

Identifying and Bridging the Gaps in Education System Through Effective Use of  
Educational Technology – Schools in Botswana

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## **ABSTRACT**

### **Identifying and Bridging the Gaps in Education System Through Effective Use of Educational Technology – Schools in Botswana**

**Seitebaleng Susan Dintoe**

The purpose of this research is to identify the tools available in the market that enable the acquisition of knowledge in educational institutions through effective use of information and communications technology (ICT). These educational institutes may be operating with formal classroom based teaching methods or in the distance-learning mode. The focus in this thesis is on the case of Botswana. The affordances and capabilities of ICT offer the potential to solve or mitigate various challenges confronting educational systems and institutions in a developing economy such as Botswana. The first step in this thesis was to collect relevant data and information and analyze the current state of education in schools in Botswana. Information concerning the broad pedagogic context of Botswana are introduced; data regarding internet access and usage, existing baseline rates of literacy, availability of skilled instructors as well as information concerning the specifics of educational policy and initiatives involving the use of technology for teaching and learning are presented. After presenting the context of the Botswana educational system, the crucial gaps in terms of the performance and capabilities of the existing processes in school systems were identified. Arguments are offered concerning the role that ICT could play in addressing these gaps or enabling solutions. Other countries with similar pedagogical infrastructures to Botswana are used as examples. Finally, this thesis offers conclusions and recommendations that are expected to address the gaps identified and specify the actions that can be taken by Botswana's education departments to enhance the level of education in schools in their country.

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## DEDICATION

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## **LIST OF ACRONYMS**

APC	Association of Progressive Communication
ASALs	Arid and Semi – Arid Lands
BOTSWANA – MOE	Botswana Ministry of Education
BTC	Botswana Telecommunications Corporation
BBS	Bulletin Board System
CAGR	Compound Annual Growth Rate
CMC	Communication Management Configuration
CEIBAL	Basic Information Educative Connectivity for online Learning
CCE	Centre for Continuing Education
CDs	Compact Disks
CD-ROMS	Compact Disk – Read Only Memory
DDE	Department of Distance Education
DE	Distance Education
EDU.TECH.	Educational Technology
EFA	Education For All
E – LEARNING	Electronic - Learning
E-MAIL	Electronic – Mail
E-INDEX	Electronic - Index
EMIS	Education Management Information Systems
GCE	General Certificate of Education
GDP	Gross Domestic Product
HBR	Harvard Business Review

IICD	International Institute for Communication and Development
ICs	Information Communications
ICT	Information Communication Technology
IDRC	International Development Research Centre
IEARN	International Education and Research Network
IRI	Interactive Radio Instructions
IT	Information Technology
MOEST	Ministry of Education Science and Technology
NDP	National Development Plan
NGOs	Non-Governmental Organizations
OECD	Organization for Economic Co-operation and Development
ODL	Open and Distance Learning
OLPC	One Laptop Per Child
OLPT	One Laptop Per Teacher
OTA	Office of Technology Assessment
PCs	Personal Computers
PEST	Political, Economical, Social, Technological
PELP	Public Education Leadership Project
SACHES	Southern African Development and Historical Education Society
SADC	Southern African Development Countries
SADC EPSI	Southern African Development Community Education Policy Support Initiative
SACMEQ II	Southern & Eastern African Consortium for Monitoring Educational Quality II

SSIRI	Southern Sudan Interactive Radio Instruction
SSIRIP	Southern Sudan Interactive Radio Instruction Program
US	United States of America
UK	United Kingdom
UB	University of Botswana
UNESCO	United Nations Educational Scientific and Cultural Organization
WIFI	Wireless Free Internet
WWW	World Wide Web

## **CHAPTER 1: INTRODUCTION**

The educational field is vast. The contribution of Information Technology (IT) is truly undeniable to every knowledge seeker across the world. The pedagogy has gone through a sea of change in the last two decades with the advent of various technological innovations. There has been an information explosion in every field of knowledge, and thanks to the developments in IT, we seem to have everything that we need to know almost at our fingertips. This is a major achievement of our era.

Educationists worldwide are beginning to realize the immense possibilities of spreading knowledge with the help of IT, not only in these times but also in the times ahead that will further create new chapters in the field of education. The foundations for learning need to be strengthened. IT enables us to provide a broad range of learning opportunities to everyone and, at the same time, recognize and reward learning immaterial of how, where and why it takes place in today's quickly changing world. Any kind of educational initiative that is taken in policies the world over should focus on further strengthening the knowledge society and revolutionizing the field of education.

Educational technology is a broad concept with many nuances, but the simple definition of educational technology in this context is the collection of tools that are used to facilitate the learning of the students. Educational technology consists of, at its centre, learning and instructional theories. However the domain of educational technology includes ways to enhance human capabilities by reinforcing or augmenting them via the use of technology. This can be accomplished, for example, by using computers, calculators, internet or cell-phones, just to name a few of the most recognized tools. On the other hand, IT concerns itself with methods to improve the ways of delivering

instruction and learning to the students. The educational technologist is someone who converts fundamental psychological and educational research into the design of effective programs based on evidence of measured success. Educational technology has grown from the level of a cottage industry into a full-fledged international domain of the modern technological world (Shurville, Browne & Whitaker, 2008).

Educational technology has presented quite a few benefits: knowledge communities, including flexibility, economic efficiency and learner friendliness, among others (Kuruba, 2005). The capabilities of the technology also lead to enhanced academic, social, and employment opportunities (Marino, Sameshima & Beecher, 2009).

### **Overview of Botswana's Education System**

The Republic of Botswana is a landlocked Southern African country, which gained its independence in 1966. Although Botswana was among the poorest countries in the world at the time it attained its independence, a relatively stable political system has permitted Botswana to grow rapidly. Only 30% of its population lives below the poverty line. It now has one of the fastest developing market economies, outpacing the development of Hong Kong, Singapore, Taiwan and South Korea. No wonder the World Bank has quoted Botswana's success story as a phenomenal development in the modern world (World Bank, 2009).

Botswana has made huge strides in the development of the education system. Reflecting a remarkable growth in such a short amount of time, Botswana has come from the state where there were hardly any graduates at the time of independence to achieving a literacy rate of more than 80%. The education system in Botswana provides equal access to boys and girls, though girls are more likely to drop out of secondary schools,

namely due to the country's high teen pregnancy rates (Botswana Education System, n.d.).

The structure of the education system includes ten years of basic education and two years of secondary education, followed either by graduation or vocational courses. Upon completing the 12 years of initial education, students are then eligible for Botswana's General Certificate of Education (GCE) (Republic of Botswana, 1994).

The Botswana government is fully committed to its policy of developing human capital. Due to this, there has been a rapid expansion of education and vocational training in Botswana in order to meet the demand for skilled labour in an expanding economy.

Initially, there were two levels of Distance Education (DE) in Botswana. These levels were at the two ends of the chain of supply and demand: one level served as provider while the other level acted as consumer for DE. In a paper on the use of technology in DE, Gangappa Kuruba analyses the following aspects through which short-term courses can be offered for enhancing the skills of Botswana's work force (Kuruba, 2005):

- Scenario of Distance education in Botswana,
- Importance of Open and Distance Learning (ODL) in promoting one's professional skills,
- Delivery of professional development programs by different institutions and,
- Different strategies that can be deployed enhancing professional skills through the ODL channel in Botswana.



The application of Open and Distance Learning (ODL) in promoting special skill sets and the strengthening of the professional development programs is analyzed in the perspective of the advent of new technologies. These technologies are quite useful as they enable the users to access the unlimited potential they offer in terms of participating in educational or training sessions from any part of the globe. The strategies proposed in this paper deal with providing students with the opportunity to attend these sessions while granting them the maximum amount of flexibility to overcome geographical and time constraints. Different niches in the economy can reap the benefits of these programs as the long-term cost of conducting and attending such programs is less expensive than attending full-time educational institutions. The cascading effect of such educational programs contributes to the all-around development of the individual, thereby revitalizing the economic development of the country. Various aspects and a further analysis of this research will be undertaken in chapter three of this thesis.

### **Overview of the Problem**

The problem statement identified for this research is: “What are the gaps in the current education system in Botswana and what are the appropriate educational technology methods for solving these gaps at the primary and secondary level of school education?”

### **Objectives and Purpose of the Study**

The purpose of this study is as follows below:

- Study the current state of education system in Botswana schools,

- Identify the gaps in the education system,
- Identify and evaluate the appropriate ICT methods and,
- Analyze how to apply the methods identified above to the current learning at the primary and secondary level of school education in Botswana.

The expected outcomes of this research are:

- Describe of the context of Botswana in terms of capacity and infrastructure with an objective of presenting arguments concerning which technology-based strategies might be helpful in addressing the gaps in the Botswana educational system,
- Document the various ICT strategies, initiatives & programs that have been employed in Botswana for improving the penetration of education,
- Review initiatives in regions that may be comparable to the context of Botswana that have had some demonstrable success and that might correlate over to the context of Botswana,
- Provide an account of appropriate ICT methods, which can then be applied within the Botswana's education system to enhance the learning outcomes of the students; to provide coverage for as many students as possible to impart the education they desire; to support the instructions of improved learning and teaching processes; to improve the management of education.

### **Research Questions**

The thesis will attempt to answer the following specific questions in the field of Educational Technology, in the context of Botswana:

- What is the current state of education in Botswana schools?
- What are the gaps in the current education system?
- What role does the technology play in furthering education in schools?
- What is the prevailing situation or status of Educational Technology in Botswana schools?
- How can educational technology be leveraged to bridge these gaps in Botswana's schools?
- What is the feasibility of educational technology being implemented in Botswana's schools to bridge the existing gaps in the education system?

### **Significance of the Study**

The value or importance of educational technology is evaluated first and foremost in terms of student success rates. There are various methods discussed in published literature that can be employed in order to determine the usefulness of educational technology. In this thesis, I seek to identify what is the level of ICT usage in education, what is known about its impact and, more speculatively, what are ICT strategies that might improve education and would furthermore be compatible within the context of Botswana.

This study on technology will fill an existing gap in the literature about the state of ICT in education in Botswana, and will provide a useful base for current researchers. The studies related to this act as the primary source of information. Countries that are spending large amounts of their assets on technology and science face a higher growth and development rate. The policies followed by the developed countries in the

educational sector are much more refined and act as the model for the developing and underdeveloped countries to follow, though the specific circumstances of developing countries, and the ambiguity of findings related to the impact of technology within schools in developed countries, must be kept in sight.

It is not possible for developing or underdeveloped countries to cure the existing attitudes and infrastructures underlying their problems and crippling deficiencies overnight. So this study is aimed especially for those who are economically strong and capable of improving their position by using appropriate access to IT, as these people will be the future of the economy thanks to the assistance they, themselves, received from these technologies (Gura & Percy, 2005).

### **Assumptions**

The following assumptions are identified in the study:

- The secondary information and data obtained from various research papers, journals, books and online sources is accurate,
- In the short term, the rate of development of educational technologies remains almost constant and there is no drastic change,
- The underlying data on Botswana (e.g., various educational statistics on which some of the results are based) does not change considerably over the short term,
- The political, economic, social, technological (PEST) factors remain constant with minor changes in Botswana.

## **Scope and Limitations**

The scope of the study is as given below:

- To identify the gaps in the current education system in Botswana,
- To highlight the use and potential value of ICT in addressing the current gaps and challenges in the education systems in Botswana,
- To come up with the solution for eliminating or mitigating these gaps through implementation of appropriate ICT methods.

There are several limitations of this study, as given below:

- The study draws the gaps in the secondary education in Botswana from presumably correct secondary data. There is an expectation that the projected future scenario, as well as the current environment, remains the same in the near future,
- There is limited availability of relevant primary data and evidence,
- There is a lack of comparable, comprehensive data concerning ICTs in education at similar levels. Indeed, United Nations Educational Scientific and Cultural Organizations (UNESCO) has only recently launched a pilot study to develop and validate an instrument to track ICTs in education throughout the world, the first such survey instrument to be introduced. Formal data collection with a revised, validated instrument will only begin in 2010. (UNESCO, 2009).

## **Delimitations**

Although the Botswana education system seems to be self-compliant, there are a few irregularities:

- The Education System provides equal service and access towards the education of both boys and girls, but one aspect the system lacks is providing the same education environment to handicapped students. The education structure has not been designed to suit the needs of the disabled children. Regular school classes are not fit for children with mental illness, learning disabilities or some physical impairment. Moreover, the prevailing attitude of students towards the impaired is largely contemptuous.
- A few schools have been developed to impart education to these children, but with the growing population, it is very difficult to serve them all. The non-governmental educational societies took up the charge to educate these children, but the outcome was not favorable, as the parents still had to pay school fees. In this respect, the government has made commitments to enhance the efforts made by the Non-Governmental Organizations (NGOs) to provide better education to children who require special care and effort. The 1994 revision in the Botswana educational policy mandated the provision for a basic ten-year education for all children in Botswana. The policy also sought to introduce pre-vocational skills, such as technical and computing skills (Women's Education and Training, 2002).

## Definition of Terms

Definitions of terms are provided here in order to help readers conceptualize words as employed in this study. This will provide a common basis for understanding the discussion of this work. These definitions have been guided by current research literature.

By no means does the researcher intend to provide definitions that cover the widest uses and variations of these terms. The following terms are frequently used in this study and for the purpose of this study are understood as follows:

Educational Technology:

- “Educational technology (also called learning technology) is the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources. The term educational technology is often associated with, and encompasses, instructional theory and learning theory. While instructional technology covers the processes and systems of learning and instruction, educational technology includes other systems used in the process of developing human capability. Educational technology includes, but is not limited to, software, hardware, as well as Internet applications and activities” (Richey, 2008).

Information Communication Technology (ICT):

- A range of technologies for gathering, storing, retrieving, processing, analyzing, and transmitting information is known as Information Communication Technology (ICT) (WCPT, 2010). The ICT has its relevance and implications in the fields of:
  - i. Critical thinking,

- ii. Broad competencies of the authorities,
- iii. Decision making,
- iv. The handling of dynamic situations,
- v. Teamwork,
- vi. Effective communication (UNESCO, 2002).

Developing and Developed Countries:

- There is a set of specific criteria that determines whether the country is categorized as developing or developed. These criteria are economic measures, national income, indices for life expectancy, education, per capita income, and Gross Domestic Product (GDP). A country that has higher levels of development regarding these criteria is known to be developed. Those countries which lie below the threshold for these criteria, but whose growth has been regular and extensive, are termed as developing countries. In addition, developing countries have higher birth and death rates as compared to their developed counterparts. The unavailability of contraceptive measures and life saving drugs, respectively, are the main reasons behind these differences (Developing and Developed Countries, 2009 and Women's Education and Training, 2002).

### **Organization of the Thesis**

This thesis is organized into six chapters. In chapter one, an introduction and overview of Botswana's Education System is presented, as well as the problematic, objectives/purpose, the significance of the thesis and factors limiting and delimiting the scope of the inquiry.



Chapter two states the reasons, ways of collecting data and how the data will be analyzed.

Chapter three provides an overview of the gaps in educational system and the methods used, and further support reasons to collect data. In addition, it presents the main research focus, which is to identify gaps in the existing system.

Chapter four provides an account of the present situation regarding ICT in education sectors. Emphasis is placed on Botswana's situation, the focus of this thesis, with an aim to provide some guidance concerning the future use of education technology in Botswana schools.

Chapter five outlines the ICT solutions to the gaps in education systems.

Finally, chapter six presents my summary, conclusions and recommendations for future studies.

The conclusion also enumerates basic points that have yet to be resolved as a result of the limitations and delimitations of the system.

## **CHAPTER 2: METHODOLOGY AND SOURCES USED**

### **Explanation of Chosen Methods**

This thesis is based on the secondary data obtained from various sources collected in a systematic way. This aimed to identify the gaps in the current education system and to further analyze the current level and feasibility of educational technology implementation in Botswana.

Various authenticated secondary sources like relevant technical journals, books, magazines, news articles, Ezines, World Wide Web (WWW), databases, were identified and listed. The listings of these sources were followed by an in-depth study of these sources to arrive at a gross understanding of educational technology and the current state of education in Botswana. The data thus obtained was tabulated and the relevant trends were identified. Subsequently, international levels of educational data was obtained and then compared to Botswana's current educational level in order to identify the good and the "not so good" elements of Botswana's Educational system.

After obtaining data on the current state of Botswana's educational system, the gaps were identified and categorized under a number of organized headings. The different categories by which the gaps can be identified in the current scene in Botswana are detailed as below and discussed in chapter 3:

- Students' Behavioral Gaps
- Teachers' Behavioral Gaps
- Capability Gaps
- Training Gaps

- Infrastructure Gaps
- Communication Gaps
- “Other” Gaps (Cultural, Government policies in education, Political stability)

These gaps were then matched up against various ICT-based solution strategies, once the feasibility of different strategies had been addressed in terms of factors such as culture, capacity (skills, human resources, technological infrastructure...) addressed by the effective use of the modern tools available in the field of educational technology. The results section of this thesis contains the output of the research conducted. There were subsequent discussion on sections that focused entirely on the quality of data and the inferences drawn from the various trends followed by conclusions and the recommendations sections.

Contrasts were drawn between situations where successful educational technology strategies or solutions have been implemented in Botswana and contexts where such strategies are absent. Any cases of failure of technology-based strategies were also presented, as they provide a rich source of information regarding constraints or obstacles, or lessons learned.

The journals, studies and publications that were useful for secondary data collection are organized into the table 1 below. Moreover each resource is identified according to the area of study or type of data for which it can be used.

**Table 1- Secondary Data Collection Sources.**

<b>Resource name (journals, studies, publications etc)</b>	<b>Area of study</b>
1. Contemporary Issues in Technology and Teacher education (CITE)	G,I,T
2. ICT in Education in Botswana	P,D,N
3. The Boston College Centre for international Higher education, Country Profiles	P,D,N,I
4. SACMEQ, Education in Botswana	P,D,N,I
5. Towards a Systematic Framework for Examining the Congruence Among Reading Objectives, Tasks, and Competencies in Botswana's Primary Schools (2008)	G,P,D,N,I
6. The SACMEQ II Project in Botswana: A Study of the Conditions of Schooling and the Quality of Education (2005)	G,P,D,N,I
7. Factors Influencing Pupil Achievement in Botswana: An Application of Structural Equation Modeling (2005)	G,P,D,N,I
8. A Cross-National Comparison of Primary School Children's Performance in Mathematics Using SACMEQ II Data for Botswana, Lesotho, and Swaziland (2005)	G,P,D,N,I
9. Botswana: Education, Culture and Politics (1992)	G,P,D,N,I
10. From Now On: The Educational Technology Journal	T,G,P
11. Journal of Interactive Media in Education	T,G
12. Virtual University Journal	T
13. Educational Technology and Society	T,
14. Open DOAR: Directory of Open Access Repositories	T,I

15. Educational Technology Journal	T,G,I
16.The World Factbook, (2003). United States Central Intelligence Agency. March 2004.	D,T
17.WITSA Reports & Surveys. World Information Technology & Services Alliance (WITSA). March 2004.	T,D
18.UNESCO Institute for Statics. United Nations Educational, Scientific and Cultural Organization. April 2004.	D,T
19.Global Information and Technologies Department. World Bank. May 2004.	T,D

Note: Legends used in the above table:

- G – To identify gaps,
- I – To identify Issues,
- N – To identify needs,
- P – To identify nature of problems,
- D – To obtain relevant data,
- T – To identify how technology can be leveraged in this case.

### **How and Why Methods were Chosen**

The gaps in the Botswana Education system have been identified through web research and a thorough reading of the latest journals in the field of education with a particular perspective on Botswana policy documents and government sponsored

evaluation data. The aforementioned methodology has been identified after much deliberation after the research on the gaps in the education sector.

This methodology would help in analyzing and identifying the gaps, their solutions as well as limitations of this research. The expected outcome of this research is to suggest the appropriate possibilities in educational technology utilizing ICT in Education in Botswana.

### **Data Analysis**

The secondary data collected was analyzed to assess the current state of the education system in Botswana. The strategy which was used for the literature and the database sources was designed in such a way that one can identify and retrieve primary and secondary studies and reports on Botswana's Education policy.

## **CHAPTER 3: IDENTIFICATION OF THE GAPS**

### **Introduction**

The field of education has always been a constant focus of intense debate and discussion due to the crucial role it plays in the development of a society. The primary and secondary education phase of any individual fundamentally builds his/her personality and character. Expanded views of intelligence have emerged in recent years; for example, the work of Gardner (1993), among others, on the concept of “multiple intelligences” suggests the personality development as an essential outcome of the basic education. In conjunction with this development, there has also been considerable focus on literature dealing with notions of self-esteem and self-efficacy, and the role they play in learning and development. The students need to be provided a chance to build up confidence so they can ultimately feel comfortable doing any task that is presented to them (Gardner, 1993).

Educational technology supports the various teaching and learning techniques, and it is argued that this helps educators to achieve cognitive and behavioral goals in ways that were not previously feasible. (Teach-nology, 2009).

### **A Brief Overview**

Botswana’s government has done considerably well in promoting the internet among its people, but gaps still exist that need to be looked into. Internet usage in Botswana is as low as five percent of the population. In addition, there is a considerable disparity in terms of urban and rural access to ICT services. Other challenges include the relatively high cost of Personal Computers (PCs), the lack of electricity in many rural

locations, and high charges for internet connections. With the increasing sophistication of Botswana's economy, there is a greater need than ever to have timely and accurate data to facilitate decision-making in promoting the right technology in education for effective literacy penetration across country (Technology- An increasing sophistication, 2009).

Moreover, Botswana's ICT sector itself is small and generally focused on local market opportunities. The government needs to liberalize and enhance regulation of the communications industry in order to attract investment as well as encourage innovation and competition (Isaacs, 2007). Education expenditure is high at ten percent of the GDP in Botswana, as against USA, Norway, South Africa and Malaysia, who spend close to five percent of their GDP in education. Thus, significant educational achievements have been attained in Botswana, including the provision of nearly universal and free education; however, overall outcomes have not created the skills and the workforce that Botswana needs (World Bank, 2009).

In Botswana disparities also exist in terms of reading ability across entire regions. These regions have been classified into three groups based upon an average reading score established by the Southern & Eastern African Consortium for Monitoring Educational Quality II (SACMEQ II). This classification system identifies the regions that are performing:

- At average reading score,
- At slightly above-average reading score,
- At above-average reading score.

An average pupil in Botswana has difficulties with more complex reading tasks. These complex tasks are those such as (Masalila, 2008):



- Reading and rereading through long texts,
- Synthesizing information from various parts of the text,
- Making judgments about the author's purpose or rationale beyond text substance,
- Analyzing detailed texts for underlying messages,
- Inclusion of information from different parts of the text in order to conclude writer's thoughts, assumptions, individual beliefs.

The following are gaps identified and discussed in detail as given below:

### **Students' Behavioral Gaps**

According to a study conducted on standard six students by Keitheile and Mokubung (2005), gender-based disparities exist in students' access to schooling. The rate of absenteeism is high in most regions in Botswana, particularly in the Western region as shown by Tables 2 (a) and (b):

**Table 2 (a) - Percentages, Mean, and Sampling Error, Days Absent**

Region	Days absent	
	Mean	SE
Central North	0.4	0.07
Central South	0.4	0.08
Gaborone	0.4	0.08
North	0.3	0.05
South Central	0.2	0.04
South	0.5	0.09
West	0.8	0.08
<b>Botswana</b>	0.4	0.03

**Table 2 (b) - Percentages and Sampling Errors for Reasons for Pupils' Absenteeism.**

Region	Illness		Family reasons		Fees		Work	
	%	SE	%	SE	%	SE	%	SE
Central North	81.8	2.87	7.9	3.06	2.3	1.58	1.0	1.02
Central South	66.9	5.17	14.3	3.51	2.6	1.36	2.6	1.89
Gaborone	54.1	7.11	15.5	6.02	1.7	1.73	7.4	4.26
North	71.4	6.79	9.6	3.77	0.0	0.00	0.0	0.00
South Central	76.7	3.88	13.6	4.06	0.0	0.00	0.1	0.12
South	79.8	3.34	12.6	3.56	0.0	0.00	1.7	1.20
West	70.7	6.66	9.9	2.64	0.6	0.58	4.5	1.51
<b>Botswana</b>	72.7	1.98	12.0	1.38	1.1	0.41	2.3	0.64

The main reasons cited for student absenteeism include illness, fees and work. Education in Botswana is free, but students have to contribute towards payment of cooks for school lunch programs.

The repetition rates among students in Botswana are also very high (Table 2 –b). The study conducted by Keitheile and Mokubung in (2005) found that around thirty-one percent of students were found to have repeated a standard at least once. Moreover the condition of the students' homes is less than favorable and their access to books is limited. An average student in Botswana has limited access to electricity as well, especially in the home life.

The level of parent education was observed to be low, and this further affects the students' participation in schools. Moreover, this also leads to fewer students receiving assistance at their homes with their schoolwork. The study recommended more flexible schooling arrangements for students especially so that students can have a chance to retain their "traditional ways of life". The low participation of parents can be enhanced by increased parent-teacher interaction. However, this also requires flexibility on the part of the teacher so that they can meet with their pupil's parents at their convenience.

### **Teachers' Behavioral Gaps**

The most common teacher behavioural problem was health (7.9%), followed by arriving late at school (14.1%) and absenteeism (38.1%). Appendix C highlights these problems. There is also a need on behalf of the administration to pay particular attention to the inter-regional disparities on various human resources factors like classroom, teachers' professional qualifications, experience and school head experience as seen in appendix D.

According to the study conducted by Keitheile and Mokubung (2005), the gender distribution of teachers also varied across regions (appendix C and D). The female teachers in the Western region constitute 37% of the total head count while Gaborone had as high as 84%. Their study recommended ensuring that no factors discouraged male teachers from participating in the education system.

### **Capability Gaps**

The education level of the teachers was also cited as another major gap in the education system (appendix D). According to one study, (Keitheile & Mokubung, 2005), a little less than half of the teachers of standard six students had junior secondary education as their highest qualification. Another one third had a senior secondary certification. The average time spent by teachers on training was also not deemed satisfactory.

Moreover, the teachers' levels of experience also showed wide regional disparity, where some areas showed the average experience level fell to almost half of the average (appendix D). Hence, there are few good and experienced teachers actively involved in the education system of Botswana. Keitheile's and Mokubung's study recommended provisions for under-qualified teachers to upgrade their qualification over time. It was also recommended to maintain and utilize a database of teacher's qualifications in order to manage the disparity in qualifications.

In-service training programmes were felt to be more effective as they addressed relevant needs of flexibility and availability. Benchmarking in-service training was also felt to be effective so as to guide the in-service educators regarding the expectations and delivery targets (Keitheile and Mokubung, 2005).

It was observed that the teachers' attitudes towards regular parent-teacher meetings were generally less than enthusiastic. Few teachers who taught the students actually met the parents of those students. Moreover, only a quarter of teachers were observed to ask the parents to sign their students' homework. The study observed that the assessment process needs to be enhanced and teachers' knowledge and skills for this process also needs to be improved. It was also noted that a continuous assessment process should be incorporated.

The average living conditions of the teachers were observed to be poor enough that it potentially distracted them from their teaching work. Their study recommended ensuring acceptable living conditions for teachers in addition to flexible teaching provisions in the schools.

### **Training Gaps**

Considering the characteristics of the school heads, the study conducted by Keitheile and Mokubung (2005), observed that about three-quarters of the school heads had primary school education or junior secondary school education as their highest qualification. The average experience level of school heads was observed to include around 2.4 years of professional training.

This also included six weeks of management training. The study recommended further specialized training for the school heads in Botswana in administrative and management skills. It was observed that schoolteachers do not have adequate means of communicating among themselves in order to discuss with their peers different problems and issues and build an overall constructive teaching environment. It was observed that school heads generally couldn't provide libraries, as only 30% of the schools had

libraries. This also greatly affected student performance. As concluded in earlier research, targeted professional development programs need to be further developed and implemented to increase teachers' knowledge and skills in teaching reading (Nguyen, Wu and Gillis, 2005). Moreover, it was recommended that measures such as extra tutorials in English should be provided to help pupils who do not speak English outside school. Teachers' qualifications in this area should also be surveyed in order to identify the teaching needs for English as a Second Language programs.

### **Infrastructure Gaps**

It has been observed that in Botswana, there is no equality in the provision of primary school mathematics across schools located in the remote rural areas compared to those in large cities. Whereas schools located in the remote rural areas were found to be the most disadvantaged, those from large cities were found to be the most advantaged (Mokoaena and MaKahala, 2005).

### **Infrastructure Gaps in Class Library Books per Pupil**

It is known that classroom libraries are very important in helping children to learn to read. They are even more important than school libraries. It is important that children just have many books that they can read (Nguyen, Wu, & Gillis, 2005).

**Table 3 - Means and Sampling Errors of Class Library Books per Pupil**

<b>Region</b>	<b>Class library books per pupil</b>	
	Mean	SE
Central North	1.8	0.29
Central South	3.4	0.53
Gaborone	1.8	0.40
North	2.8	0.58
South Central	2.1	0.38
South	3.2	0.66
West	1.6	0.41
<b>Botswana</b>	2.5	0.19

The Central South region had most books, with an average of 3.4 books per pupil, while the West with an average of 1.6 books per pupil had the lowest number of books (Table 3). It can be seen from the table that Botswana schools were poorly resourced in terms of class library books. With fewer than three books per pupil little variety can be expected. This is a poor condition for learning to read. Not only did a third of standard six pupils have no classroom library but even those who did had very few books in them. In places where there were no public libraries and homes that did not have plenty of reading material the situation was even worse (Nguyen, Wu & Gillis, 2005).

Among the diverse, groundbreaking methods in the field of educational technology, distance education methods gained importance for their obvious advantages as being flexible, economical, learner friendly and favorable for adult learners. Technology-based distance education will yield more benefits to the learners who can

access it at their own pace, time and geographical location. In order to provide open access higher education to all, especially to those disadvantaged groups who could not join the formal system of education due to inbuilt constraints of the formal/conventional system. Some of the constraints associated with a formal/conventional system are the need to attend the classes by being physically present in the class, and the requirement to appear for exams at the pre-defined schedule. On the other hand, educational technology implementations in distance education provide the freedom to attend classes at will and appear in exams from anywhere and at anytime (Kuruba, 2005).

There are several reasons mentioned below which explain why people do not pursue higher education in Botswana:

- Lack of multiple locations of Universities in Botswana (UB), which results in the inability of the University to handle the demand pressures from students who are finishing their school education,
- Reluctance from the employers in releasing their employees, who want to pursue higher education along with their regular job,
- The option of studying from home or long distance learning is not available in the University of Botswana (Mutula, 2002).

### **ICT Infrastructure**

As per the Africa ICT Indicators for the year 2007, the infrastructure facilities available in the African continent are as tabulated below. From this data, we see that Botswana ranks 11 with numerous infrastructural gaps when compared with other Sub-Saharan African countries. Botswana is said to be highly developed in



telecommunications infrastructure in Africa with rapidly growing infrastructure.

**Table 4 - ICT Infrastructure in Africa (Top 15 Countries)**

	<b>Population</b>	<b>Main telephone lines</b>		<b>Mobile subscribers</b>		<b>Internet users</b>	
	<b>000s</b>	<b>000s</b>	<b>p. 100</b>	<b>000s</b>	<b>p. 100</b>	<b>000s</b>	<b>p. 100</b>
Liberia	3,750	...	...	563	15.01	...	...
Sierra Leone	5,870	...	...	776	13.23	10	0.19
Mauritius	1,260	357.3	28.45	936	74.19	320	25.48
Seychelles	90	20.6	23.79	77	89.23	29	35.67
Egypt	75,500	11,228.8	14.87	30,047.0	39.8	8,620.0	11.42
Libya	6,160	852.3	14.56	4,500.0	73.05	260	4.36
Cape Verde	530	71.6	13.8	148	27.9	33	6.36
Tunisia	10,330	1,273.3	12.33	7,842.0	75.94	1,722.2	16.68
South Africa	48,580	4,642.0	9.56	42,300.0	87.08	5,100.0	10.75
Algeria	33,860	2,922.7	8.63	21,446.0	63.34	3,500.0	10.34
Botswana	1,880	136.9	7.78	1,427.0	75.84	80	4.55
Morocco	31,220	2,393.8	7.67	20,029.0	64.15	7,300.0	23.38
Namibia	2,070	138.1	6.66	800	38.58	101	4.87
S. Tomé & Príncipe	160	7.7	4.86	30	19.09	23	14.59
Gambia	1,710	76.4	4.47	796	46.58	100.2	5.87

Note: (Exhaustive Table in Appendix B)

### Communication Gaps

The uses of ICT and other technological developments in distance teaching-learning strategies have faced challenges due to socio-cultural scenarios. The different learning styles among students, the level of interactivity to be obtained, the maintenance of mutual respect among educators, the consciousness towards authority, the hesitation to open up, a fear of communication and gender sensitivity are among some of these challenges. These all can be grouped under the banner of cultural issues and differences. These factors are affected by local culture, differing beliefs between regions, the socio-

economic levels of educators and students, traditional beliefs, religion, as well as individual psychological barriers and modernity in terms of the development of a place (Kumar, & Bhattacharya, 2007).

As observed in a survey on ICT throughout Africa, it has been seen that “many countries and donor agencies are struggling to keep track of ICT/education projects and development projects over which they have no control and about which they often have little knowledge so that the lessons learned from these projects -- let alone their existence -- can inform strategy and planning related to ICT use in education going forward” (Farrell & Isaacs 2007). To add to this, this report also points out that “much relevant data collection has already occurred, but the results are scattered across a number of publications and databases (many of which are not widely known), held within individual organizations, not easily accessible to the education community, and/or, where public, not widely disseminated.”

The UNESCO report aimed at measuring ICT in education highlights the gaps in effective measurement of the performance indicators (UNESCO, 2002). This report attempts to put in place standard concepts and practices to measure the success of ICT implementations. The report states the operational and methodological caveats in determining the success measures of ICT implementations. As the domain of ICT refines over time, a clear understanding of the implementations will bring more clarity to the success measures.

The UNESCO report also states that there is a lack of high-quality and reliable data, as well as standardized guidelines for establishing comparable and relevant indicators. The report recognizes the measurement lacunae as one of the primary reasons that hinders the policymakers in making informed decisions. Another fallout of this gap is

the inability to show or prove the commitment of policymakers in making ICT an integral part of the education systems (UNESCO, 2002).

### **“Other” Gaps**

There are additional gaps categorized in the “other” category, as these gaps are not uniformly visible. The cultural issues differ as these values change over geographical and cultural regions. Similarly, the political stability, government policies and the commitment of the Government towards elevating the educational standards in a society makes a difference.

Traditional education has its own associated challenges, amplified by the fast-paced changes of the skills demanded in today’s labor market. As new paradigms are developing across the globe, focusing more on the act of learning rather than education itself, the delivery of education also needs to change accordingly. There are major differences in imparting education. From the traditional localized and confined physical space to flexible cross-border and globalized classrooms, imparting education has come a long way in a short time. Thus, teachers and students need to focus on educating students so that it helps them in their future professions, as the curriculum is no longer constrained by any certification goals or strict schooling roadmap (UNESCO, 2002).

### **Conclusions**

This chapter prepared the context and the gaps in the implementation of educational technology in Botswana. These gaps were classified into three major categories, viz. infrastructure and capacity gaps, trained resource gaps and others. The

“other” category captured the gaps which could not be classified under the first two categories. The infrastructure and capacity gaps, as the name suggests, included the infrastructure gaps and communication gaps. The trained resources gaps included the students’ and teachers’ behavior gaps as well as training and capability gaps. Finally, the “other” category included the cultural considerations, stability and its commitment to education and how the educational process is changing all around us.

It was found that while infrastructure and capacity gaps clearly existed, the trained resource gaps were apparently most significant. The gaps in the capability of the teachers and students were quite wide. While there were efforts to minimize these gaps; they were not bearing results, as there was not enough support.

This thesis will delve deeper into these issues through a search of current literature and databases from secondary resources and recommendations will be made accordingly.

## **CHAPTER 4: THE PRESENT SITUATION OF ICT IN THE EDUCATION SECTOR**

### **Present Situation**

It has been observed through e-learning conferences and the surveys conducted across the continent that Africa's educational institutions do not effectively harness the full potential of the e-learning practices. Quantitatively, this was presented by a report published by the University of London, UK (Unwin, 2008).

There were quite a few interesting observations in the report, though the researchers did not recommend a generalisation due to the specificity of the population from which the sample for the survey was drawn. (Refer to Appendix A). As the findings are statistically not significant, generalisation is not recommended. Still, the outcome more or less confirms the general understanding of the state of ICT in Africa. It is not possible to directly apply these results to Botswana's education system. However these results give a general idea of the state of affairs in terms of implementing ICT in the education sectors of Africa.

The report primarily draws the following conclusions:

- There are a wide variety of e-learning practices in Africa,
- E-learning is still in its early stages,
- The untapped potential of e-learning is very much understood.

The respondents also considered lack of fundamental requirements in employing e-learning. They are as given below:

- Lack of infrastructure, especially as it concerns connectivity in rural areas,
- Lack of appropriate training and capacity development,

- Lack of digital content i.e., the content is available in printed format and there are not enough 'soft' copies of printed content, as necessary,
- High initial cost of implementation.

Some of the relevant excerpts from the survey are indicated below.

When asked about the educational levels (the formal steps in education e.g. primary, secondary, higher education levels) addressed by their e-learning courses, respondents listed the following:

- Higher education 53% (169)
- Continuing education 37% (116)
- Vocational 23% (74)
- Secondary school 22% (70)
- Informal/non-formal 22% (69)
- Technical education 21% (66)
- Primary school 10% (33)
- Special educational needs 9% (28)

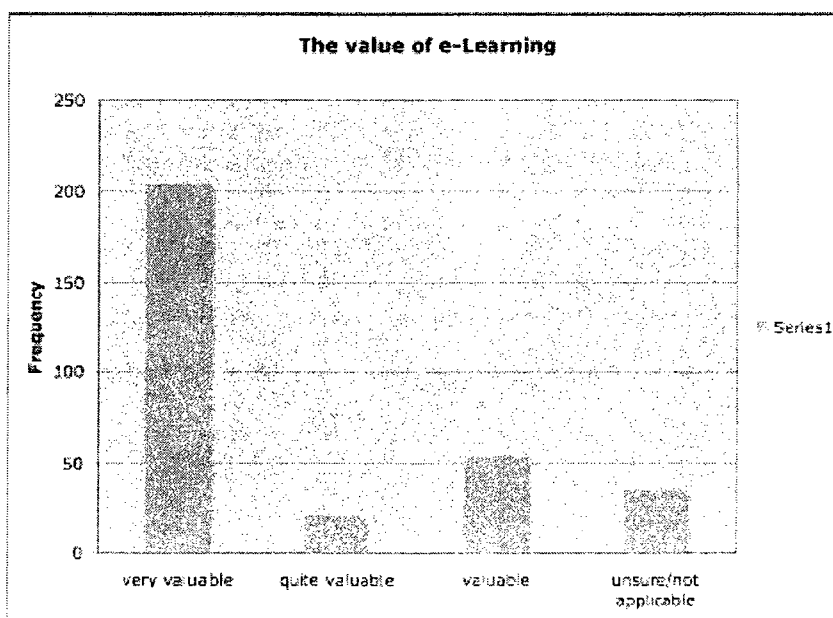
This reinforces the view amongst practitioners who responded to the survey that the majority of uses for e-learning were in the higher education and vocational fields.

Respondents to the survey were from 42 different African countries, with Kenya representing 15 percent, South Africa representing 12 percent, Nigeria representing 11 percent, Ethiopia representing nine percent and Uganda representing eight percent of the total respondents (see Appendix A for further details). Of those surveyed who indicated their gender, 25% (773) were women and 75% (230) were men. Of those who reported the educational context within which they were working, 37% (118) were

from higher education institutions, 5% (16) from primary or secondary schools, 5% (14) from NGOs, and 3% (9) were from vocational and technical institutions. Of those who responded to questions about e-learning and blended learning, 72% said they used e-learning (although this only represented 48% of all respondents) and 78% used blended learning approaches. The majority of identifiable respondents to the survey were therefore men who work in universities and who have had some experience with e-learning.

Unsurprisingly, given that the respondents were drawn specifically from a database of those interested in e-learning, 68% of respondents remarked that they thought that e-learning is, or could be, very valuable for their learning and teaching needs, compared to the six percent that felt it was quite valuable, 17% that thought it was valuable, and the only 11% who were unsure or thought it inapplicable (Figure 1).

**Figure1 - The value of e-learning (e-learning Africa, 2009)**



The overriding conclusion to be drawn from this evidence is that the majority of those who claim to use e-learning systems are not using an integrated formal learning management system at all, but are rather using basic digital technologies to enhance their learning, more often than not accomplished by simply accessing information from the Web. This was reinforced by respondents' answers to questions concerning the specific e-learning practices and methods that they used in their teaching/learning. Although it is difficult to generalise from the diversity of comments received, the dominant practices seemed to be Internet with 11% (34), e-mail with 10% (31), CDs with 9% (28), the Web (Intranet or local intranet of institutes) with 7% (22), video with 5% (17), chat with 4% (13), and presentations with 4% (13).

Discussion forums were only mentioned by 3% of respondents (9), multimedia by 2% (7), the use of digital libraries by 2% (6), instant messenger by 2% (6), and only one respondent specifically mentioned educational games. This again suggests that there is still not a particularly high level of sophistication in the usage of e-learning among the majority of respondents.

In another question, respondents were specifically asked whether they were involved in the development of e-learning content, and 41% (130) answered in the affirmative; the majority of respondents therefore did not see themselves as being involved in producing content for e-learning. Interestingly, with further questioning, even fewer respondents (only 34%, or 109 individuals) claimed to be involved in the management of e-learning courses.

### **Infrastructure Issues in the e-Learning**

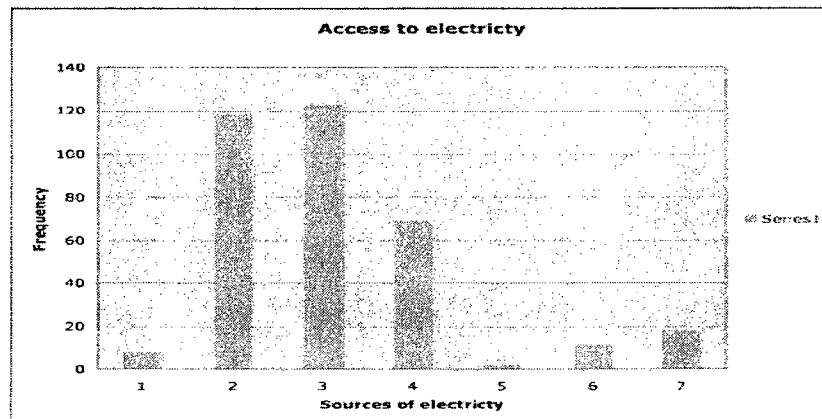
It is suggested that it may not only be infrastructural issues preventing the



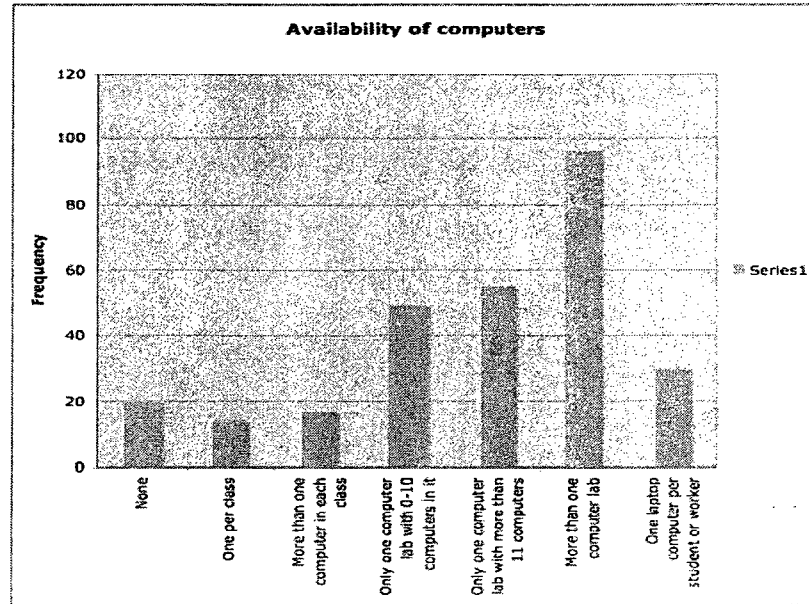
effective implementation of ICTs in education. Rather, the dimensions of management, effective development, and expertise at various levels in the den of e-learning might need further attention. The report also appropriately refers to the infrastructural issues as the ‘hard’ dimensions, development and managerial aspects as the ‘soft’ dimensions.

The graphs in figures 2, 3 and 4 clearly highlight the various issues identified by the respondents in effective implementation of ICT in education:

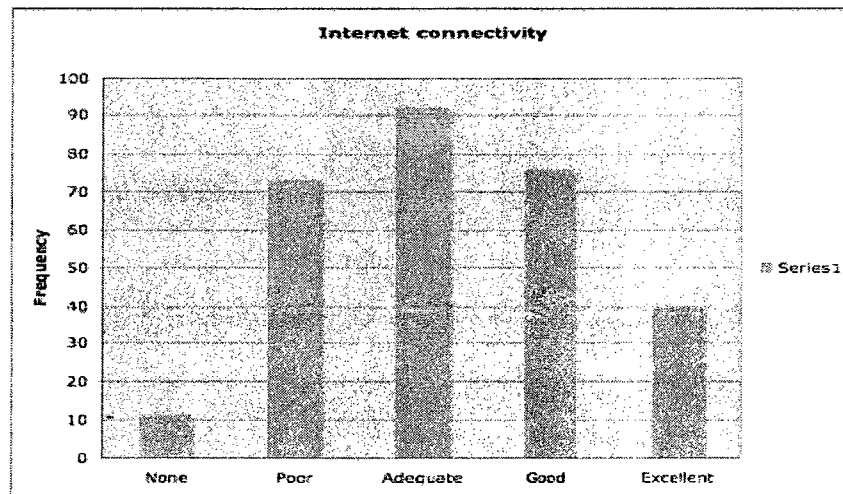
**Figure2 - Infrastructure Issues - Electricity (e-learning Africa, 2009)**



**Figure3 - Infrastructure Issues – Computers availability (e-learning Africa, 2009)**



**Figure 4 - Infrastructure Issues – Internet Connectivity (e-learning Africa, 2009)**



It is on such issues that future sessions at the e-Learning Africa conference in Ghana in 2010 should focus if we are to work together successfully to use the vast potential of ICT to empower future generations of African children.

## **Infrastructure and Capability in Botswana as Compared to other African Nations**

Some of the statistics made available by the International Telecommunication Union are shown below. From these statistics, it is quite evident that Botswana is not itself among the highest in the African continent in terms of relevant indices of capability or capacity. Thus, there exists a good opportunity for increasing the infrastructure facilities so that ICTs can be put to use for educational purposes.

A comparative study of ICT access and usage in eleven typical sub-Saharan countries, (tables 5, 6, 7 and 8) brings out the disparities and the similarities in ICT access and usage (Gillwald & Esselaar, 2005). The countries chosen for comparative study are Botswana, Cameroon, Ghana, Ethiopia, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Uganda and Zambia. The study seeks to move beyond the more traditional and limited collection of telecommunications indicators to explore the communication patterns, access strategies and expenditure of consumers, and indeed of those who continue to be marginalized from communications services on the continent.

**Table 5 - Main Telephone Lines \***

	<i>Main (fixed) telephone lines</i>			<i>Main (fixed) telephone lines per 100 inhabitants</i>		
			<i>CAGR</i>			<i>CAGR</i>
	<i>(000s)</i>		<i>(%)</i>			<i>(%)</i>
	2003	2008	2003 – 08	2003	2008	2003 – 08
<b>Angola</b>	85.0	114.3	6.1	0.54	0.63	3.1
<b>Botswana</b>	131.4	142.3	1.6	7.33	7.41	0.2
<b>Cambodia</b>	31.4	43.1	6.6	0.23	0.30	4.8
<b>Central African Rep.</b>	9.5	12.0	4.8	0.24	0.28	2.9
<b>Egypt</b>	8,735.7	11,936.0	6.4	11.76	14.64	4.5
<b>El Salvador</b>	752.6	1,077.2	7.4	12.51	17.56	7.0
<b>Ghana</b>	291.0	143.9	-13.1	1.39	0.62	-15.0
<b>Guatemala</b>	944.1	1,449.4	9.0	7.81	10.59	6.3
<b>Lithuania</b>	824.2	784.9	-1.0	23.86	23.64	-0.2
<b>South Africa</b>	4,821.0	4,425.0	-1.7	10.29	8.91	-2.8

**Table 6 - Mobile Cellular Subscriptions \***

	<i>Mobile cellular subscriptions</i>						<i>Ratio of mobile cellular subscriptions to fixed telephone Lines</i>
				<i>CAGR</i>	<i>per 100</i>	<i>%</i>	
	<i>(000s)</i>		<i>(%)</i>	<i>inhabitants</i>	<i>Digital</i>		
	2003	2008	2003 – 08	2008	2008		
<b>Angola</b>	350.0	6,773.4	80.9	37.59	...	59.3:1	
<b>Botswana</b>	445.0	1,485.8	27.3	77.34	100.0	10.4:1	
<b>Cambodia</b>	498.4	4,237.0	53.4	29.10	...	98.3:1	
<b>Central African Rep.</b>	40.0	154.0	30.9	3.55	...	12.8:1	
<b>Egypt</b>	5,797.5	41,272.5	48.1	50.62	100.0	3.5:1	
<b>El Salvador</b>	1,149.8	6,950.7	43.3	113.32	...	6.5:1	
<b>Ghana</b>	795.5	11,570.4	70.8	49.55	100.0	80.4:1	
<b>Guatemala</b>	2,034.8	14,948.6	49.0	109.22	100.0	10.3:1	
<b>Lithuania</b>	2,102.2	5,022.6	19.0	151.24	100.0	6.4:1	
<b>South Africa</b>	16,860.0	45,000.0	21.7	90.60	100.0	10.2:1	

**Table 7 - Internet \***

	<i>Internet</i>				<i>Broadband Subscribers</i>	
	<i>Subscribers</i>	<i>Subscribers</i>	<i>Users</i>	<i>Users</i>	<i>Total</i>	<i>Per 100</i>
	<i>(000s)</i>	<i>per</i> <i>100 inhab.</i>	<i>(000s)</i>	<i>per</i> <i>100 inhab.</i>	<i>(000s)</i>	<i>inhab.</i>
	<i>2008</i>	<i>2008</i>	<i>2008</i>	<i>2008</i>	<i>2008</i>	<i>2008</i>
<b>Angola</b>	107.0	0.59	550.0	3.05	15.9	0.09
<b>Botswana</b>	10.0	0.52	120.0	6.25	8.9	0.46
<b>Cambodia</b>	18.0	0.12	74.0	0.51	16.6	0.11
<b>Central African Rep.</b>	2.5	0.06	19.0	0.44	-	-
<b>Egypt</b>	2'504.8	<sup>2</sup> 3.07 □	13,573.0	16.65	769.7	0.94
<b>El Salvador</b>	126.0	2.05	650.0	<sup>1</sup> 10.60 □	123.5	2.01
<b>Ghana</b>	28.9	0.12	997.0	4.27	23.0	0.10
<b>Guatemala</b>	...	...	1,960.0	14.32	79.0	0.58
<b>Lithuania</b>	593.9	17.88	1,826.5	<sup>3</sup> 55.00	590.1	17.77
<b>South Africa</b>	3,566.0	7.51	4,187.0	8.43	426.0	0.86

**Table 8 - Basic Indicators \***

	<i>Population</i>		<i>GDP</i>		<i>Ratio of</i>
	<i>Total</i>	<i>Density</i>	<i>Total</i>	<i>per capita</i>	<i>mobile cellular</i>
	<i>(M)</i>	<i>(per km2)</i>	<i>(B US\$)</i>	<i>(US\$)</i>	<i>subscriptions to</i>
	<i>2008</i>	<i>2008</i>	<i>2007</i>	<i>2007</i>	<i>fixed telephone</i>
	<i>2008</i>	<i>2008</i>	<i>2007</i>	<i>2007</i>	<i>Lines</i>
<b>Angola</b>	18.02	14	59.26	3,376	59.3 : 1
<b>Botswana</b>	1.92	3	12.34	6'519	10.4 : 1
<b>Cambodia</b>	14.56	80	8.63	602	98.3 : 1
<b>Central African Rep.</b>	4.34	7	1.70	399	12.8 : 1
<b>Egypt</b>	81.53	82	133.53	1'668	3.5 : 1

<b>El Salvador</b>	6.13		287		20.37		3'336		6.5 : 1
<b>Ghana</b>	23.35		98		7.62		364		80.4 : 1
<b>Guatemala</b>	13.69		126		34.03		2,548		10.3 : 1
<b>Lithuania</b>	3.32		51		38.35		11,425		6.4 : 1
<b>South Africa</b>	49.67		42		283.75		5,770		10.2 : 1

(\* = ICT Statistics Database from International Telecommunication Union for the year 2008).

The comparative study of African countries (Gillwald and Esselaar, 2005) as shown in Tables 5, 6, 7 and 8 measured the capability of the country to absorb ICT implementations in terms of an e-index. To provide a comparison of indicators, a simple measurement has been used which allocates rankings of one to ten for each of the surveyed countries based on four service categories: fixed, mobile, payphone and email. While these categories are contestable, they are informed by the following rationale: higher fixed lines are likely to reflect in greater backbone extension of networks, critical to not only extending voice services to remote parts of the country, but vital data services in the short term as well. This study provides a baseline against which countries can assess their incremental gains, analyse demand and develop policies and strategies that are responsive to them, empowering all their citizens with the benefits of effective participation in the information era.

Mobile telephone has opened up the continent to voice communications in an unprecedented way, but due to the high costs of bandwidth, its utility for enhanced data services will be out of the reach of most consumers, who can barely afford basic voice services. Although mobile has made enormous inroads, the continued high payphone usage stresses the importance of public access. Payphones are often used where fixed and

mobile services are restricted. However, low payphone usage can also reflect a general lack of provision where not even collective access is made possible. It is also clear that payphones are a critical part of a broader communications strategy.

The e-index comparison is as shown below:

**Figure 5 - ICT e-Index (Gillwald & Esselaar 2005)**

\* Cameroon, Ghana and Mozambique have been excluded due to inability to weight data

Country	Mobile penetration – prepaid (%)	Email penetration – subscribers	Fixed line penetration (%)	Payphone % (used in the last 3 months)	e-Index Points
South Africa	8	6	7	8	29
Botswana	7	5	8	7	27
Zambia	6	8	6	5	25
Rwanda	3	7	2	6	18
Lesotho	5	3	5	4	17
Tanzania	4	4	4	2	14
Uganda	2	2	1	3	8
Ethiopia	1	1	3	1	6

As seen in figure 5 above, Botswana ranks quite high on the list, making it a good contender for the effective implementation of ICT.

As the study shows, Botswana and Uganda are widely believed to serve as examples of the best policies and regulatory practices on the continent, being cited in various multilateral and donor agency reports, including the International Telecommunications Union (Gillwald & Esselaar, 2005).

#### **Availability of Necessary Communications Networks in Botswana**

Botswana's government intends to invest and create appropriate technology in the education system. Due to the large number of school dropouts, the number of adult

students is also high and they expect some supplementary support in order to facilitate the learning process (Kuruba, 2005).

According to government officials, it is estimated that at least one computer is available per school for administrative use and ThutoNet aims for one computer per classroom in each school (Republic of Botswana, MAITLAMO ICT Policy, 2005). All junior secondary schools have computer laboratories.

Botswana has two radio stations; one being a national channel while the other one is a commercial channel. The public domain channel has a division largely for educational broadcast. This division has been divided into two sections. One is for Non-formal education and the other section is for school broadcasting. These programs focus on supporting the subjects taught in schools. In addition, there are programs for teacher education as well. Currently, some distance education programs are broadcast through these radio stations.

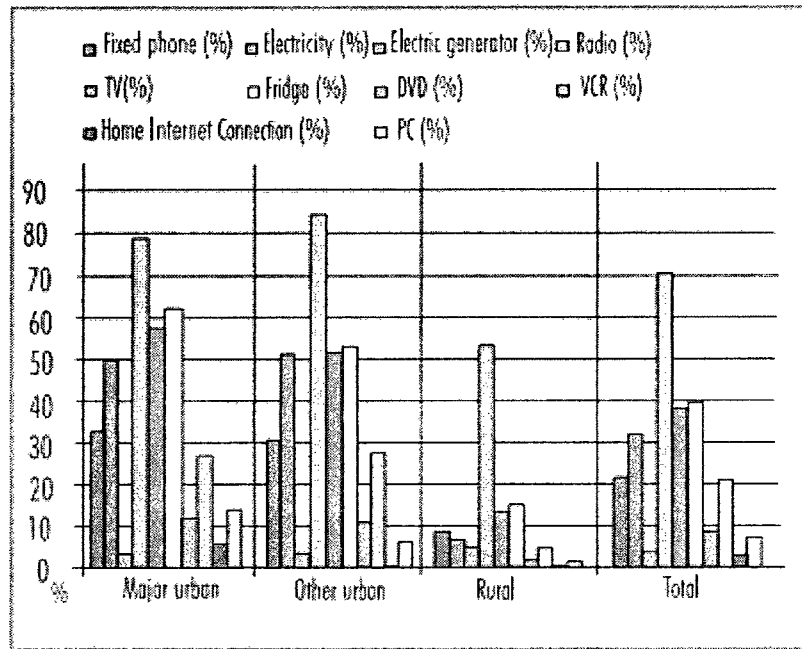
Lessons transmitted via radio and television can be employed to broadcast lessons in more effective ways than can print, often. Interactive computer programs and on-line teaching can be encouraged as well, as the learning tends to be highly effective with these aids. In order to increase the access, CD-ROMs or internet can be leveraged for self-instructional material. Video conferencing can also be put to use for more interactive communication between educators and parents (Kuruba, 2005).

The examination of mobile phone usage also indicates that the use of mobile technology for the purpose of education in Botswana is feasible. Towns experience the highest rates at 41.4%, while rural areas are at a lowly 11.3%. Overall use is 25.3%, somewhat under the figure of 31% provided by operators. These figures are growing rapidly also. (Sebusang, Masupe & Chumai, 2005).

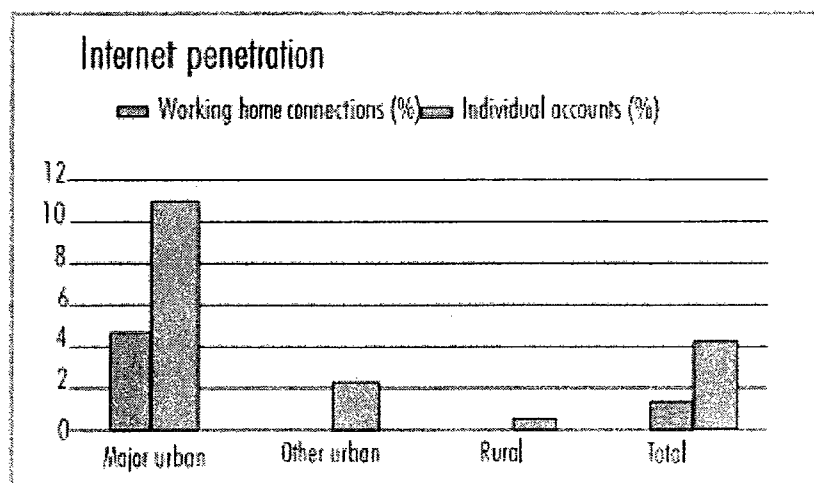


The e-index study of Botswana by Sebusang *et al*, points to the following ICT statistics (figures 5, 6, 7 and 8).

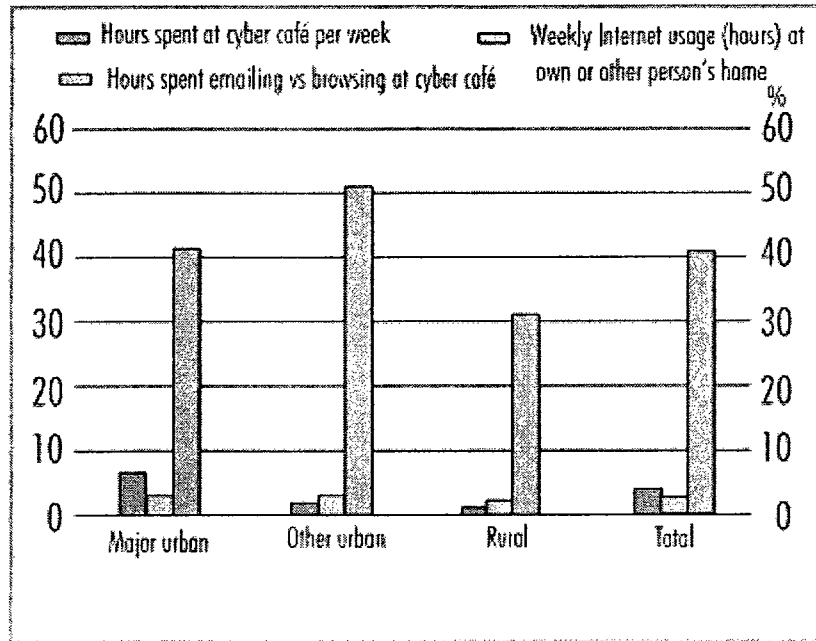
**Figure 6- Integrated Household ICT Statistics of Botswana (Sebusang et. al., 2005)**



**Figure 7 - Internet Penetration in Botswana by Location (Sebusang et. al., 2005)**



**Figure 8 - Weekly Internet Usage in Botswana (Sebusang et. al., 2005)**



The study highlights the fact that broadband access is not within the reach of most of the population in Botswana. Radio is the exception, with national census figures indicating its availability in 71% of households, versus 69.7% from the survey; coming in at a distant second is the refrigerator, at 39.4%. But more telling in terms of ICT usage is the low percentage of home PC ownership at 6.1% and individual email addresses at 4.29%. (Sebusang et. al., 2005).

The study concludes with the remark that while Botswana has moved some way in liberalizing and extending telecommunications access over the last few years, overall access figures, excluding mobile phones, are still very low (figures 6, 7 and 8). Worse still is the clear information divide between the rural areas and urban centers. Unless urgently attended to, this will continue to escalate, further sidelining rural communities by denying them opportunities for self- growth. Because of the low levels of electricity access, ICT technologies such as internet correspondingly lag behind other middle-income countries that Botswana should be benchmarking itself against. If access is to be

improved, more needs to be done to increase the reach of basic technologies, like electricity and fixed phone lines in order to pave the way for newer ICTs.

For the impact of ICTs to be felt, there has to be an appreciably higher usage of the internet, but for this to happen, more people must use PC's. "Stated differently, a higher usage of the internet presupposes a higher computer ownership (and with it, computer literacy). Hence, higher PC ownership could drive internet usage, as owners begin to recognize the need for services that only the internet can provide" (Sebusang, Masupe & Chumai 2005).

### **Identifying the Gaps in the implementation of ICT in Education Systems of Botswana**

Keeping in view of these facts, adequate infrastructure exists in some regions, and there is the intent to develop education technology in Botswana. Hence, there seems to be a good potential for leveraging educational technology in Botswana's education system.

Thus, summarising the above discussion, the gaps that have been identified as hampering the effective implementation of ICT in the education sector in the case of Botswana, are as follows:

- The development and implementation of the low-cost solutions,
- The appropriate development of e-learning software,
- The marketing of education through ICT to a specific niche (e.g. youth, college dropouts, etc.)
- The handling of infrastructure issues through cost-effective solutions,

- An increase in government participation with education technology,
- The creation and monitoring an Education Management Information System (EMIS) so that the success of any initiative involving ICT can be measured and appropriate action can be taken.

### **The Use of ICT in Teaching and Learning**

Educational Technology (Edutech) is a World Bank blog that evaluates ICTs in teaching and learning practices across the world. Its homepage (Trucano, 2009) talks about the Basic Information Educative Connectivity for Online Learning (CEIBAL) project, which has allocated “One Laptop Per Primary School Student” (OLPC) to effectively diffuse the practice of ICT. Project CEIBAL was launched in Uruguay and it is considered to be one of the finest implementations of ICT in South America. Rwanda is now planning a similar OLPC initiative.

Initially launched for primary school level, the project has been extended to the high school level as well. The success of current ICT implementation has been phenomenal, even though the Minister of Education in Uruguay considered the extensions risky, but successful in the end. The report by the World Bank’s ICT and education specialist, Trucano (2007), highlights the innovations Uruguay made by introducing ICT to the field of primary education. The report also highlights the success achieved in this project. Project CEIBAL has resulted in making primary schools a hub of ICT, where free community Wireless Free Internet (WIFI) is available, enabling internet access to scores of municipal schools across the country. As it was feared that providing only the hardware may not result in successful implementation of ICT in schools, the project

coordinators also started the process of providing 'one laptop for each teacher'. This slogan has resulted in many teachers taking up ICT implementations in their classes and method of teaching. This behaviour is a radical change from the earlier 'inertia' displayed by the teachers, who were simply not interested in implementing ICT in their teaching methodologies.

Another strategic move by the project was to arrange for free training programs for parents and community members specifically on how to use the hardware which was provided for them to implement the ICT in their areas. Thus, the project was not only bringing in new machines (hardware) but they were also creating the 'soft' skills to use it. As it was realised, by the policymakers of this initiative, the failure of implementing ICTs in many systems may be the result of lack of 'soft' skills at the appropriate level, not the lack of hardware (Trucano, 2009).

Another report by the International Institute for Communication and Development (IICD) summarised that the learning process can be dramatically improved by:

- Creating ICT provisions in teacher training colleges to enhance the capability of trainees,
- Strengthening the curriculum and the quality of teaching aids to make the learning process more efficient,
- Improving the efficiency of the management and administration in order to devote more time to providing efficient education to the students (The Importance of ICT, n.d.).

Thus, it can be seen that the ICTs are considered to be of paramount importance in enhancing the quality of education in any country.

The same report goes on to observe that the institutional capacity in the education sector needs to be strengthened in order to manage and plan activities more effectively. Information is mostly in hardcopy format and is not easily accessible. Data on teachers, salaries, student grades, the number of pupils per class, and statistical information in general are scattered and are not readily available.

The report also observes the use of ICT in bridging the gap in youth education in a world that is increasingly connected and moving towards an information- or knowledge-based society makes new ways of learning crucial. In this context, learning skills go beyond learning through the formal education system. As many young people drop out of formal education, ICT can enhance vocational training for those who do not complete school or for unemployed adults to help them to gain technical knowledge, so that either they can be self-employed or it is easier for them to seek employment immediately after the course.

Another study points to the effective low-cost options available, which can reduce various gaps that are present in effective implementation of the ICT in education sector (Trucano, 2008):

- Interactive Radio Instruction (IRI) in Urban Slums
- Quality of teaching and learning
- Enhancing Educational Management through EMIS (Education Management Information System)
- Improving Educational Policy and Coordination
- Improving Quality and Equity

- Cost and benefit analysis of the education sector intervention
- Monitoring and evaluation of the ICT programs

### **Conclusions**

Current ICTs can serve to leverage educational resources, provide access to scarce resources, and connect teachers, parents, students and experts with their peers, one another, and the world at large. The potential is great, but so far the effects of technology-based strategies on teaching and learning have not been universally strong or positive. There are many challenges concerning the design and implementation of effective strategy; limited or unreliable infrastructure, lack of adequate funding, poor planning, lack of systematic thinking, and a host of cultural, linguistic, technological and organizational challenges. Nonetheless, it is widely recognized among educators, governments, industry and labour that if students want a successful future in this century, they need to be lifelong learners. With the help of educational technology, skills necessary for the students to work and fully participate in life can be developed.

We cannot forget that the use of technology in education is also invariably contingent on changes and reforms in pedagogy. The direct teaching method used in the early part of the century, though still effective for some skills, is giving way to cooperative and problem-based approaches. For students working together towards a common objective, teachers serve as an expert, facilitator and a coach, guiding the students in discovering things for themselves. This is as much an innovation to the learning process as the introduction of ICTs, and poses its own issues in the context of this thesis.

## **CHAPTER 5: ICT GAPS AND SOLUTIONS IN EDUCATION SECTORS**

### **A Brief Overview**

The analysis conducted for the purposes of this thesis gives interesting dimensions to the solutions identified to the gaps. The objective of this research is to identify the tools available in the market to enable the acquisition of knowledge and learning in schools, covering a wide area, through computers, internet and ICT. As discussed in the following paragraphs and the subsequent sections it has been found that the human dimension of the problem plays an important role.

The complexities and challenges that are confronted by the teachers are increasing day by day, and thus educators see themselves in the midst of multiple transformations that seem to be occurring within and outside the limits of the school. Teachers play an active role in the progress/modifications of the classroom as new technologies have been found to be introduced inside schools (Batane, 2005). Henceforth, schools continue to be provided with the latest technological equipments, such as computers, in order to facilitate the process of teaching and learning in Botswana. The literature at hand demonstrates that the recent era of education in Botswana demonstrates a desperate need for the teachers to learn and employ technology. Therefore, current teachers face the challenge needing to acquire a professional working knowledge in the required technology in order to perform effectively in the subsequent technology-oriented classes that have been introduced in the schools of Botswana (Batane, 2002).

One of the studies conducted analyzes the process of teacher performance in a particular school in Botswana concerning the technology that is being used in the classes. Interviewing the teachers and the officials of the Ministry of Education at great lengths



yielded an authentic record of their accounts. The results state that the teachers who have already learned about computer technologies by their own initiative are being required to complete an additional comprehensive training for the technology inside the school. Moreover, the teachers are more or less dissatisfied with the training that is being imparted to them. Hence, the research conducted suggests the need for a more organized approach towards teacher training inside the schools in order to involve a greater number of teachers and ultimately yield a positive result (Batane, 2002).

Another study tries to test alterations in the behavior of the teachers in addition to their capability to follow the trend of computerization in schools. The factors that were determined to predict success were: training courses of the teachers, the implementation of teacher panels, the hopes and enthusiasm of the teachers towards the training and teacher computer-use inside schools.

The study was conducted in the schools of Botswana by employing the subsequent tools: questionnaires, interviews, focus panels, case studies and observations. The panels that were analyzed were composed of both students and teachers. The findings stated a drastic change in the behavior of teachers and their capability of adapting to computerization. Moreover, the teachers who had a thorough knowledge of computers effectively employed its tools and made good use of the software (Totolo, 2005).

Up until now, the teachers were not very open to the changing methods and wanted to rely on the more comfortable, conventional method of teaching. They are quoted as saying that they had not expected any drastic change because of computerization (Totolo, 2005).

## **Findings of the Analysis**

The analysis of the current situation of the ICT in Botswana was conducted with an objective to identify their availability, usage, application and their relevance on the people they impact.

The relation between appropriate technology alternatives and economic growth has started to gain identification among professional educators and teachers with the attempts of Botswana Technology Center (BTC), in Botswana. The organization of BTC aims at helping the people of Botswana in recognizing proper technology alternatives. By employing the resources available at hand along with the knowledge of ICT, the BTC consistently analyzes and adopts novel technologies when needed in order to make the ends meet in Botswana. The activities consist of relocation of applicable technologies to different economic sectors both within the public sphere and the industries (Totolo, 2005).

The BTC plays an active role in designing and developing electronic products such as modular data loggers, borehole water sensors, solar rechargeable hearing aids and photovoltaic controllers, all which are widely used locally, with a number of them patented across Africa.

The boom that has been lately experienced in the sector of information and communication technology in Botswana is gradually seeing a downward trend. The industry of computers becomes to a great extent ready for action and is seeing a good number of world class players coming in. This implies that lately there are more than 50 dealers across the country; with the chief concentration in Gaborone. Open to the new technology, Botswana gets a number of products earlier than the other parts of South Africa (Long Term Vision 2016, 1997).

An increased percentage of the occupations in the information technology industry are more or less related to the government, with regional companies capable of supplying, to a rising level, the proficiency and provision to fulfil all the needs of the departments of state. With the entire continuum of the sector provided for, a number of dealers offer a comprehensive solution -- providing support, software and hardware -- while other suppliers have chosen to concentrate on products that are industry-specific (Totolo, 2007).

The individual computer magazine of Botswana keeps on updating the people in line with the most up-to-the-minute modifications that keep on happening inside the industry. There is an electronic billboard that helps the specialists of the information technology, in such concerns, which permit an access to around 1500 topics related to computers (Kaino, 2005).

One of the studies by Kaino (2005) focuses on the resources which can make a school system perform well. As the study mentions, there is no scarcity of projected approaches like, seeking competent principals, delegating them to the required authorities, introduction of competitive markets in collaboration with charters, alternatives, and vouchers, establishment of good schools to make sure that the students get required and proper attention, and the list continues. On one hand, such approaches have a stunning influence on private schools, whereas, on the other hand, they have not succeeded for producing even one well-performing advanced school system (Kaino, 2005).

In spite of these initiatives, including a doubling-up in yearly public expenditure on education to around \$450 billion in 2005, no one has been able to make out how to develop a system of long-term success across the school districts. The reasoning behind this phenomenon is that a number of teachers, researchers and makers of policies more

often than not, look at the district office as an organization. Usually district offices are controlled by the superintendent, who is often considered as a chief constituent of the obstacles to development of the education system and an unimportant factor in the answer to the problem (Kaino, 2004).

Besides this, the solutions that are based on schools are important, yet they are not sufficient. Had they been sufficient, the low-performing schools would be able to develop themselves and the districts would be brimming over with high performing schools. Gaining excellence on a larger level calls for a more comprehensive strategy for developing guidelines inside the classroom and identifying particular organizations to execute it. The district office has the capacity to form this kind of a plan, recognize and circulate excellent practices, develop leadership qualities at all standards, create information systems to monitor the individual student improvement and identify ineffective students/teachers/administrators responsible for the consequences. The basic reason why the attempts at reforming or improving the educational system have not gained any kind of success on the district level is that they have neither tried to aid the district office in performing this role, nor have they built up a feasible alternative (Kaino, 2005).

So how do we identify an organization that is in a position to support tactics for developing learning and teaching methods across districts? In what way can the district offices create significant structures, cultures along with systems that are particular to education of public? As of yet, there is no such administrative model. A number of business executives have encouraged superintendents and school boards to control their districts more or less like businesses; namely to execute the same administrative models, organizational advances and leadership. The subsequent sections focus on the answers to

such questions.

### **Current Trends**

In order to assist the leaders of advanced school systems in constructing and executing an administration model, twelve faculty members from Harvard Graduate School of Education and Harvard Business School, came up with the concept of the Public Education Leadership Project (PELP) in 2003. The project concentrated on advanced school districts for an apparent reason: they are the largest obstacle of education in the U.S. with reference to the number of students and levels of accomplishment. If records are any indicator, then around 70% of the students in the U.S. complete high school, which ranks the United States tenth amongst the 30 member countries that constitute the Organization for Economic Co-operation and Development (OECD). In a math test given to 15 year-olds in OECD countries, the American students' scores averaged to 24 correct answers out of 30 questions. They scored lower marks than students from countries of equivalent wealth, such as Germany, France and Japan, and even students in some developing countries like Poland and Slovakia. Advanced schools in the U.S. show an unequal education for students who are Spanish and African American, who as early as the age of nine are showing signs of lagging behind by three grade standards in mathematics and reading. About half of these students succeed to pass to high school; among those who are able to read, students are on average only of an eighth grade standard (HBR, 2006).

It is not long that PELP has strived to the fullest to recognize proficient administration and leadership exercises from both non-profit and business sectors in order to facilitate the advancement of public school districts. Moreover, the panel has

conducted a thorough research on the achievements and the breakdown of the advanced school districts by investing hours of monitoring around 15 districts all over United States, with student populations ranging from 7,900 to 434,400. After a long period of stagnation, a number of these districts showed noticeable improvement in terms of student accomplishment, yet the average standards attained by students were still extremely low (HBR, 2006).

PELP has developed a successful strategy for consistently obtaining excellent student performance throughout entire school districts. Using this strategy, nine out of 5 districts, including those in Chicago, teamed up with PELP to examine and improve approaches to new school management.

It is a bit premature, but then the outcomes that are at hand so far are really amazing and excellent. Out of 15 districts that have been used as research, 12 that have been obstinately adhering to the systems wide administrative and organizational excellence are making authentic and constant development in improving the performance of their students. This implies that the proficiency of students in mathematics and reading at varying grade standards have progressively increased throughout the past three years.

### **Teacher Training Qualifications**

In order to make the technology of computers successful in schools, it is important that the teachers are trained and are prepared in advance. The invitation to the training must contain the requirements and knowledge teachers are expected to come with. Training of teachers is crucial activity towards the advancement of educational technology solutions and strategies because of the strong requirement for instructional

expertise (HBR, 2006).

According to the Office of Technology Assessment (OTA) Report published in 1995, in order for teachers to use the technology well, they not only require having an access to it, but they also have to think of new ways in which the technology can be put to use. It is therefore critically important to be aware of how teachers connect with technology, of what their responsibility is in a new atmosphere like this, and of how they are helped in classrooms that are more or less technology-based. Using computers in schools presents a challenge to teachers who are still new to the technology and to those who follow more conventional methods of teaching and who are still not familiar with the advantages technology training could offer. Such teachers face a problem of learning new techniques and find it difficult to change their method of teaching. In the end the teaching process becomes more challenging for them and outcomes are uncertain.

On the other hand, technology has undeniably and comprehensively entered in the field of education and teachers find themselves at a stage where they are left with no other alternative other than adapting. For a number of experienced teachers, computers weren't necessary at the initial phase. Additionally, the results that are at hand concerning the research done concerning the influence of the technical knowledge is drastically positive, with researchers stating how technology can assist the students to learn and perform better (Kuruba, 2005). The teachers in the research stated that the technical science aided them greatly in encouraging the students to learn and teaching them with various methods. They reported that the students, who nearly gave up, found the school an interesting place where they could work wonders with technology in their education. The technical knowledge helped the students get in touch with other students all over the world. The inference of the research was that the normal activities, which could not be

conducted in the school, worked wonders when blended with the use of technology as well as appropriate and cautious guidance from the teachers. Computers have continued to be accepted by the schools as they introduce new improvements in the process of teaching (Botswana MOE, 2009).

Different reports give various suggestions regarding how schools should employ computers when developing their quality of education. A number of experts advise that leniency towards independent usage of the computers should not be permitted for students since that may resort to some detrimental practices on behalf of the children. On the other hand, there is a different group of teachers who state that it is better, if you leave the students to learn everything inside the computers on their own.

The Association of Progressive Communication (APC) conducted a study in 2009 that explains the benefits of, and ways to implement, ICTs for the advancement of democracy and empowerment in Uganda, Kenya and Tanzania. The study identifies that ICT has the potential to synergise the development of the economy and promote democratisation, and reduces poverty by spreading quality education everywhere. The report provides three strategic priorities that can be used to effectively implement ICTs in any school program. The priorities are given as below:

- To raise and build the awareness of the potential of ICTs,
- To institutionally strengthen the state government departments, such as the ministry of education, in Botswana,
- To support the community voice in public debates on ICT.

ICTs in the educational field have been identified as particularly beneficial to girls in Africa (Isaacs, 2002). Isaacs identifies the benefits of ICT use for effectively enhancing



the learning, educational management and teaching ranging from early-learners to adult education and analyzes the possibility of introducing ICTs in formal secondary and primary school education in Africa. The study mentions the success of school net programs in Africa as well, and gives examples of various programs that have been successfully running to the benefit of many.

International Development Research Centre - IDRC Acacia, Imfundo, Schools Online, International Education and Resource Network - IEARN, World links are a few examples from the host of successful SchoolNet Africa programs running in Africa. The success of these programs was not a single day effort; rather it was a cyclic approach in implementing learning obtained through the pilot projects. Various models emerged because of the pilot projects. There were primarily three models:(1) only Government support (Botswana, Egypt), (2) NGOs with strong Government and private sector support (South Africa, Namibia), and (3) In-house projects within Existing Institutions (Angola, Lesotho). The initial successes of the pilot projects were limited but encouraging. Poor time management by volunteers, hardware issues, bare minimum technical support, prohibitive high cost of telephone lines, and lack of integration of curriculum were identified as major bottlenecks. The lessons learnt from the pilot projects were incorporated in the subsequent large-scale ICT implementations. A number of lessons including involvement of Ministry of Education, integration with national agenda of ICT strategy, formal organisational structure and decentralised technical and management support were of particular note. The success of subsequent large-scale programs was also attributed to the strong leadership with a systematic approach and solution, accurate definition of the ownership, the marketing and branding strategy, and the sound financial management of the whole initiative. Another important aspect of the SchoolNet programs

in Africa was the full integration of the continuous evaluation, monitoring and research aspects. These steps led to an effective course correction as soon as the real-time parameters swayed even a bit from the planned values (Issacs, 2002).

A SADC (South African Development Countries) study on the use of ICTs in the curriculum in Botswana, Namibia and Seychelles (Chisholm, Dhunpath & Paterson, 2004) provides an in-depth commentary on the human development and basic education in the African countries of Namibia, Botswana and Seychelles. The study also delves into the costing of the ICTs in the aforementioned African countries. The study recognizes that the Namibia is e-ready in terms of basic education and has better preparations to implement the ICTs in the curricula. Botswana was found to be actively pursuing the transformation from a pilot phase to a large-scale implementation of the ICT. The inter-linkages between the effective teachers are training and allocation of specific time for ICT implementation by teachers and volunteers was a necessity in both countries. Government or ministry of education support was instrumental in the effective implementation across the board. The study also found four major drivers to the enhancement of the ICT competencies in the Seychelles.

- service sectors accorded priority in the economic development,
- An attempt to enhance the image of the country as a financial hub for the investors, Raise efficiencies of the Government operations and
- Enhance communication with the mainland Africa as Seychelles is an island off the coast of Africa.

The study concludes with the view that the recognition of the importance of ICT in education has been identified and now there cannot be any impediment to its

implementation. Governments across the three nations have identified the importance of ICT and a formal integration of ICT with Education curriculum will only pace up its implementation.

### **Recommendations for the Identified Gaps**

In order to bridge the gaps, the teachers, using ICT in Botswana's education system, can make use of the following methods. The suggested methods are organized as per the classification of gaps presented in chapter 2.

#### **Infrastructure and Capacity Gaps**

##### **Developing and Controlling (EMIS)**

In order to have any system work effectively, it is important to incorporate the feedback mechanism. The development and implementation of an EMIS is required so that success with newly developed ICTs can be gauged and proper steps can be taken to implement them (Trucano, 2008).

The EMIS system can be monitored by specialized authorities in the Ministry of Education as formed by the Government of Botswana. The EMIS can be developed as a dynamic system, which means that it will receive the real time data from the various education centres. The EMIS would have capability to generate these reports on a frequent, regular and 'as desired' basis. The role of the authorities would be to access the dynamic EMIS and ensure appropriate action is taken (Trucano, 2008).

## **Implementing a Follow-Up Mechanism**

There was also a problem with consistent follow-ups which resulted in the teachers losing the skills that they familiarized themselves with in the previous sessions. Subsequently, as per Alden, (2004) teachers were required to have an in-depth and prolonged assistance when it came to good use of technology but also in their attempts to incorporate technology in their set of courses. In addition, the one-time training sessions that were offered at the workshops were insufficient to endow the teachers with the required skills that they needed to incorporate ICTs into their teaching methods.

## **Low in Cost Solutions**

Botswana is not a rich western nation with unlimited resources to invest in the implementation of new technology specifically for the field of education. Instead, if these implementations are to be done, they have to be cost effective. The value of educational technology is recognized and appreciated by educationists for the 'massification' of education in a uniform way.

As the EFA Global monitoring report team study (Team, 2010) shows, the effects of the financial crisis, which affected the global economy, is also affecting the education sector. This phenomena is due to the inability of the governments of the countries like Nigeria and Botswana to meet the financial obligations for the new education programmes, including ICT. Thus, it becomes more necessary to implement low cost ICT solutions in Botswana instead of trying to implement solutions that cannot start at all. The report mentions that 72 million children are still out of school due to the combination of slow economic growth and poverty. The budget pressures on governments complicate things further and hence the gains from the good work done earlier may erode.

Another study reviewing the best ICT practices in Africa concludes that, considering the difficulty in implementation and the high costs involved, low technological solutions are an effective first step for the immediate fulfilment of educational needs in Africa (Lynch & Casely-Hayford, 2003).

There are differing views, though. Nigeria, for example, tended to emphasise the way in which ICT platforms can support the ‘massification’ of education; South Africa feels motivational factors and the opportunities that they provide for an enhanced learning experience makes the difference in the implementation of the ICT in education sector. There are also diverse views about the costs of implementation of these systems. Advocates of open source solutions, especially those from South Africa, tend to suggest that they can ‘reduce the cost of current face to face learning’, whereas those from other countries where costs of electricity and connectivity are high, or institutions that are tied into proprietary systems, suggest that such solutions can be much more expensive than traditional modes of teaching (Unwin, 2008). Open source solutions also may bring hidden costs, in terms of greater efforts required to develop and support systems, document applications and train users.

As Botswana is more similar to Nigeria than South Africa, a safer analogy can be drawn. Thus, development of ICT in Education in Botswana arguably should support ‘massification’ of the education rather than ‘reduce the cost of face to face learning’.

Hence, there is a strong need to effectively develop and implement solutions which are low cost and easy to implement. These low cost solutions are the foundation for the development of ICT in the education sector as the sustainability of the solutions is never an issue in such cases. A study done in Kenya, Ministry of Education Science and Technology - MOEST, (2005), highlights the role Interactive Radio Instructions (IRI)

played in increasing the reach of ICT in developing countries like Kenya. The study mentions minimal-cost learning opportunities for students in urban slums and Arid and Semi-Arid Lands (ASALs) that is not only easy in terms of extent but is also high quality. Another success story in the implementation of interactive radio programs comes from Somalia where Southern Sudan Interactive Radio Instruction Program (SSIRIP) gives Somali children access to the best interactive audio programs. With this, children are given the possibility to attend non-governmental, formal, community and Quranic schools. The teachers lead the class with the assistance of audio programs, resulting in pedagogy that is much more active in nature. Additionally, the success of the SSIRIP can be demonstrated from available data. For example, since its beginning in 2005, SSIRIP's reach has been far and wide, with as many as 300,000 students enrolled. These students belonged to various grades from one to five. In 2006, through additional 245 educational centres, SSIRIP reached 25,000, previously out-of-school children.

Southern Sudan Interactive Radio Instructions' (SSIRI's) success in lifting the educational standard highlights the importance of interactive radio programs in the education sector (SSIRI, 2007). This is put into context when one considers Sudan's particular condition. Sudan is ravaged by civil wars, resulting in the biggest internally displaced population in the world. The majority of the population is displaced in the southern part of Sudan, resulting in poverty, high mortality rates and low education levels. Almost 20 years of war in Sudan has resulted in the loss of approximately 1.5 million lives of the nearly four million displaced. Amongst other fallouts of the war, the education system of the country has been badly affected. Two and half million children are without basic education, resulting in a drastically increasing illiteracy rate to 85% percent in the southern Sudan, and a jump in the overall illiteracy rate of Sudan to 57%.

The gross enrolment rate in Sudan has been reduced to 20% as access to education becomes increasingly difficult. There are only 20% of teachers with formal training, while only seven percent of teachers are female (SSIRI, 2007). The implementation of project SSIRI faced many challenges, including:

- The inability of potential target groups to attend the radio lessons due to the time of the broadcast,
- The varying and incompatible schedules of different schools in certain parts of the country,
- The instance where schools are not within the range of the radio signal.

The SSIRI project also initiated a training program for teachers in video production so that staff can be active in developing simple teaching videos. Another innovative program is aimed at developing alternate energy solutions for recharging the batteries that power the various electronic gadgets.

The following programs were the suggested solutions which focused on using the existing infrastructure and minimising the development of new systems, wherever possible.

- *IRI in Urban Slums*: Radio and television lessons can be leveraged to broadcast lessons in more effective ways than the print media. Botswana has two radio stations; one is a national channel while the other is a commercial channel. The public domain channel has a division largely for educational broadcast which can be deployed effectively (Trucano, 2008).
- *Leveraging Interactive Technology*: Interactive computer programs and on-line teaching should be encouraged. In order to increase the access, CD-ROMs or

internet connections can be leveraged for self-instructional material. Video conferencing can also be put to use for more interactive communication between parents and educators (Kuruba, 2005).

- *Leveraging Mobile Technology*. The examination of mobile phone usage also indicates that use of mobile technology for education in Botswana is feasible (Gillwald & Esselaar, 2005).

### **Trained Resources Gaps**

#### **Target Marketing ICTs**

ICT can be effectively used in bridging the gaps in youth education in a world that is increasingly connected and moving towards an information-based society, making new ways of learning crucial. In this context, learning skills goes beyond learning through the formal education system. As many young people don't complete formal education, ICT can enhance vocational training for dropouts or unemployed adults to help them to acquire employable skills through technical training (Wagner, 2004).

A report (Kozma & Wagner, 2006) on the use of ICT for providing the option of continuing education recommends the following:

- The concept of 'broader literacy' needs to be understood over and beyond the limited traditional understanding of it as simply functional reading and writing.
- There is an urgent need to integrate education and ICT across various governmental departments, whether they be national or provincial.



- The fine balance between new ICT possibilities and the context in which the ICT is being brought in must be identified.
- International organizations and various donors should appropriately influence governmental bodies in making favourable national policy decisions for the betterment of education.

### **Training Teachers to Employ the Technology**

A number of teachers lack self-confidence in regards to the new technology and thus avoid the novelty. Furthermore, many among those who were brave enough to use the tools were still very unsure whether they would be able to keep up with the technology. In Botswana, the Ministry of Education was training less teachers in the pilot schools when the computer knowledge program was introduced, but as the program was disseminated to an increased number of schools, the schools began to be more accountable for training all their teachers effectively. On the other hand, this was no longer followed simply for the reference of training technology (Botswana MOE, 2009).

Another problem that teachers faced while using the technology in their classes was the lack of experience they had in using it. In his research, Prawd (1996) inferred that teachers who had used computers professionally for five years or more were more likely to use them in their classes. He concluded that ongoing specialized development is required to aid teachers acquaint themselves with the technology by using it in their classroom teaching as well.

One of the studies (Leach, 2004) investigating the use of ICT in educating teachers in the Global South, concludes that:

- All of the teachers and students involved in the study quickly developed confidence in using the computers for a variety of purposes,
- ICTs helped teacher efficiency as they could plan their teaching time in a better way,
- There were evident positive outcomes when teachers introduced ICT into lesson plans,
- Scarce technical support and various security issues notwithstanding, the teachers were quite enthusiastic to learn ICTs,
- ICTs also facilitated new modes of teacher-to-teacher cooperation.

### **Teachers Absorbing New Technology**

Insufficient time was one of the critical limiting factors impeding the teachers from using technology in their classrooms. The documentation of available facts state that it was due to insufficient time that the teachers were not able to use the new technologies. They found it difficult to attend the training sessions along with the workshops and hardly had the necessary time to acquire the necessary experience with different equipments and software. They barely found the time to interact with peers regarding what would work for them or what would not concerning the use of new resources etc. Teachers were already running short of time, and learning a new approach to use in their classes became increasingly tedious for them (Kaino, 2004).

In addition to this, when discussing teaching requirements, the stress is on the time offered for teachers to familiarize themselves with the use of explicit applications. The discussions surrounding the relationship between teachers and the new approaches

have come up fewer times than the time constraints.

## **Other Gaps**

### **Proper Advancement of the Software of E-learning**

A majority of those claiming to be using e-learning are not using an integrated formal learning management system at all, but are rather using basic digital technologies to enhance their learning, more often than not interpreting e-learning simply as accessing information from the Web. Thus, the best suggestion for this gap is to either develop or seek the best e-learning products in the western markets. There is a strong need to have a particularly high level of sophistication in the usage of e-learning in Botswana (Unwin, 2008).

Another option is to involve the prospective users of the e-learning software in the process of development since this would ensure the right content and format for the users. The developers would be able to ‘bounce’ their alpha versions of the software with the targeted users; the feedback from the target group can be applied in the beta version, ensuring that there is minimum discrepancy between the product features and expectations. Another advantage from this exercise would be motivation for the users to effectively use the software as it was created with their participation.

### **Government Intervention in Educational Technology**

The government’s policy has always been the same for any kind of in-service teacher training agenda. In-service training is typically a specialized lecture wherein the

professionals talk about their case studies and the research concerning the work for the other people in their peer group. It is a key constituent of education for pharmacists, physicians, and other medical professionals. Additionally, only a specialized and limited number of teachers are selected from the school for training. Moreover, after getting trained these teachers would further teach their own peers and colleagues. The only problem faced by the teachers was that they were always running out of time and could not be released from their work and thus they were unable to dedicate themselves to training completely. Furthermore, these same teachers were considered the chief players of the academic technology agenda for the school, and subsequently they were loaded up with the additional school responsibilities when technology came into picture. Plus, they had to resolve the queries of the students, administrators, and teachers. Hence, they hardly had time to devote to their training classes, which resulted in their low self-confidence when it came to employing technology in their classes (Batane, 2006).

### **Conclusions**

As discussed, the ICTs can play a major role in enhancing the level of education in Botswana. However, it is interesting to note that it is not only technology but also the human factor that needs to be taken into consideration before designing and implementing an appropriate solution.

This chapter identified several potential solutions to the gaps identified in the previous chapter. The solutions are not only identified from the perspective of resolving localised problems, but of developing a holistic solution with appropriate feedback. This was done to ensure an inexpensive and effective methodology.

Finally, the existing infrastructure was leveraged wherever possible so that there is

no additional burden on the exchequer to implement the ICTs in Botswana's educational system.

## **CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH**

### **Summary and Conclusions**

The purpose of this research was to identify the tools available on the market that enable effective learning in schools, through the use of computers, internet and IT. The particular focus in this thesis was on the case of Botswana. The affordances and capabilities of ICT offer the potential to solve or mitigate various challenges confronting educational systems and institutions in a developing economy, such as Botswana's. The relevant data and information was collected and the current state of education in schools in Botswana was analyzed. Information concerning the broad context of Botswana was introduced (data regarding, e.g., internet access and usage, existing baseline rates of literacy, availability of skilled instructors) as well as information concerning the specifics of educational policy and various initiatives where technology was used in education. The crucial gaps in terms of performance and the individual capabilities of the school systems were identified. These gaps were divided into three categories and the recommendations to address these gaps were suggested in the previous chapter. The identified gaps were infrastructure and capacity gaps, gaps in appropriate trained resources and others, which included the intervention from government and cultural issues.

Arguments were presented concerning the role that digital technologies and ICT could play in addressing these gaps or enabling solutions. Other countries with similar characteristics to Botswana were used as examples, especially in their implementation of appropriate policies and strategies involving promising or successful ICT usage in education. We discussed the case of Uruguay in South America, which made the project

CIEBAL a success at the primary school level with the slogan of 'one laptop per child' (OLPC). As observed, this slogan was extended to 'one laptop per teacher' (OLPT) as well. This case highlighted the importance of merging hardware support with software skills to support the initiative of implementing ICT in schools at all levels (Trucano, 2008). The study also highlighted the importance of developing and controlling EMIS in implementing ICT in education (Trucano, 2008). A strong follow-up mechanism (Alden, 2004) and innovation in discovering low-cost solutions to ICT implementation in educational technology (Team, 2010) are among other considerations in addressing the infrastructure and capacity gaps. Several examples of the studies, like MOEST (2005), SSIRI (2007) and SIRIP (2007), were mentioned, which highlighted the success of low-cost solutions such as interactive radio instruction and mobile technology.

Next, the identified gaps in the area of trained resources could be addressed by effective implementation of ICT. The benefit of ICTs in the continuing education of school dropouts was also cited. As Kozma and Wagner (2006) suggests in their study, ICTs can play a major role in implementing effective solutions in the education sector for adult learning. Another observation made in the thesis was the difficulty faced by secondary school teachers in adjusting to the new role they were expected to play, namely learning and adapting to new technology in their curriculum. Because of new technology, teachers were expected to alter and update the methods they had grown accustomed to using in their classrooms, which was not an easy task. Moreover, readjusting the timetable and learning completely new technology was not possible for every teacher. Some schools opted for the "train-the-trainers" program. In this program, selected senior teachers were trained in ICT and computer use for the purposes of education. However, these trainers were not given additional time for carrying out their training programs and

were therefore expected to sacrifice their personal time in order to train their peers. This arrangement did not work out in most cases, as the trainers and trainees both saw this as an additional burden; this resulted in insufficient training and most gave up on the process altogether. Kaino (2005) mentions that teachers were already running short on time and learning new technology became more cumbersome than helpful to them. Another case point was a study on ICT in enhancing the quality of teachers in Global South. The study gave constructive recommendations for the betterment of teachers and students involved in the implementation of ICT in education. It was found that the effectiveness of the teachers increased as they used computers to plan their lessons (Leach, 2004).

The “other” category of gaps included the proper advancement of the e-learning software and synergetic support from the government in advancing ICT in education. The e-Learning Africa seminar by Unwin (2008) recommended a high level of sophistication in implementing educational technology in Botswana. The government is capable of supporting the success of this move by providing more time for the teachers who are involved in implementing new initiatives in education (Batane, 2006).

Thus, as concluded earlier, technology use alone cannot be a success in schools unless there is a strong will on the part of school management and teaching staff to make it part of their regular curriculum. On the other hand, teachers would not use the ICT and technology in their curriculum unless they have been appropriately trained on the technology. Additionally, enough support needs to be provided to them for the successful implementation. Thus, as discussed earlier, the most important barrier in implementation of technology in schools is not the hardware and infrastructure support, but rather the training of the teachers and making teachers implement their learning in their day-to-day curriculum (Kaino, 2005).



The analyses of technological solutions in mitigating gaps were framed within the context of what is arguably feasible within Botswana. For example, although the government is promoting internet usage across the country, gaps still exist. Furthermore, internet usage in Botswana is reportedly seen with as little as five percent of the population. Also, there was a considerable disparity in terms of urban and rural access to ICT services. Significant disparities in reading achievements also exist in Botswana across regions.

Finally, a workable educational technology model was provided as a result of the analysis conducted and subsequent discussion. The thesis provided conclusions and recommendations in the previous chapter that would help in addressing the identified gaps and the actions which can be taken by the Botswana's Department of Education to enhance the level of education in schools to rival those of other nations.

### **Recommendations**

It was observed in the study that implementing the appropriate hardware and connectivity was an important factor in the success of ICT development in Botswana's education system. Still, the importance of "soft implementation", or the training of teachers and supporting professionals, was equally important. Unfortunately, the officials implementing the ICT were largely ignorant regarding this important aspect. Thus, apart from recommending the necessary efforts in enhancing the infrastructure, this study suggests appropriate training for those involved in the implementation of ICTs in Botswana schools.

In order to make the implementation of ICTs effective in Botswana, the training teachers received on computers and ICTs in general needs to change. In doing so, it is

imperative that the teachers are not put under unnecessary pressure while learning the computer systems or other technology. Instead, teachers should be freed from some of their regular duties in order to make some time available for the computer training. Substitute teachers can be hired on a short-term basis to take over their responsibilities of those who are training.

The teachers training program should implement methods from the theory of adult learning to address the needs of the teachers. This is particularly required while they are learning about computers. Since teachers are familiar with the concept and context of basic education, the pedagogy of this training needs to be different from the usual training provided.

The education level of the teachers was also cited as another major weakness in the education system. Moreover, the teacher's experience level also had a wide regional disparity where, in some areas, the average experience level fell to almost half of the national average. The study recommended provisions for under qualified teachers to upgrade their qualification over time. Also it was recommended in the study to maintain and utilize a database for teacher's qualifications and managing the disparity in qualifications.

In-service training programs were felt to be more effective if they address relevant needs of flexibility and availability. Benchmarking in-service training also was felt to be effective in order to guide educators regarding the expectations and objectives.

### **Further Research**

It would be interesting to conduct further primary research using a mixed method, the qualitative being the main method and the quantitative for supporting data, in the area

of ICT's and their rated success by the ministry of Education in Botswana for implementing new technology in the school system.

The studies can be conducted on following areas:

- Primary/Secondary Research Study – The studies need to be conducted in the districts and rural areas, because most of the available ICT studies in Africa are focused on urban areas. Such a primary study would bridge gaps in the understanding between the ICT implementations between rural and urban populations.
- Policy implementation of ICT in schools – Botswana had been privy to the pilot projects for implementation of ICT in school. As the lessons learnt from this implementation were identified, large-scale integrations to the national education policy were being discussed. As these ideas are implemented, it would be interesting to carry on a study on the various policy implementations related to ICT implementations in Botswana.
- Costing ICT for schools in Botswana – As with any other initiative, the financial fundamentals are one of the most important considerations in implementing ICT for schools in Botswana. The study should aim for the desired investment and the returns from the investment in the longer term.
- Monitoring and Evaluation of ICT in Schools – As the ICT implementation becomes intense and expands its domain everywhere, the monitoring and evaluation of it would become a necessity. A study can be conducted to arrive at the success parameters of the ICT implementations in the schools. The study can

also go a step ahead by suggesting the acceptable range of values for such parameters at different levels of implementations.

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## **APPENDICES**

## Appendix A

### Participants in the e-Learning Africa Survey

Country	Number of respondents	Country	Number of respondents	Country	Number of respondents
Algeria	4	Congo	1	Guinea	3
Benin	1	Senegal	7	Togo	3
Botswana	5	Democratic Republic of Congo	10	Ivory Coast	4
Burkina Faso	3	Sierra Leone	1	Tunisia	4
Burundi	5	Egypt	6	Kenya	46
Cameroon	10	Somalia	2	Uganda	25
Central African Republic	1	Eritrea	2	Lesotho	1
Saudi Arabia	1	South Africa	38	UK	1
Morocco	3	Ethiopia	28	Liberia	1
Mozambique	2	Sudan	3	Zambia	8
Namibia	2	France	1	Libya	1
Niger	1	Swaziland	1	Zimbabwe	4
Nigeria	35	Ghana	12	Madagascar	1
Rwanda	5	Tanzania	14	Malawi	3
Mali	3	Mauritania	1	Mauritius	3

## Appendix B

### ICT in African Countries

	Population	Main telephone lines		Mobile subscribers		Internet users	
	000s	000s	p. 100	000s	p. 100	000s	p. 100
Algeria	33,860	2,922.7	8.63	21,446.0	63.34	3,500.0	10.34
Egypt	75,500	11,228.8	14.87	30,047.0	39.80	8,620.0	11.42
Libya	6,160	852.3	14.56	4,500.0	73.05	260.0	4.36
Morocco	31,220	2,393.8	7.67	20,029.0	64.15	7,300.0	23.38
Tunisia	10,330	1,273.3	12.33	7,842.0	75.94	1,722.2	16.68
<b>North Africa</b>	<b>157,070</b>	<b>18,670.9</b>	<b>11.91</b>	<b>83,865.0</b>	<b>53.39</b>	<b>21,402.2</b>	<b>13.64</b>
South Africa	48,580	4,642.0	9.56	42,300.0	87.08	5,100.0	10.75
<b>South Africa</b>	<b>48,580</b>	<b>4,642.0</b>	<b>9.56</b>			<b>5,100.0</b>	<b>10.75</b>
Angola	17,020	98.2	0.62	3,307.0	19.43	95.0	0.60
Benin	9030	110.3	1.22	1,895.0	20.98	150.0	1.66
Botswana	1,880	136.9	7.78	1,427.0	75.84	80.0	4.55
Burkina Faso	14,780	94.8	0.70	1,611.0	10.90	80.0	0.59
Burundi	8,510	35.0	0.45	250.0	2.94	60.0	0.77
Cameroon	18,550	130.7	0.79	4,536.0	24.45	370.0	2.23
Cape Verde	530	71.6	13.80	148.0	27.9	33.0	6.36
Central African Rep.	4,340	12.0	0.29	130.0	2.99	13.0	0.32
Chad	10,780	13.0	0.13	918.0	8.52	60.0	0.60
Comoros	840	19.1	2.33	40.0	4.77	21.0	2.56
Congo	3,770	15.9	0.40	1,334.0	35.40	70.0	1.70
Côte d'Ivoire	19,260	260.9	1.41	7,050.0	36.6	300.0	1.63

D.R. Congo	62,640	9.7	0.02	6,592.0	10.52	230.4	0.37
Djibouti	830	10.8	1.56	45.0	5.40	11.0	1.36
Equatorial Guinea	510	10.0	1.99	220.0	43.35	8.0	1.55
Eritrea	4,850	37.5	0.82	70.0	1.44	100.0	2.19
Ethiopia	83,100	880.1	1.06	1,208.0	1.45	291.0	0.35
Gabon	1,330	36.5	2.59	1,169.0	87.86	81.0	5.76
Gambia	1,710	76.4	4.47	796.0	46.58	100.2	5.87
Ghana	23,480	376.5	1.60	7,604.0	32.39	650.0	2.77
Guinea	9,370	26.3	0.33	189.0	2.36	50.0	0.52
Guinea-Bissau	1,700	4.6	0.27	296.0	17.48	37.0	2.26
Kenya	37,540	264.8	0.71	11,440.0	30.48	2,770.3	7.89
Lesotho	2,010	53.1	2.97	456.0	22.71	51.5	2.87
Liberia	3,750	...	...	563.0	15.01	...	...
Madagascar	19,680	133.9	0.68	2,218.0	11.27	110.0	0.58
Malawi	13,930	175.2	1.26	1,051.0	7.55	139.5	1.00
Mali	12,340	85.0	0.69	2,483.0	20.13	100.0	0.81
Mauritania	3,120	34.9	1.10	1300.0	41.62	30.0	0.95
Mauritius	1,260	357.3	28.45	936.0	74.19	320.0	25.48
Mozambique	21,400	67.0	0.33	3,300.0	15.42	178.0	0.90
Namibia	2,070	138.1	6.66	800.0	38.58	101.0	4.87
Niger	14,230	24.0	0.17	900.0	6.33	40.0	0.28
Nigeria	148,090	6,578.3	4.44	40,396.0	27.28	10,000.0	6.75
Rwanda	9,720	16.5	0.18	679.0	6.98	100.0	1.08
S. Tomé & Príncipe	160	7.7	4.86	30.0	19.09	23.0	14.59
Senegal	12,380	269.1	2.17	4,123.0	33.31	820.0	6.62
Seychelles	90	20.6	23.79	77.0	89.23	29.0	35.67



Sierra Leone	5,870	...	...	776.0	13.23	10.0	0.19
Somalia	8,700	100.0	1.15	600.0	6.90	94.0	1.11
Sudan	38,560	345.2	0.90	7,464.0	19.36	1,500.0	3.89
Swaziland	1,140	44.0	4.27	380.0	33.29	42.0	4.08
Tanzania	40,450	236.5	0.58	8,252.0	20.40	384.3	1.00
Togo	6,590	82.1	1.30	1,190.0	18.08	320.0	5.07
Uganda	30,880.0	162.3	0.53	4,195.0	13.58	2,000.0	6.48
Zambia	11,920	91.8	0.77	2,639.0	22.14	500.0	4.19
Zimbabwe	13,350	344.5	2.58	1,226.0	9.18	1,351.0	10.12
<b>Sub-Saharan</b>	<b>757,880</b>						
<b>AFRICA</b>	<b>963,530</b>	<b>35,411.2</b>	<b>3.77</b>	<b>264,475.0</b>	<b>27.48</b>	<b>50,406.4</b>	<b>5.34</b>

AFRICA ICT Indicators, 2007

## Appendix C

### Teacher Behavioural Problems

Frequency of teacher behavioural problem	Indicating 'never' occurs	
	%	SE
Arriving late at school	14.1	2.75
Absenteeism	38.1	3.82
Skipping classes	73.7	3.45
Intimidation or bullying of pupils	66.3	3.74
Sexual harassment of teachers	99.6	0.42
Sexual harassment of pupils	99.0	0.74
Use of abusive language	67.4	3.77
Drug abuse	96.9	1.40
Alcohol abuse	82.0	3.13
Health problems	7.9	2.19

## Appendix D

Equity of Human Resource Allocation as Assessed by (a) Variation among Schools within Regions, and (b) Variation among Regions

Human resources	Variation among schools within regions							Variation among regions (rho x 100)
	1	2	3	4	5	6	7	
Classroom teacher prof. qualifications	67.6	68.6	117.9	64.7	117.5	118.0	121.7	1.7
Classroom teacher experience	82.4	111.2	67.9	79.7	106.7	102.3	98.1	9.5
School head prof. qualifications	65.1	96.5	134.2	97.5	103.9	107.1	31.8	9.0
School head experience	85.1	78.2	105.7	84.2	113.6	107.7	77.9	11.4
Inspectors/advisors visits	112.7	83.0	91.1	112.6	90.3	81.5	137.5	0.0
Pupil/teacher ratio	77.7	75.9	142.2	99.0	84.2	121.4	83.2	4.0

*Note: 1= Central North; 2=Central South; 3=Gaborone; 4=North; 5=South Central; 6=South; 7=West.*