CAP was that it was just an awareness course without aims, not taught in schools or associated with any skills. For example, the officer pronounced that (Excerpt 185):

...if there is any institution offering computer awareness, we expect them to be assessing their students... we don't just assess. We need to know what were the intentions of the program, what were the goals, what were the aims of this programme so that we craft our assessments based on that...

The officer continued stressing that their understanding of computer awareness at BEC was that it was simply awareness course that (Excerpt 186):

...possible learners should be exposed to computers. So it's merely exposure ... just trying to show students that we live technology. That is why some would just show them the hardware to say this is a monitor, a mouse and so on.

4.8.4 Stakeholders' perceptions and integration of Computer Awareness and ICT

In JSSs, the integration of the CAP was prescribed by the revised junior secondary curriculum (2008) as one other way through which ICT skills are imparted to learners. The results from interviews and survey revealed lack of uniformity in the understanding of the purpose of integrating the CAP across the different subject areas among important stakeholders in the schools and education sub-sector.

During focus group discussions, teachers held divergent perceptions regarding the integration of the CAP. From the somewhat heated debate, it became apparent that among others, the controversy emanated from the way the objectives were structured in different syllabi. A subsequent analysis of the ICT objectives revealed that some objectives were specific, subject matter relevant and applicable to the subject areas. For example in Mathematics, one objective states that “learners should be able to use a spreadsheet to draw bar graphs, pie charts and line graphs”. In contrast, others were generic and not applicable to their subject areas. For example in Art one objective states that “learners should be able to discuss contemporary and emerging issues including ICT”. Meanwhile, some of the teachers highly supported its integration in teaching and learning as one way of providing learners with the chance to have more contact with computers. This group also argued that learners would have the chance to learn how to use computers in different subjects. Similar observations were replicated during interviews with participant teachers. For example, a participant teacher said that (Excerpt 187): “This would provide them with increased chances to practice more with computers. Repeating certain activities allows them to master learnt skills and apply some skills in different subjects”.

In contrast, others were unconvinced about the benefits integrating CAP and viewed it as ‘duplication’ and ‘a waste of their time’ which they could otherwise channel towards the completion of syllabuses. However, these participants raised question about contextualization

of the integration. For instance, a participant teacher remarked during an interview that (Excerpt 188): “This will mean wasting time repeating what would have been taught. I personally feel I can do it as long as I understand its contribution to students’ learning of my subject area...not to re teach computer awareness”.

Somewhat differently, other teachers were not particularly averse to integrating the CAP but were displeased with the proposed approach to ICT integration. During interviews, they complained that the approach was too prescriptive, stifled creative use of ICT for classroom practices and limited students’ acquisition of skills. For example, a Mathematics teacher observed that (Excerpt 190):

What has been suggested is very limited use of ICT for a subject like Maths... one ICT objective in a year... there are so many areas in Maths where students can learn using computers... and acquire more skills...they should have been more flexible... to allow us to choose when and how to use computers...

Similar reactions were reflected in teachers’ responses to two related questions (Q6 b, g & j). Questions 6 (g) and 6 (j) respectively asked teachers about the extent to which they viewed integrating computers as likely to increase their workload and the extent to which it felt like an extra burden to them. The results are presented in table 21.

Table 21: Teacher perceptions of integrating CAP

	GA	GD	NS	Total
i) Increases my workload	47 (34.6%)	62 (45.6%)	27 (19.9%)	136 (100%)
ii) Is like an extra burden to me	30 (22.1%)	79 (58.1%)	27 (19.9%)	136 (100%)

The results in table 21 suggested that a majority 62 and 79 (45.6% and 58.1%) of teachers generally disagreed (GD) that integrating CAP neither increased their workload nor felt like an extra burden to them respectively. A sizeable numbers 47 and 30 (34.6% and 22.1%) of teachers, generally agreed (GA) that it increased their workload and felt like a burden respectively while the same numbers 27 (19.9%) said they were not sure (NS) about either case.

Chapter Summary

The chapter presented the qualitative and quantitative data regarding the *Maitlamo* policy influence on the integration of ICT into the JSS curriculum. The presentation was guided by the research questions. For each question, the qualitative and quantitative data sets were merged to permit constant comparison, agreements and deviations. The chapter presented data on implementation of the ICT curriculum and related variables: organizational culture and school operations and practices. It also presented results on teacher preparation for ICT integration: professional ICT development, its adequacy and policy. Further, the chapter presented results on provision of ICT resources for ICT integration: adequacy, reliability and accessibility of the resources. The final set of results covered learner acquisition of appropriate ICT skills, provision of opportunities for learner acquisition of ICT skills and stakeholder perceptions of ICT curriculum.

CHAPTER FIVE: DISCUSSION, STUDY IMPLICATIONS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Overview

This chapter discusses the research findings, implications, conclusions and recommendations. The discussion is guided by the research questions and themes arising from the data analysis. The purpose of this study was to assess congruence between ICT policy intentions and classrooms practices regarding the integration of Computer Awareness Programme (CAP) into the junior secondary school (JSS) curriculum. This was carried out by examining the implementation of the ICT curriculum, teacher preparation, and provision of ICT resources and acquisition of ICT skills by learners in juxtaposition with *Maitlamo* statements. The Extended Design Actuality Gaps (EDAG) model was used as the evaluative framework for this study. The model is used to assess policy performance by reflecting on what has been achieved against what was intended. The study utilized the pragmatic paradigm of the mixed method hence combining the qualitative and quantitative approaches to obtain a holistic picture regarding integration of ICT and specifically computer awareness into the school curriculum.

The results indicated that there is mismatch between theory and practice relating to the integration of ICT into teaching and learning. ICT integration is faced with multiple and interwoven challenges such as inadequate teacher professional development and insufficient ICT resources. These factors negatively impact on successful implementation. As a result learners do not seem to acquire useful ICT functional skills.

The discussion of the findings integrates themes and subthemes derived from the research objectives. It also captures underlying thoughts from literature and theoretical grounding of this research study. The four major themes which emerged are: the provision of

ICT infrastructure, ICT teacher preparation, implementation of ICT integration and acquisition of ICT skills by learners.

5.2 Maitlamo and ICT infrastructure

As part of implementing the *Thuto Net* programmes, *Maitlamo* sought to provide schools with adequate ICT infrastructure. This comprised computers, network and telecommunication services, internet connectivity and electricity. The results for this study are mixed, revealing notable positive aspects and inherent contradictions in the provision of ICT infrastructure and resources to schools. Observations and research participants attested to concerted efforts regarding the provision of ICT infrastructure as well as technical support to JSSs. Nonetheless, participants expressed concerns about the slow and inconsistent process of providing the same. It is evident that the ICT infrastructure that is provided is inadequate to support effective ICT integration into the school curriculum. For instance, participants indicated that there has not been significant increase in the ICT resources provided to schools. This marks a substantial implementation gap in terms of what schools are provided as opposed to their requirements.

The above observations are inconsistent with what is suggested in the main theoretical framework guiding this study (Baqir, 2009). The extended design actuality gaps framework underscores the availability of ICT infrastructure as a crucial input for successful ICT integration. Compared to emerging and developed counterparts, developing countries still face the challenge of providing ICT resources to schools (Chikati et al., 2013; Khan et al., 2012; Nkhwalume, 2013). The following section provides detailed discussions of this finding.

5.2.1 Computer hardware, software and internet connectivity

The study revealed that all the JSSs are provided with a standardized package of computers, software and internet connectivity infrastructure irrespective of their location and

size. This study's results indicate that issues of school size and location should be considered when ICT resources are provided to schools. In other words, the standardization of ICT resources provided to schools veils possible inequities observed by Ratsatsi (2002). For instance, shortage in an 18 stream school (largest school in terms of student intake) may be more pronounced than in a 6 stream school (smallest school in terms of student intake). Larger schools have larger number of students and often classes and staff. Constant breakdown of ICT resources such as computers and servers experienced particularly in remote schools coupled with delayed technical support requires consideration in the provision of these resources. These have negative implications for equity and access to ICT resources. The status quo is bound to impact teaching and learning especially in large schools where issues of sharing might be escalated, constraining effective learning. In particular, evidence suggested that compared to their counterparts in urban environments, students, particularly in remote schools only relied on schools to gain access to ICT resources. Overall, this is likely to impact on their performance.

What has come out of the fieldwork is that the available ICT resources in schools do not support the effective teaching of the CAP and the integration of ICT across the different subjects. In fact, these findings are congruent with similar observations by several other studies (Batane, 2006; Nkhwalume, 2013; Republic of Botswana, 2016; Sithole & Lumadi, 2012) which decried the inadequate supply of computers and associated ICT resources to schools.

Generally, the results of this study suggest that the provision of the standard Microsoft Office (MS) for teaching and learning does not cater for the needs of all subjects offered in JSS curriculum. Although the study participants appreciated the utility of the package, they however revealed that it has limitations for some of the practical subjects. This shows that some of the subjects require specialized and dedicated computer software. This finding is not

surprising because *Maitlamo* does not make any pronouncement on procurement of relevant software for specified subjects.

On a different note, this investigator found that for administrative purposes, some schools managed to secure specialized software such as ED-Admin. The software is tailor made to keep progress records for students, assist in performance analysis and report creation. However, this study did not establish why some schools were able to afford the specialized software while others could not. Such disparity is unexpected in public schools funded by the same Government.

As stated earlier, ideally all the JSSs should have access to internet connectivity infrastructure. However, this study revealed that internet connectivity was severely challenged in most of the schools. What compounded this situation was lack of broadband connectivity and limited network services in schools. This finding corroborates a similar finding by Sithole and Lumadi (2012) who observed challenges regarding schools' internet connectivity. Internet connectivity in most schools is through satellite dishes for students and teachers. The school administration areas are connected to the Government Data Network (GDN) through the Government Accounting and Budgeting System (GABS). Although schools have the ICT related infrastructure, not all of them have been catered for. One school in particular had no hope of attaining internet connection since it did not have the requisite infrastructure and had been informed that their school was outside the internet connectivity map. Ironically, a short distance away from the school, the village library has WIFI internet connectivity.

In a few other JSSs, provision for internet connection has not been done. The related infrastructure to support internet connection remains incomplete with no indication that the contractor would complete the project in the near future. Interestingly, some of the study

participants blamed school management for not following up on completion of ICT related infrastructure. This essentially puts into question the effectiveness of Government's monitoring systems to ensure that companies awarded Government tenders complete jobs assigned to them (Baqir, 2009; Tatto, 2012).

Another challenge relates to the shoddy work around internet connectivity, the result of which is erratic, unreliable and slow internet to efficiently support teaching and learning. In fact, some of school administrators claimed that they had given up on the GABS and reverted to manual forms of communication. Others waited patiently in case they were lucky to gain access or get tangible assistance. Given that *Maitlamo* technically provides for all the JSSs to be connected to efficient internet either through narrow or broadband depending on the school size, this according Baqir, (2009) and Heeks (2002) represents partial failure in terms of the project implementation cycle. It also has the long-term effect of stifling progress towards successful implementation of the *Thuto Net* initiative with the view of helping to integrate the use of ICT to improve teaching and learning.

Further, the findings show that the impact of lack of or slow internet was more pronounced in remote JSSs especially where there were no prescribed textbooks to support teaching and learning. As stated earlier, this presents and embodies an equity challenge. In extreme cases, teachers relied, with limited success, on colleagues in schools with internet connectivity. Without prescribed texts and internet connectivity, teaching and learning are bound to suffer. Similarly, this is likely to affect the morale of both staff and students especially if they find that their counterparts in other schools have internet connection which is also comparatively fast. Low morale among staff and students leads to frustration which might negatively influence the school's performance. In fact, Ratsatsi's (2002) study highlights the importance of wireless connectivity (WIFI) as a pre-condition for effective acquisition of ICT skills and competencies.

5.2.2 Maintenance and replacement of ICT resources in schools

It was observed that the degree to which *Maitlamo* can significantly impact on successful integration of ICT into teaching and learning is partly undermined by poor maintenance and replacement of ICT resources in schools. The findings of this study revealed that it took up to almost two decades to replace the old computers which had reached the end of their life span. Given the limited information that is available at school-level, this study could not establish the justification for the delay in replacing old computers. Similarly, it was not easy to establish why Government lacks the political will to increase the quantities of ICT related resources to be proportional with the size of the schools and also take into account the rural-urban location. This situation is not helped by the fact that *Maitlamo* does not clearly articulate the plan for maintenance and replacements of the ICT resources.

As stated earlier in the study, technical assistance is also not readily available especially in remote and rural areas. This investigator was alerted of instances of technical assistance which had been pending for close to two years in at least three schools. In one of the cases, this investigator witnessed school-based programmers personally transporting the server to the regional offices for technical assistance. Subsequent reports showed that they were unsuccessful in getting the assistance they sought. Similarly, evidence suggested that the one school-based computer programmer and an ICT coordinator per school standard coupled with their weak competencies rendered technical support inadequate to effectively cater for cross curricula ICT integration. The programmers were not fully capacitated to solve all server related technical problems. The ICT coordinator also doubled as the CAP teacher and was ever engaged to provide sufficient assistance and mentorship to teachers (Kopcha, 2012). The CAP lessons were sometimes stopped for extended periods exceeding two years. Invariably, students' learning was disrupted. Although *Maitlamo* identifies technical support

as one important area requisite for successful ICT integration, it has not done enough to address the area.

5.2.3 Sustainability of ICT-related resources

Evidence suggests that the extent to which Botswana Government can successfully sustain the provision of ICT-related resources to all the 207 junior secondary schools is problematic since it is a costly exercise. As such, the Government might be forced to rely on donor support to sustain the procurement of new infrastructure. This probability is heightened by at least three observations: i) that initially CAP was implemented as a joint venture between USAID and Botswana Government (Garegae & Moalosi, 2011), ii) *Maitlamo* envisaged exploring the acquisition of surplus computers from external forces and iii) the current challenge of competing national demands but limited financial resources (Al'Abri, 2011; Kozma, 2005). Against this backdrop, it remains to be seen how the Government hoped to address the sustainability gap in integrating ICT into education and other sectors of the economy. The question that remains is the adequacy and sustainability of the political enthusiasm (Baqir, 2009; Heeks, 2002) to realize the practical success of ICT integration in education.

5.2.4 Government-private sector partnership

This study revealed that the *Computers for schools* initiative is one of the ways through which the Government sought to augment its efforts to provide ICT resources to schools. It sought to take on board the private sector, civil society organizations, parastatal enterprises and individuals to assist in terms of the provision of financial and material resources as a gesture of social responsibility to support the integration of ICT into teaching and learning. This study revealed that donations of ICT infrastructure have so far included computers and computer peripherals and internet connectivity gadgets such as 3G modems. One of the major drawbacks associated with donations as observed in this study is that only a

few selected schools stand to benefit from such initiatives. It is practically difficult for the Government to dictate to the beneficiaries of private donations regarding whom and what to donate. Arguably, donations have the long term potential of creating imbalances in terms of ICT resources in schools. However, observations indicated that the reality is that generally the JSSs which have received private donations are not substantially better off given the small nature of the donations. In some instances, issues of maintenance have cropped up since privately donated ICT resources were not incorporated into the Government inventories.

5.2.5 Computer laboratories: One computer lab per school policy

Evidence suggests that the Government's administrative policy of one computer laboratory per school cannot sustain the teaching of the CAP and ICT integration across the different subjects. This situation was compounded by the fact that most JSSs have few functional computers and printers deployed in the computer laboratory. The same computers cater for CAP and the integration of ICT across the different subjects. There is also no need to reemphasize limited access to the internet. School libraries did not have computers and in some schools old computers were assigned to teachers in staff rooms and Heads of Departments' offices. The tendency in some schools was to use computer laboratories as meeting rooms. This has been observed to compromise CAP lessons and deny students the opportunity to learn.

The limited ICT resources which are also confined to one place constrain access to the resources as observed by several other studies (Batane, 2006; Nkhwilume, 2013; Sithole & Lumadi, 2012). Access to ICT resources is a critical antecedent to ICT integration into the school curriculum (Baqir, 2009; Kozma, 2008). This study revealed that students had no access to the computers outside lessons. During lessons, teachers and students competed for the few ICT resources. The situation was not helped by lack of codified ICT resources deployment frameworks to guide the allocation of resources in schools. Even in schools that

were comparatively resourced, evidence suggested cases of non-use due to lack of guidelines on deployment of ICT resources. This situation has implications for successful integration of ICT into teaching and learning. It also represents a substantial gap in terms of the available ICT resources and the degree to which schools can effectively equip learners with appropriate ICT skills for the work environment.

5.2.6 Electricity supply

The observations by this investigator and the information obtained from the research participants indicate substantial improvement in the supply of electricity to schools compared to previous years which were characterized by frequent disruptions and load shedding. Although comparatively stable, electricity supply in all the sampled JSSs was not fully reliable. Study participants revealed that they still experienced unannounced power cuts and unregulated power surges resulting from maintenance related work and technical faults. Unexpected power cuts disrupt lessons, lead to loss of valuable teaching and learning time and sometimes unsaved data, creating uncertainties among teachers who plan to use ICT during lessons (Kopcha, 2012). Research participants also reported multiple cases of damaged ICT resources caused by electric faults and unregulated power surges. Some schools reported frequent internet failure and damage to computers and related devices such as printers and scanners. In an extreme case, one school claimed to have lost up to 16 computers due to power related problems. The power cuts and associated electric faults not only damage ICT resources but also undermine Government's effort to ensure reliable supply of electricity and the provision of adequate ICT resources.

5.3 Quality of pre-service ICT training

The study found that pre-service teacher training at secondary colleges of education was inconsistent and ineffective to guarantee meaningful ICT training for all graduates. This

stemmed from a combination of two related challenges: lack of requisite ICT competencies among teacher educators and incoherent and weak ICT teacher training programmes at colleges of education. This weak teacher training is a cause for concern in the broader picture of ICT integration in Botswana's education. It also indicates a substantial gap in teacher training in terms of ICT integration and what is envisaged.

Inconsistent and ineffective teacher preparation contrasts with Mishra and Koehler's (2008) TPACK model. The model sees teachers as critical inputs for successful integration of ICT. It anticipates a teacher professional training system that produces well trained ICT competent teachers, well-grounded in subject content and appropriate teaching approaches. Extensive literature highlights comprehensive teacher preparation as an invaluable factor for the success of ICT integration. Basically, pre-service teacher training must produce ICT competent teachers who can creatively use ICT in their classroom practices to enhance learning and teaching (Bingimlas, 2009; Harris et al., 2009; Hosman, 2010; Keengwe et al., 2008; Laronde, 2010). The following sections discuss contextualized findings to illuminate the major finding stated above.

5.3.1 Teacher educators' ICT competencies

The results of this study suggest that teacher educators at colleges of education lack requisite ICT competencies to model ICT integration during pre-service teacher preparation. Study participants agreed that some had not received any ICT training at all and lacked basic ICT use skills. Most never received training on ICT integration in learning and teaching. Very few had sound competencies to integrate ICT. In at least one case, a department ignored a prescription by the then Ministry of Education to integrate ICT citing inter alia lack of ICT competencies. This means that teacher training on ICT integration is a non-starter. In a situation where teacher educators do not receive training on ICT use and integration in

education, it is unlikely that they would effectively appreciate the potential usefulness of ICT in learning and teaching. In other words, teacher trainees are more likely to complete study programmes without having been exposed to adequate training on ICT integration (Wang et al., 2014) or would complete training without a deep culture of ICT use.

Maitlamo's silence regarding the training of teacher educators does not help the situation. It ignores the reality that secondary colleges of education produce teachers for JSSs. It is during pre-service teacher preparation that effective diffusion of technology integration could be done for the benefit of teacher trainees. This would increase the likelihood that the trainees will integrate technology in learning and teaching during their professional practice (Gülbahar, 2008; Tella, 2011). Otherwise, this stalls progress in terms learners' acquisition of ICT skills. This presents a potential practice gap arising from lack of professional exposure.

5.3.2 Secondary colleges of education ICT practices

This study did not establish whether or not lack of requisite ICT competencies among teacher educators in secondary colleges of education was related to the optional integration of ICT into their classroom practices. However, it established that teacher educators in non ICT based departments were not expected to integrate ICT. Only a few educators with passion and interest in ICT made efforts to use ICT for teaching purposes. Given that it was not mandatory to make ICT an integral part of their classroom practices, educators chose to ignore teaching of ICT skills because they did not feel competent to do so.

The non-use of technology in teaching and learning by secondary college lecturers contrasts with observed improvements in ICT use culture in higher education institutions in Botswana and elsewhere. In his study, Motshegwe (2014) found that most lecturers at the University of Botswana (UB) were using ICT tools for learning and teaching practices.

Similarly, in his study, Mgawi (2017) reported some use of e-Learning technologies to support face to face instruction. Other teacher preparation institutions have employed the TPACK framework to facilitate the integration of ICT (Martin, 2015) and Design Based Research (DBR) to model and enhance teachers' ICT integration capabilities (Wang et al., 2014). Yet other countries such as the United States of America (USA) have adopted and formalized the International Society for Technology in Education (ISTE) standards as guidelines for teachers to promote ICT integration in teaching and learning (Laronde, 2010).

It is not surprising that teacher educators did not expect their trainees to use ICT during their teaching practice (TP) sessions in JSSs. Study participants agreed that if a student effectively used any form of ICT during TP, they merely marveled at it and viewed such students as exceptional interns. Teacher trainees had no motivation to use ICT since it was not expected of them and did not add value to their TP performance mark. In their study, Batane and Ngwako (2017) also observed that because student teachers were not expected to use ICT in their lessons, they did not use it despite the availability of ICT resources. Non preparation of teacher trainees for ICT integration during pre-service leaves a huge gap in teacher preparation and marks the beginning of a vicious cycle of continued trials and unsustainable failure.

5.3.3 Quality of secondary colleges of education's ICT programmes

The study established that secondary colleges of education ICT programmes were ineffective to produce teachers who are competent to integrate ICT into their classroom practices. Research participants agreed that the ICT training programmes emphasized basic computer skills. Evidence suggested that these ICT skills are far too weak to enable teacher trainees to integrate ICT into teaching and learning. This piece of result is consistent with Bose's (2004) finding that computer training at secondary school colleges of education is not

effective. Mishra and Koehler (2008) accentuate that ICT teacher preparation must exceed technical literacy to include a broader understanding of technology including when and how to use it. This emphasizes preference for pre-service ICT training (Harries et al., 2009; Sang et al., 2009). Interestingly, the secondary college of education's ICT programme is limited to introduction to computer awareness. The same teacher trainees are expected to integrate ICT and CAP into their different subjects in JSSs. This is paradoxical. Ideally, teacher trainees should be more knowledgeable than their students. As such, this challenges the suitability and relevance of CAP not only at college level but also across the country's education system. It is also perhaps a benign acknowledgement that gaps in ICT knowledge and skills exist across the education ladder.

What appeared to make the situation worse was that the Communication and Study Skills (CSS) department which used to equip all teacher trainees with basic computing skills has since stopped offering this service in the two colleges. One teacher participant confirmed that: "Computer Awareness was stopped at college a year into my studies... We had not done much really..." This means most students leave secondary colleges without even basic computing skills except some skills in media creation taught as a one year course to all year one student teachers. The decision by the CSS department to stop offering the computing component means that the envisaged ICT professional development plan remains the only hope for teachers to receive ICT training which will supposedly permit them to integrate ICT into learning and teaching.

Evidence from this study also suggests that *Maitlamo* prescriptions do not go beyond equipping teachers with basic technical skills. Analysis of the policy document indicates the assumption that the acquisition of ICT knowledge and skills is synonymous with computer awareness. This puts into question the extent to which the officially sanctioned training plan can adequately prepare teachers to fully integrate ICT into learning and teaching. This study

could not explore Government's justification for its pronounced favour for the CAP over full integration of ICT into teaching and learning. Nevertheless, this investigator doubts the effectiveness of using CAP as a vehicle for transforming the country's economy from mineral-led to a knowledge-based one.

5.3.4 In-service ICT Professional development

The study found that in-service ICT professional development in the country is incoherent and ineffective. Evidence suggests the failure of *Maitlamo* to facilitate the professional development of teachers and members of school management to successfully use and manage ICT resources for teaching and learning. What appears to compound this situation is that schools lack coherent and codified ICT professional development policies. This study has demonstrated that non-implementation of the national ICT professional development plan is a precursor to the failure to fully integrate ICT in teaching and learning. These results contrast with what is envisioned by Kozma's (2008) conceptual model and Mishra and Koehlers' (2008) TPACK model. These two advocate initial ICT training during pre-service as critical antecedent for sustained professional development. In other words, continuous ICT training is required on an initial and ongoing basis (Behar & Mishra, 2015; Hosman, 2010; Sir Dorabji Tata Trust 2013).

Evidence suggested the probability that the ten year old professional development plan could be abandoned due to challenges such as acute shortage of resource personnel. Study participants also revealed the plan was unsustainable, unsystematic and uncoordinated. This heightens the possibility of in-service ICT professional development being surrendered to schools. However, this study established that schools have not been empowered to generate contextualized policies and programmes which they can sustainably implement. Study participants revealed that school-based workshops were usually ineffective and disorganized. Resource persons lacked vital knowledge and skills. This finding is consistent

with Batane's (2004). The absence of such policies and programmes coupled with weak knowledge and skills by resource personnel means that schools cannot be trusted to successfully conduct their own ICT professional development. In other words, schools are incapacitated to even conduct ICT workshops to equip staff with basic skills. There is limited collaboration with local communities to resuscitate and facilitate ongoing ICT training. The status quo can only lead to extended delays or complete discontinuation of ICT integration. This implies that learners might continue to complete basic education without having learnt how to apply ICT skills. In turn, the country's vision of becoming globally competitive through the effective use of technology will keep fizzling out.

5.4 Maitlamo: Implementation of ICT integration

Evidence suggested that key *Maitlamo* implementers were not fully conversant with the very policy they are supposed to implement. Managements' support for ICT use and integration is weak and inconsistent. School management teams (SMTs) prioritized school's overall performance and position in the regional and national league tables at the expense of ICT integration. Schools' and national assessment practices jeopardized ICT integration as subjects are dichotomized into examinable and non-examinable subjects. At the same time, reports indicated that the national curriculum incorporated too much content and many subjects to permit meaningful ICT integration and use of the preferred learner oriented methods. These interlocking challenges are worrisome in the broader picture of ICT integration in education in the country. This illustrates significant gaps in what actually happens in schools as opposed what is expected of them.

5.4.1 Stakeholders' knowledge: *Maitlamo* and integration

This study found that the majority of study participants were not well acquainted with *Maitlamo*. Their knowledge of *Thuto Net* which provides the framework for ICT at school level was weak. In fact, the study participants consistently complained that they were not

consulted during the policy formulation process. This limited knowledge of such a policy by people who are supposed to be key drivers of the implementation process is a cause for concern in the larger picture of integrating technology in education in the country. This indicates a substantial gap between what is happening in schools and what is on paper.

This observation that the people who are expected to implement the policy are not familiar with it contradicts the extended design actuality gaps model (EDAG) (Baqir, 2009) which suggests that successful integration of technology requires greater similarities between policy intentions and what actually happens during implementation. This presupposes that implementers participate in the formulation of the ICT framework to have a good understanding of the policy and its broad aims. *Maitlamo* has to provide the guiding framework for the implementers. Past studies indicate that ICT policies are put in place to regulate ICT related projects (Zlotnikova & Weide, 2011). Specifically, educational ICT policies provide the rationale, goals, direction, shared vision and guidelines for long term national socio economic development (Ang'ondi, 2010).

Evidence suggests that there was inadequate consultation during the formulation of *Maitlamo*. Study participants confirmed lack of knowledge of the *Maitlamo* policy, its aims and *Thuto Net*. Schools do not have copies of *Maitlamo* and study participants had barely heard about it. Schools do not have coherent ICT frameworks to guide implementation and effective ICT integration. This indicates that the policy makers have not made sufficient efforts to allow the policy to trickle down to the schools for contextual interpretation by key stakeholders on the ground. Hence it is problematic for schools to operationalize *Maitlamo* (Tondeur et al., 2008; Howlett et al., 2015). In other words, despite the Botswana's centralized education system (Maruatona, 2002), it would make sense for teachers and SMTs to be actively involved in the design of the ICT framework (Baqir, 2009). The buy in of stakeholders is dependent on their sense of ownership of the policy (Tondeur et al., 2008).

These results were unexpected given that officially “the National ICT Policy has been developed after extensive consultation with people of Botswana....To date over twelve hundred representing a cross section of our society have been engaged in the development of this Policy” (Republic of Botswana, 2007, p.6). This claim puts into question the extensiveness of the consultation process during the policy formulation stage. What compounds this situation are three observations that i) details of the consultation process are not readily accessible, ii) in Botswana, consultation and active engagement of critical stakeholders in policy formulation remains symbolic (Obasi & Lekorwe, 2014) and dominated by technocrats (Mwansa, et al., 1998) and that iii) *Maitlamo* lists the design and coordination of the *Thuto Net* programme and ICT promotion and awareness campaign under fast track initiatives.

Fast tracking the implementation of *Thuto Net* could have easily resulted in omissions and oversights (Howlett et al., 2015). Lack of/and inadequate consultation and policy diffusion only widens the design actuality gaps (Baqir, 2009; Heeks, 2002) and provides ample room for resistance during the implementation stage. This evokes the suspicion that the policy design was dominated by technocrats. Unlike in cases where people know about the policy but are unable to put it to action, in this case it is a nonstarter since very little was done to sell it to the key stakeholders. This situation has implications for the achievement of integrating ICT into the school curriculum, more importantly equipping learners with relevant ICT skills required in the labour market and broadly, contributing to the transition of Botswana’s economy from a mineral-led to knowledge-based economy.

5.4.2 Management support for ICT integration

While other studies such as Nkhwalume (2013) reported general lack of administrative support, this study established that management support for ICT use and integration was weak and inconsistent. Study participants indicated that school management

support for ICT use and integration differed from one school to the next. There were also indications that school management only supported ICT integration for administrative purposes specifically record keeping of students' continuous assessment marks and generation of students' progress reports. The variations in management support for ICT use and integration show a gap in management's preferences in terms of areas in which technology can be used and integrated as opposed to what the policy suggests. *Maitlamo* and other related policy documents such as ETSSP preach ICT integration into learning and teaching and the long term vision of building knowledge-based society.

Evidence points to the potential of personal preferences in overriding policy intentions and in some instances disrupting policy implementation. The role of SMTs in promoting successful ICT integration cannot be overstated (Baqir, 2009; Republic of Botswana, 2013; 2016). In the context of this study, SMTs with the support of regional and national education offices are expected to spearhead crosscutting technology integration and help build a culture of ICT use in schools. However, in this case, there are glaring disparities in terms of management's support for ICT use and integration. There were positive instances where some of the school management teams supported ICT integration. However, selective management support or where it was nonexistent appeared to stifle progress in building the culture of ICT integration in schools. It also denied students the opportunity to acquire ICT skills required in the work place. To the extent that teachers in some schools are reprimanded for using computers to design lesson plans or schemes of work as revealed by research participants is antithetical to the national ICT policy aspirations.

These differences among school management teams are intriguing for two reasons i) *Maitlamo* highlights the critical role of school management in leading ICT integration in education and ii) the sampled schools are all public schools operating under similar contexts. This illustrates that *Maitlamo* has not provided effective oversight measures to deal with

varying personalities, personal preferences and management styles. These have the potential to breed variations in the implementation of technology integration in education. In other words, divergent management support for ICT integration across schools implies corresponding differences in school practices with respect to ICT use and integration.

Teachers and students in one school reap the benefits of ICT integration and feel motivated to use it while in another school they may feel disadvantaged and disillusioned. This can create a digital divide among students and teachers, conceal passion and ICT use competency or lack thereof among teachers and subsequently affect school's performance.

5.4.3 ICT integration: curriculum, assessment and pedagogy

Integrating ICT in education suggests matching the use of ICT in learning and teaching within the existing triad of curriculum, assessment and pedagogy (Mishra & Koehler, 2008). This study discovered that integrating technology into these is severely challenged. For example: i) the national curriculum is congested, ii) national assessment practices for the ICT component at the JSS level are not systematic and clearly articulated and iii) teacher centred methods still dominate classroom practices. Each of these has dire implications for the larger picture of integrating ICT into the education system in the country. This illustrates substantial implementation gaps in terms of what schools can achieve as opposed to policy expectations. These findings contradict Kozma's (2008) conceptual framework for successful ICT integration in education. As critical tenets of the framework and education in general, curriculum, assessment and pedagogy must endorse successful technology integration into learning and teaching. Accordingly, these have to feed into each other such that changes in one invoke reciprocal and corresponding changes in the others (Achtenhagen, 2012; Republic of Botswana, 2016; 2013). The next sections expound the challenges in each area.

5.4.3.1 Implications for curriculum

The results on integrating ICT into teaching and learning suggest that the CAP was introduced into an already crowded curriculum. The Republic of Botswana (2014) and the ETSSP (2015) also observed that there were too many subjects students had to do. It would appear that the CAP aggravated the situation since it implied reduced contact time for many subjects which directly contributed to schools' overall performance during examinations. Some schools were reluctant to embrace and approve the CAP programme.

Similarly, the content in the other subjects were overcrowded as observed in other studies (Nkhwalume, 2013; Republic of Botswana, 2014). Nkhwalume for example opined that crowded content denied teachers time to integrate ICT in their classroom practices. Observations during field work further revealed that most of the proposed ICT objectives are not incorporated into the different subjects. This rendered ICT integration problematic as teachers' interpreted ICT integration to imply increased content and that they had to teach their core subject in addition to CAP. This did not only breed confusion but also boosted teacher resistance to integrate ICT and CAP.

This situation was not helped by the feeling amongst teachers that the current curriculum is driven by examinations and overall performance. The Republic of Botswana (2014) and ETSSP (2015) also make a similar observation that the school curriculum is superficially covered as teachers are overly preoccupied with preparing students for examinations. In the context of this study, the cross curricula ICT integration superimposed skills based teaching and learning into a curriculum that for all purposes promotes teaching for examinations and rote learning. This implies that the system of curriculum review has remained largely unchanged to match the practices of ICT integration. This is consistent with Tabulawa's (2009) contention that the system of curriculum review in Botswana employs two antithetical approaches of behaviourism and constructivism which translates into conflicting

practices. It is likely that ICT integration was viewed as ill-informed and ignored in favour of outstanding performance and a gratifying position in the regional and national league tables.

Not surprisingly, *Maitlamo* does not clearly articulate how the curriculum can be harmonized with ICT integration. The probable assumption was that technology integration would naturally and seamlessly fit into the curriculum (Baqir, 2009; Heeks, 2002). In this regard, the policy has not been helpful in ensuring that the curriculum is in sync with the integration of ICT. Any such harmonization in the curriculum would necessitate similar adjustments in assessment practices.

5.4.3.2 *Integrating ICT and assessment practices*

Substantial evidence from this study points to lack of systematic and clearly articulated assessment protocols to cater for ICT integration. The assessment practices remain unchanged. Field observations indicated that very little is done to meaningfully integrate assessment into the teaching of CAP. At the national level, ICT integration remains non-examinable. Priority is given to examinable subjects with more time and attention diverted and channelled to these subjects at the expense of non-examinable curriculum components such as ICT integration. Schools are caught up in a conflict zone: quantity vs quality in the wake of accentuated performativity (Ball, 2003) and commodification of education thanks to globalized neoliberal reforms (Brown et al., 2008). Disregarding the non-examinable but critical components of the curriculum defeats the core purpose and essence of education. The fact of the matter is that non-examinable disciplines such as ICT integration are bound to die naturally in an environment where there is stiff competition for space and time from examinable ones. This denies students opportunities to become competent and innovative ICT users and also acquire 21st century skills such as collaborative learning, critical thinking and information processing associated with the use of ICT in learning and teaching (Wang et al., 2014). It also thwarts

the country's dream of effectively using ICT to transform the society and the economy into knowledge-based one.

Increased emphasis on examinable subjects and schools' pursuit for outstanding performance appears to deter efforts to effectively integrate ICT into learning. For example, Laronde (2010) observed that although professors did not engage students in the use of ICTs for learning, they used ICT tools to prepare for and deliver their lessons. In other words, ICT tools can enhance the efficiency and effectiveness of teaching and learning of different subjects.

5.4.3.3 *ICT integration and pedagogy*

Field observations revealed that teachers did not use or incorporate ICT into the lessons. Most of the lessons observed by this investigator relied on teacher centred methods interspersed with few learner centred episodes such as question and answer method. This finding concurs with several other studies (Mungoo & Moorad, 2015; Republic of Botswana, 2014, ETSSP, 2015). Observations revealed that learner centred approaches such as group work was not systematically planned. The general feeling was that employing learner centred methods and integrating ICTs would delay teachers from completing their respective syllabi on time. Tabulawa (2009) has argued that the adoption of learner centred methods by teachers is constrained by the use of behaviourist approaches to promote constructivist practices. This is a new culture which is taking shape in the JSSs. This puts into question the level of school readiness to embrace learner centred methods and increased use of ICT in education (Orlando, 2011).

In addition, it is evident that the *Thuto Net* component of *Maitlamo* does not clearly articulate the processes to guide the implementation stage. In other words, *Thuto Net* accentuates inputs but is silent on how the inputs are to be translated into outputs and

outcomes. This corroborates Garegae's (2012) observation that *Thuto Net* is not adequate to support classroom use of ICT. Perhaps as Orlando (2011) predicted, the policy makers assumed that teachers would automatically adopt learner centred methods in the advent of ICT integration. That has not been the case and students are denied the chance to use ICTs in learning, gain ICT skills and apply these across the different subjects. This has crippled efforts to use ICTs in education to achieve quality education, economic diversification and transform the economy into the knowledge-based one.

5.5 Learners' acquisition of ICT skills

The study established that ICT integration in JSSs was inconsistent to effectively endow learners with relevant ICT skills in readiness for the labour market. Study participants and field observations indicate that the CAP is not resourcefully taught while ICT integration is a complete non-starter. What appeared to compound the situation are the divergent and largely negative perceptions held by different stakeholders regarding the integration of ICT. This cripples the achievement of the *Maitlamo* policy intention of equipping learners with requisite ICT skills for the world of work. This also represents a substantial gap between what transpires in practice and what is on paper. Students complete basic education without the envisaged ICT skills.

In contrast, Kozma's (2008) ICT, Education Reform, and Economic Growth conceptual framework envisages an effective education system that is able to prepare learners to meaningfully function in the globalized world and information age. In other words, ICT integration has to explicitly articulate outputs and outcomes as well as highlight the importance of monitoring and evaluation. Past studies highlight the importance of the 21st century and soft skills (Nenty & Phuti, 2014), preparing learners who are technologically competent, innovative and ready for absorption into the knowledge-based economies (Kharade & Thakkar, 2012; Nleya, 2009). In this regard, despite the intrinsic complexity of

doing so (Kaffash et al., 2010; Mishra & Koehler, 2008; Voogt & Pelgrum 2005), education systems must integrate ICT into existing curricula in order to prepare learners for the future characterized by cross cutting technology use.

This study has revealed that CAP is not effectively taught to equip learners with critical ICT skills. This finding was unexpected because the programme has been an integral part of the JSS curriculum for approximately 20 years with a syllabus and clearly articulated objectives. Ideally, the programme was introduced to align the provision of ICT resources to the desired outputs and outcomes (Hosman, 2010). The main pillar of CAP was to equip learners with ICT skills that can be transferred from one learning environment to another and to the world of work. The anticipated alignment is consistent with the goals of *Maitlamo*, the national curriculum and the newly crafted ETSSP. It is evident that the translation of theory into practice through the effective implementation of the CAP continues to be problematic.

5.5.1 CAP: Opportunities and Challenges

The findings of this study indicated that since its inception almost 2 decades ago the CAP has suffered from shortage of ICT resources, persistent technical problems and lack of qualified and dedicated teachers and teacher attrition with respect to those who volunteered to teach it. Evidence suggests that that CAP was taught by teachers on voluntary basis. Some of the teachers who volunteered their services discontinued their engagement. Not much has been done to ensure that there are qualified teachers to teach the programme. The ICT coordinators who are left to teach the CAP to the entire student population indicated that they are overwhelmed with the work and that students' learning suffered when they were not in school on leave or due to other official commitments. This finding concurs with similar observations by the Republic of Botswana report (2016) which established that CAP was taught by volunteering teachers owing to critical shortage

of staff. However, there is no indication from the report that teachers who volunteered to teach CAP were equipped with ICT skills and competencies. The report highlighted the setback that those teachers who volunteered to teach CAP paid much attention to their core subjects at the expense of the programme. The engagement of teachers on voluntary basis engraves negative perception of the programme and its importance among teachers. This makes it extremely difficult to prepare learners who have the requisite ICT skills and competencies needed by the labour market.

Similarly, schools still experience persistent technical problems. Evidence indicated that this reduced the number of computers to be used by students, led to intermittent stoppages of CAP and the disruption of students' learning. School reports revealed that the refurbished computers provided to schools at the start of the programme reached the end of their useful life earlier in the programme. There is a high probability that some schools never offered CAP while others stopped offering it many years back. Evidence indicates that the schools which continued to offer the programme operated with a bare minimum of computers to meaningfully equip learners with ICT skills. In some schools, the unavailability of computers led to CAP being abandoned unceremoniously. One of the sampled administrative staff conclusively observed that learners exit basic education without having acquired any ICT skills.

The next set of challenges arose from the combination of consistent malfunctioning of what were supposedly 'new package of ICT resources' such as computer servers and incomplete work by companies responsible for installing the ICT resources. For example, during the fieldwork, three JSSs were not offering CAP due to one or a combination of these contributing factors. In one of the schools visited, this investigator came across a bold notice which had reportedly been there for almost two years but still loomed large and read: "THE COMPUTERS ARE TEMPORARILY NOT IN USE UNTIL FURTHER NOTICE. THANK

YOU". The study participants who included students confirmed that the notice had long been up. In the first school, it emerged that the server consistently experienced technical faults. In the other two schools, the servers had yet to be connected to the computer monitors. In fact, a group of students aptly captured their frustration by observing that:

We found the notice when we started form one... We have not attended any computer awareness lessons... Computer skills are important for future careers... We are not learning anything in computers... Without the computer skills, we will not be able to compete with others who will have the skills.

Although these might seem isolated incidents, it is highly probable that most of the schools are challenged as a result of servers and incomplete work. The only difference is that they did not put up signs to that effect. Otherwise, the computer laboratory provided a convenient air conditioned meeting room for a variety of committees. The supply of new ICT resources suggested renewed hope for the resumption of the teaching of CAP. However, that was not the case as schools still experienced computer related technical problems. Still, CAP lessons could not proceed as they ideally should have. Lack of continuity of CAP lessons remained a challenge with serious implications for ICT integration in education and learners' acquisition of ICT skills. It puts into question the readiness of JSSs to integrate ICT into teaching and learning.

In a related matter, it is evident that schools independently decided on lesson duration for CAP lessons. Three out of the 12 schools operated with 40 minutes lessons while the rest used 80 minutes lessons. Study participants in schools which use the 40 minutes lessons complained that the time was too limited to allow them to fruitfully engage learners especially in practical activities. For a practical subject like the CAP, 40

minutes is too little to permit any realistic practical activities. Partly, this explains why some lessons are dominantly theoretical.

It has to be appreciated that the introduction of the CAP into the JSS curriculum preceded the formulation of *Maitlamo*. Hence, the challenges highlighted above could be expected. However, the implementation of *Maitlamo* has not significantly addressed the challenges related to technology integration. As stated earlier in the study, *Maitlamo* does not speak to maintenance and replacement of ICT resources. Similarly, it ignores ICT training for teachers who are qualified to teach CAP. The lack of specificity regarding whether or not teachers would be trained to teach the CAP leaves a gap in terms of human development capacity building. In other words, the chances of attaining the country's broader goal of becoming a competitive player in the knowledge-based world continue to dwindle.

5.5.2 Cross curricula ICT integration

As stated earlier, evidence suggests that integrating ICT into different subjects was declared a non-starter. This finding contradicts a study by Ngoma (2010) which reported that in Botswana CAP is taught across all subjects with diversity of aims. Evidence pointed to the contrary indicating that integrating CAP in Botswana remains theoretical and rather hastily proposed. Integrating ICT into different subjects presented an even worse outcome easily predictable from the fate of the CAP. The project faced the same problems that bedeviled the CAP programme only amplified. For instance, by its nature, cross curricula ICT integration required more ICT resources than those required for the CAP. More students and teachers were expected to use the available resources unlike where the resources were only used for the CAP. As earlier discussed, it is evident that the ICT resources provided to schools were too few to support ICT integration. To integrate ICT, teachers required more ICT competency than is required to teach the CAP.

Evidence suggested that teachers were incompetent in this regard with some having received no ICT training at all to teach the CAP.

What exacerbated the situation was that unlike the CAP which had clear objectives, *Maitlamo* does not clearly articulate outputs and outcomes (Hosman, 2010; Tatto, 2012) for ICT integration. In other words, there were no clear and measurable targets for ICT integration. This left implementers with no guidance and the drive to achieve anything. Likewise, without guidance in the form of set targets, implementers were at liberty to do what they wanted and free to choose not to do anything without fear of accusations of non-action. This fuels negative perceptions of technology integration among implementers. It was highly possible that those responsible for implementing ICT integration could choose the easier option of non-implementation. This undermined the achievement of the policy goal of equipping learners with ICT skills and competencies. Overall, the cross curricula integration of technology represents a case of greater mismatch and increased chances of failure (Baqir, 2009; Heeks, 2002).

5.5.3 Monitoring and evaluation

The results of this study indicate that *Maitlamo* could not assist in strengthening monitoring and evaluation (Tatto, 2012) of the programme to ensure that its desired outputs and outcomes are realized in line with the proposed outcomes based and quality education (ETSSP, 2015; NCAF, 2015). It would appear that that the CAP has been continued over the years without any substantive evaluation of whether or not it is effectively implemented and achieving the envisaged goals of helping learners receive ICT skills. On the other hand, the integration of ICT was introduced without clearly articulated and measurable outputs and outcomes. This made evaluation of the success or failure of the reform problematic. After two decades of the proposed reform, there has not been any systematic follow up to enforce implementation or assessment of performance. At the same time, evidence suggests that there

have been no efforts to monitor the progress regarding provision of ICT infrastructure to schools and that the companies engaged in this exercise do their job diligently and complete it in time. Without feedback, the country is bound to engage in a vicious cycle of experimentation and sustained failure which comes at a cost. Table 22 summarizes the key findings of this study.

Table 22: Summary of key findings

<i>Maitlamo</i> Intentions	Practice - Outcomes
Efficient ICT Infrastructure	
Provision of efficient electricity	Stable electricity supply but unexpected power cuts [<i>Partial failure</i>]
Provision of adequate computers	Very few computers & replacements take long [<i>Partial failure</i>]
Issues of deployment of ICT resources not articulated	No framework for deployment of resources e.g. school-based ICT policies [<i>Total failure</i>]
Increased Access to ICT resources	Very limited access [<i>Partial failure</i>]
Enhanced Network services	Highly limited network services [<i>Partial failure</i>]
Aspects of monitoring & evaluation not articulated	Inadequate monitoring & evaluation of CAP [<i>Partial failure</i>] No monitoring & evaluation of integration [<i>Total failure</i>]
Provision of Internet connectivity infrastructure	Infrastructure available but not all schools have connectivity [<i>Partial failure</i>]
Provision of Broadband connection	No broadband connection [<i>Total failure</i>] Unreliable and very slow Internet connection [<i>Partial failure</i>]
Provision of Technical support	Inadequate - Consistent technical problems [<i>Partial failure</i>]
ICT professional development	
Pre-service ICT professional development not articulated	Inadequate and inconsistent ICT teacher preparation [<i>Partial failure</i>]
In-service ICT professional development	No significant implementation – reports of piloting [<i>Partial failure</i>]
ICT professional development framework in schools	No articulated ICT professional development framework [<i>Total failure</i>]
ICT integration	
Knowledge of policy by implementers	Weak knowledge of policy by implementers [<i>Partial Failure</i>]
Teaching of CAP	Ineffective & inconsistent teaching of CAP [<i>Partial failure</i>]
Cross curricula ICT integration	No implementation [<i>Total failure</i>]
Assessment	No assessment framework [<i>Total failure</i>]
Issues of curriculum not articulated	Incompatible and Crowded curriculum [<i>Total failure</i>]
Issues of pedagogy not articulated	Limited use of learner-centred pedagogies [<i>Partial failure</i>]
Management support	Divergent and weak school management support [<i>Partial failure</i>]
Learner ICT skills	
Acquisition of ICT skills and competencies	Highly limited opportunities for learners to acquire ICT skills [<i>Partial failure</i>]

5.6 Conclusions

This study set out to assess the influence of *Maitlamo* on the integration of the CAP at JSS level. Four questions guided the study: How does *Maitlamo* influence i) teacher preparation for ICT integration, ii) the provision of ICT resources, iii) implementation of ICT curriculum and iv) learners' acquisition of appropriate ICT skills. The findings revealed that *Maitlamo* is inadequate to facilitate the effective integration of CAP and ICT general in the school curriculum. Foremost, the lack of awareness of the policy by those who are supposed to implement it, as indicated in the study, is a clear recipe for policy failure. Teachers are inadequately prepared, ICT resources are insufficient, the ICT curriculum is not adequately implemented and for most part learners do not acquire the requisite ICT skills.

The study showed that there were grave disparities between what the policy articulates and what is actually happening on the ground. This was reflected in the following critical issues; i) provision of ICT infrastructure and resources to schools ii) teacher preparation for technology use both at pre-service and in-service levels iii) the teaching of the CAP as a subject and its application across all subjects as stipulated in the curriculum iv) support of ICT integration by school management and v) equipping learners with ICT and 21st century skills. All these are clearly stated policy intentions of what should actually be taking place but the study showed limited success in these respective areas. For example, there is evidence of limited and unsystematic monitoring and evaluation of the implementation processes. This partly indicates lack of commitment and political will to guarantee the success of the policy and that of technology integration in the education system. Evidence suggests lack of clearly articulated implementation strategy. There was also gross underestimation of the implications of integrating technology in education given Government's limited and overstretched financial resources.

Furthermore, *Maitlamo* is also weak in articulating critical issues that could provide much needed guidance to the implementers, provide a conducive environment for technology integration and facilitate implementation. It is not surprising that as is, the implementation of *Maitlamo* is not rigorously enforced. The necessary structures to facilitate seamless implementation are not in place. The successful technology use requires a more flexible school curriculum. Currently, the curriculum is described as too congested to allow any room to experiment with technology use. It has no clearly articulated framework to assist the teachers to implement ICT into teaching and learning.

Although the CAP was long implemented in JSSs, it has not been meaningfully assessed both in terms of formative and summative assessment. There were no clear assessment protocols on how to handle its use across the curriculum. Schools did not have adequate ICT resources and frameworks to guide equitable allocation and deployment of these resources. Similarly, maintenance and replacement policies are literally nonexistent. This puts into question the sustainability of the cross curricula ICT integration. There is no clear articulation of outputs and outcomes for ICT integration and how attainment of these would be measured. All these issues indicate that the policy is weak in providing the foundation for effective integration of ICT into education. In other words, there is no substantive evidence to demonstrate the extent to which learners actually acquire 21st century skills relevant for absorption into the labour market. High unemployment numbers suggest that learners are not given sufficient skills to be self-reliant and marketable internationally. Also, the unregulated, sporadic use of technology by some teachers who are interested as shown in the study has potential to lead to a digital divide among learners, as some would attain technology skills while others would not.

Based on the findings of this research, this study recommends the following framework (figure 7) to better assist policy and facilitate technology integration in education.

This framework intends to bridge the gap between the overall intentions of the flagship policy and their implementation on the ground.

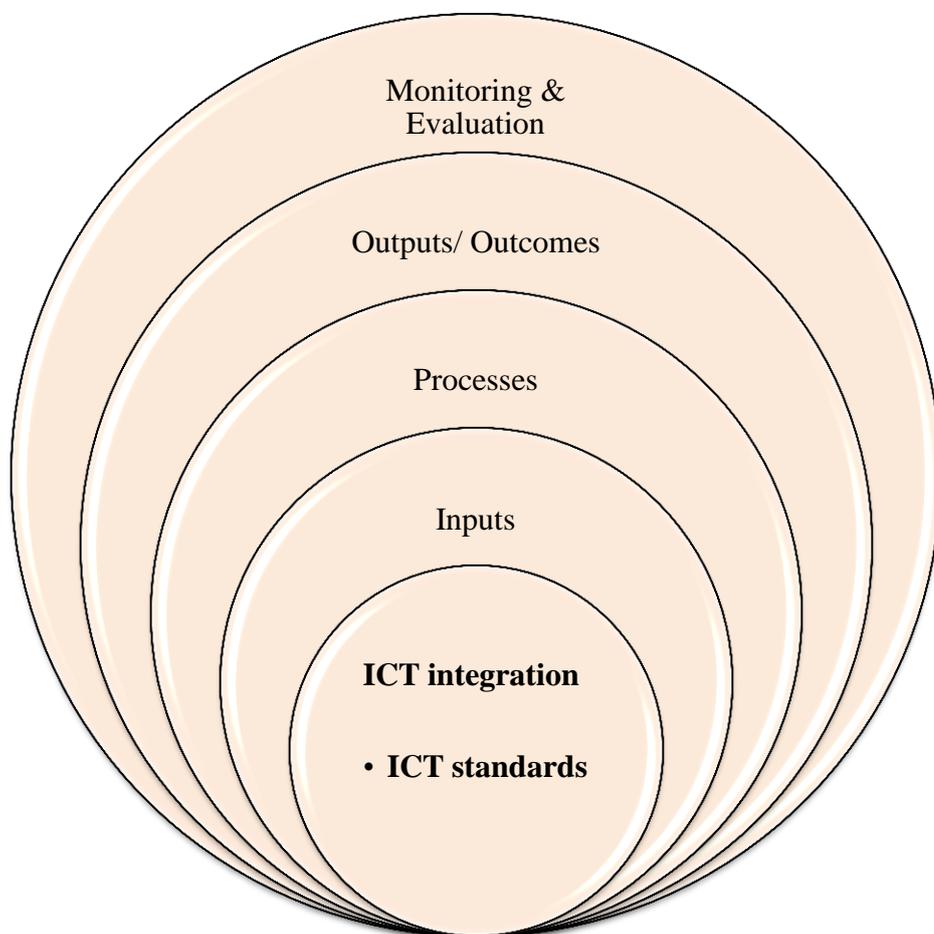


Figure 7: The proposed ICT integration framework

This framework highlights that inputs, processes, outputs and outcomes and monitoring and evaluation are critical in mediating successful ICT integration in education. In other words, these are intricately interlinked and should be carefully weaved for meaningful ICT integration. Any substantial gap in any of the areas is bound to impact on ICT integration. The outer circle accentuates the importance of monitoring and evaluation consistently sustained for each of the other key areas to ensure continuity and the beginning of a new cycle as imminent gaps are identified and bridged. This framework presupposes the formulation of a strategic plan to educate and inform key stakeholders about the underpinning

Maitlamo policy. It agrees with *Maitlamo* that schools are provided with crucial inputs such as efficient and adequate ICT infrastructure. However, ICT integration should be anchored on two sets of ICT standards: i) for physical and human resources and ii) of ICT proficiency different stakeholders. The ICT standards have implications for various education levels and stakeholders and will help in the articulation of appropriate ICT inputs, processes and outputs and outcomes. They will also permit systematic monitoring, appraisal and evaluation of the quality of ICT integration and provide learners with opportunities to learn.

The proposed framework has demonstrated that the major missing link is lack of ICT standards to propel ICT integration in education in the country. If not bridged, it is unlikely that ICT integration will be a success story in the country's education system. In turn, this will thwart the country's broader goal of becoming a competitive player in the knowledge-based world and essentially be left out.

5.8 Recommendations

This study has shown that *Maitlamo* is inadequate to support effective implementation of technology integration into education in the country. This has debilitating implications for the education system's ability to equip learners with the 21st century skills needed in the work place. This cripples the country's chances to transform its economy from a mineral-led to a knowledge-based one. This study therefore makes the following holistic recommendations:

1. A comprehensive review of *Maitlamo* involving all key stakeholders is recommended. There is also need to educate the stakeholders on the final policy.
2. There is a need to review the relevance and appropriateness of the CAP across the education levels in the country as well as Government's decision to introduce ICT in two distinct ways. The arrangement has serious resource implications.

3. The Ministry of Infrastructure, Science and Technology should expedite implementation of the *Thuto Net* initiative.

5.9 Implications for research

Policy

The process of policy formulation in the country needs investigation with the view to zoom into ways in which critical stakeholders are engaged particularly the extent to which ICT is used to enhance involvement, representation and diffusion.

Practice

1. This study focused on assessing the policy influence on ICT integration one level of JSSs. It might be interesting to investigate the status of ICT integration in other levels such as primary and senior secondary.
2. *Maitlamo* acknowledges the critical role of school management in promoting ICT integration. This study's results indicate differences in management support for ICT integration. The area needs further investigation particularly as it has the potential to cause digital divide among learners.
3. Given that donations are often problematic to regulate, a study on their impact is a necessity.

A tracer study to follow up JC graduates' ICT skills and competencies would also be another area worthy of further research.

6.0 Study contribution and implications

This study highlights the importance of developing a holistic understanding of technology integration in education encompassing inputs, processes and outputs and outcomes. It adds the need to establish ICT standards to inform each of these antecedents

to successful ICT integration. The study also provides a conceptual framework to glean the policy gaps and a theoretical framework to inform ICT integration. These are useful to policy makers as guidelines for the *Maitlamo* policy review.

The study has also looked at ICT integration from the policy dimension, bridging the literary niche in this area. As such it makes contributions to different bodies of knowledge in four broad areas of globalization, policy, education and ICT. The study has evaluated *Maitlamo*. It has looked into the effects of globalization on educational policy development and related ICT policies. These contributions open avenues for further research.

In terms of research methods, the study used a variety of data collection methods. These were not only helpful in cross checking and validating data but also in obtaining rich data, holistic picture and a comprehensive understanding of ICT integration in JSSs in Botswana. The study has demonstrated the effectiveness and value of the pragmatic paradigm in mixed methods particularly in relation to the impact of policy. This provides a useful guide in future research not only in the area of technology integration but also in other policy studies.

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APPENDICES

Appendix A: Permission: Office of Research and Development

Appendix B: Permission: Ministry of Education and Skills Development

Appendix C: Permission: Regional Education Offices

Appendix D: Permission letter to school Heads

Appendix E: Letter parents teacher association

Appendix F: Assent Form: Students

Appendix G: Informed Consent Form: BEC

Appendix H: Informed Consent Form: CD&E

Appendix J: Informed consent Form: Staff

Appendix K: Questionnaire (teachers)

Appendix L: Interview protocol: SMT

Appendix M: Lesson observation checklist

Appendix N: Document analysis guide

Appendix O: Focus Group Discussion Guide (students)

Appendix P: Copy of ISTE standards (2018)