ICT Challenges in Developing Countries: Botswana's Perspective

T. Mogotlhwane
Departmenf of Computer Science
University of Botswana
Gaborone, Botswana
Email: mogotlhw {at} mopipi.ub.bw

F. Khosrowshahi, J. Underwood
School of Built Environment
University of Salford
Salford, United Kingdom

Abstract— **Despite the availability of information and communication technologies (ICT's) infrastructure in central government in Botswana, there is evidence of lack of exploitation of the technology. There are several factors that hinder exploitation of information technology in Botswana. Botswana is classified as an upper medium income country because of the country's high GDP. However, such wealth is derived from diamond mining which has few manufacturing activities. A new social divide is emerging between those who have access and those without access to ICT's. This is a new social discourse that has a negative effect on the groups which are already disadvantaged, such as rural communities and the unemployed. With the massive investments that Botswana government has made towards ICT, it should now be getting some rewards. Lack of ICT infrastructure is often cited as a problem limiting ICT use in developing countries. Botswana's situation shows that infrastructure does not necessarily leads to high levels of use.**

Keywords- ICT, Information technology, Exploitation, Botswana, Digital divide, Development, Developing countries, Sub-Saharan Afric)

I. INTRODUCTION

In Botswana, within the last ten years, the government has invested heavily in providing a relevant information and communication technology infrastructure in all government departments [1]. From 1990 there has been concern for lack of productivity in most of government departments. Research by Thapisa and Jain [2], which looked at perceptions about productivity in academic and public libraries in Botswana, also raised productivity issues. The Botswana government has taken a number of initiatives to address lack of productivity in the civil service, such as Work Improvement Teams (WITS), setting up the Botswana National Productivity Centre (BNPC), implementing a performance-based reward system, developing good information and communication technology infrastructure in government departments. Some of these intervention measures yielded expected results, according to Selepeng [3]. However, productivity problems still persist to date, despite relatively good information and communication technology infrastructure such as email, internet and telephone availability in government departments [4]. The availability of these shows that Botswana "is already an active participant in the global information society" as observed by [5].

There has not been any detailed study to find out why information and communication technology introduction in government has not had expected outcomes [6]. Lack of exploitation of information technology in Botswana is also reflected in the country's decline in Network Readiness Index (NRI) rankings. This was also observed by Little [7], who observed that reasons for this decline are unknown and should be researched. The Network Readiness Index is a global measure that compares "the degree of preparation of a nation or community to participate in and benefit from ICT developments" [8]. The reliability of NRI rankings is illustrated by the fact that Canada has been among the leaders since 2002 to date, this has also been observed by CMA [9].

Botswana has numerous advantages such as a small population of about 1.8 million people and high GDP of about P57.1billion or US$9.5 billion [10]. The government is the major employer with 47811 employees spread among 17 ministries [5]. The country has also enjoyed political stability since independence in 1966. It is these positive developments that raise questions as to why there is the problem of service delivery in Botswana.

II. ICT DEVELOPMENTS IN BOTSWANA

Botswana has committed a lot of financial resources to information technology. According to [11], investments in ICT were 3.7% of government budget for the period 2003 to 2010. Also education of citizens has been a major priority. The main source of development funds are generated from the mining sector, especially diamond mining, which contribute 45% of GDP and account for around 77% of total export earnings [12]. A benchmark study by Little [13] compared Botswana with 7 other countries across the globe. Two of these countries share borders with Botswana while the other five were of the same population. Canada was included as a benchmark because Canada is among the countries known for effective utilisation of ICT. Despite significant investments in ICT, Botswana's NRI continue to decline [14].

To date ICT infrastructure provision has mainly been in government institutions. Each of the 24 parastatals in the country and the 17 ministries have their own website that can be accessed through the main government site [15]. A

parastatal organisation in Botswana is an institution which is funded by government, but is not run on day to day basis by government employees. It has some autonomy on management. Most of the websites for the ministries are depositories of information about the ministry and its departments. Basic information is given about various departments under each ministry, as well as contact telephone number and email. There is a problem of updating information by some of the ministries. This is something that needs urgent attention as information must not only be easily available, it must also be up to date. Also lack of a uniform design of ministries websites is evident. The Maitlamo project has already proposed a client centric design for Botswana government. The main advantage of this design is that it is capable of significantly improving the relationship between government and its citizens and overall effectiveness of online service delivery, as noted by Little [13]. This will make navigation through the website much easier and minimise changes in appearance as a person moves through the government resources online.

The Department of Road Transport and Safety (DRTS) has an advanced website which allows for some documents to be downloaded e.g. Routes Mileage and Tours which provide current fares and the distance of the majority of routes in the country (http://www.transport.gov.bw/). The current website is almost ready to facilitate online application. Internet access in government departments is fairly stable. The standard of this website is almost as good as those in developed world. Based on this information, travellers can plan their journey effectively. However, verification of information needs to be made for example Khudumalajwe should read Khudumelape. The website of DRTS receives about 1000 hits a month. The majority of these hits are from outside Botswana, mainly in USA and UK.

A. Cost of ICT and Internet Access

The high cost of hardware and internet access charges is the major obstacle for ICT to take off in the domain of the general public. The cost of a low specification computer is about P5000 (US$830) and connection charges to the internet by internet service providers (ISP) are about P500 (US$83). There is further cost of around P800 (US$130) a month associated with dial up connection, which adds to the telephone bill. A similar observation has been made in the Arab world as follows: “In most Arab countries, the total cost of internet access is way beyond the purchasing power of average citizens, especially when adding the high cost of making local calls to the cost of an ISP connection” [16]. This makes use of ICT in homes far out of reach for an average house in Botswana.

Diffusion of mobile phones technology can also be used to indicate community ICT readiness. Mobile phones are new technology devices which now have a lot of computing capabilities, for example sending/receiving text message which is similar to email as well as wireless internet access. Hence the diffusion of mobile phones in a community also reflects to some extent the community’s technical expertise in using ICT. Diffusion of mobile phones rose very quickly from 3301 in 1998 to 823070 in 2006 [17]. This illustrates that the people of Botswana are ready to become members of the information society. The use of text messages, which is very popular, shows that majority of the population have technical know-how and will easily use email if they have access to and can afford it.

It is clear from this that cost is one of the factors that lead to lack of exploitation of ICT. The phenomenal growth in the use of mobile phones was propelled by the decline in their cost. To date it is possible to get a mobile phone for P300 (US $50). Despite the higher cost of making mobile calls as compared to fixed lines, their convenience and their ability to send text messages also lead to their popularity and growth. Botswana government has invested in connecting to an under sea network cable. This investment has resulted in significant reduction in internet cost and faster internet speed of about 3.8 terabits per second [18].

B. Development and Acquisition of ICT related services

The Botswana government has adopted a system of outsourcing a lot of the services and product acquisitions that are needed by the government. This was an attempt to encourage the growth of private sector as well as making the whole process transparent. The tendering process is the responsibility of a parastatal organization called Public Procurement & Asset Disposal Board or PPADB [19]. The system is an open tender system where private companies tender for advertised projects. Developments and acquisition of IT/IS services such as system development, maintenance etc are also outsourced. Outsourcing of IS/IT services has been found to have its own limitations, the biggest problem being failure to manage the whole process [20]. It has been shown that most government departments in developing countries “are able to get away with poor project management because there is no audit of the impact of the applications that have been developed” [21].

The Botswana government has some computerised information systems already in place such as National Registration System (Omang), Livestock Identification System (LIS), Vehicle registration system etc. One of the pioneers of information technology in the Botswana government was the development of the National Registration System in 1998. This system is responsible for the registration of all citizens of Botswana aged 16 years and above. The system was developed as a central system where application forms from various parts of the country are sent to the head office of the Department of National Registration in Gaborone, where the system is based. This leads to a pile up of paper work at head office. The national registration system has been a subject of investigation by the Auditor General Office, the Botswana government spending watchdog [22].

The livestock identification system (LIS) was gradually implemented in 2001.The system was bought from Australia. It is used to store information about cattle, which are a source of beef sold to the European Union. It was implemented as a response to strict quality control requirements by the EU. However LIS is also not functioning well as there is a problem

with supply or recycling of boluses. Bolus is one of the approved "machine-readable Radio Frequency Identification (RFID) devices" used to identify cattle MLA [23]. The LIS system has also been related to problems with the procurement of cattle to be sold for slaughter [24].

C. ICT Education

Access to basic education has been a government priority since independence in 1966. Education has always received a significant portion of national budget. This has resulted in an increase in the literacy rate to the current 81% [25]. Such a high literacy rate is also an important factor for ICT diffusion. With regard to ICT education, all junior and senior secondary schools have computing skills as a subject and now the focus is to extend it to primary schools [26]. The University of Botswana and other local private higher education institutions have incorporated computing skills in the curriculum to ensure that all graduates acquire such skills during their higher education training. However the biggest problem that is emerging now is that computer science graduates are not being absorbed by the local job market.

The number of young citizens of Botswana studying information technology related courses within the country has been increasing [27]. These are studying at the University of Botswana and other local institutions. On average every year about 30 students graduate from University of Botswana with Computer Science degrees for example the number of graduates with Computer Science degree from the University of Botswana was 36 in 2005 [28] and 33 in 2006 [29]. These young graduates with such important skills are not able to get employment within the country to utilise their expertise. A good number of them end up doing a further year at the University of Botswana so that they can obtain a qualification that can enable them to be employed as teachers in secondary schools. With the current enrolment, there will be a significant increase in graduates with IT related skills in the near future.

This shows that the country has well qualified young citizens who can propel the drive to make the nation an information society. This also means that lack of qualified personnel is no longer the case as it was during the first 20 years of independence. The biggest problem is now lack of utilisation of such skills by the mainstream economy.

D. Digital Divide in Botswana

The digital divide in Botswana is in two fronts, urban digital divide and rural areas digital divide. As in the majority of African countries [30], the ICT infrastructure in Botswana is concentrated in cities and particularly in government institutions. Major economic activities take place in urban areas; hence people in such places are more likely to have some form of disposable income. It is for this reason that the majority of internet cafes in Botswana are located in Gaborone, the capital city of Botswana [31]. The digital divide in Botswana is not only in ICT diffusion; radio, television, fixed and mobile telephones have not covered the whole country yet [32]. The main problem that propels the digital divide is the distribution of the electric grid. Although the grid covers 90% of the population, only about 25% of household have accounts with the electricity service provider Botswana Power Corporation, BPC [1]. The main areas with the widest digital divide in Botswana are rural areas. It is a big problem to provide such infrastructure in rural areas where there is not much economic activity.

The urban digital divide is where lack of financial power makes access to ICT difficult even though ICT facilities exist. This is because although ICT is available in cities like Gaborone, it is still beyond reach of majority of people who do not have disposable income. This type of digital divide is not only limited to urban areas, but can exist even in rural areas if the focus is to make ICT accessible without looking at its affordability or access limitations. In developed countries like UK, this was solved by making internet access available in public libraries [33]. Botswana government in partnership with Bill and Melinda Gates has set up a project called Sesigo to provide free computer training skills and internet access at public libraries [34].

The global measure of determining the digital divide is often to look at internet access per population. This however does not give a true picture of the problem as it aggregates the number of computers to the total population, instead of determining whether the computers are concentrated on certain sectors within a country. For example internet access and computers is found mainly in government institutions in Botswana. However if this is distributed among the whole population, this will not give a very accurate figure because there are many computers within government institutions while the number is very low in private homes.

The digital divide in Botswana is growing at an alarming rate. This is due to pressure from those who have had the exposure to it, for example government employees who can access email, music, chat rooms in their offices. The author had exposure to the latest computers that are available in government departments, playing music from the internet during field work to three of government departments. In the process it is the people of Botswana who are not government employees or any of the government funded organisations, those with low income or those in rural areas that are being marginalised.

The disadvantaged members of the community are the voiceless, as they are unemployed. To illustrate this problem, all major newspapers in Botswana are available on the internet through the Botswana government website [35] which is not accessible to those without internet access. The Computer Science department of University of Botswana, in partnership with Radio Botswana (the state owned radio station), broadcast the radio on the internet, making it accessible even to the outside world. This has proved popular with citizens of Botswana based in overseas countries like Canada, USA, UK [36]. These services gives the radio station global coverage except within some parts of Botswana, which still do not have radio transmission coverage or internet access. National and private radio stations are now broadcasting live online also.

III. PRODUCTIVITY PROBLEMS IN BOTSWANA

For a long time there has been perception that productivity in Botswana is not up to the expected standard. Such perceptions have mainly come from looking at the quality of service offered by government employees. The issue is often covered in the local media [37]. Since the Botswana government is the largest employer in the country this comes as no surprise. The country does not have an industrial/manufacturing base to employ many people. Coupled with the small population of the country and high cost of utilities, previous attempts to promote the automobile assembly industry did not bear any fruits. However with a well educated labour force, the problem of productivity remains a paradox to the government. Some of the citizens of Botswana have been trained in some of the finest institutions around the world; also senior government officials have visited a number of the best performing countries of the world like Singapore, but this does not seem to have had an impact in Botswana. This may suggest that the problem is not due to lack of training.

Botswana's economic problems are unique. The country has a stable political environment and the economy is doing well. So Botswana does not have problems that are common among African countries. The country is currently classified as an Upper-Medium-Income country [38]. Unfortunately the wealth of the country is not reflected in the income levels of the general public. It is a rich country of poor people.

IV. DISCUSSION

Botswana's developments in ICT are among the best when compared to other countries in Sub-Saharan Africa, with the exception of South Africa. However this infrastructure use is mainly in central government and it has not penetrated the general public. Costs of using ICT, remains the biggest problem that prevents members of the public using the technology. Botswana's scenario shows that for developing countries diffusion of ICT takes a different form and global measures used to determine ICT penetration may fail to reflect situation on the ground. More research is required to determine instruments that can capture ICT developments in developing countries. This is particularly true because in such countries basic necessities like food and shelter may be more important than owning a computer.

V. CONCLUSIONS

Botswana has made significant progress in developing the basic ICT infrastructure. The country has political, economic and legal environment that is conducive to ICT exploitation. The biggest problem that the country is facing is how to make ICT services available to every citizen irrespective of their economic status. Access to ICT at the moment is a source of marginalisation of citizens who are on low income or unemployed. There is a need to look for ways and means of exploiting the existing ICT facilities to serve every citizen, to save them time and money when requesting government services. If this is not done, a new form of digital discrimination will emerge. Unfortunately the voices of people, members of parliament, are not in a position to be aware of this, as the majority of them lack exposure to the tangible benefits of ICT exploitation.

Maximum exploitation of ICT requires cultural change and a shift in the balance of power so that it is not based on the old pyramid structure of organisation. There must be concerted efforts to exploit the power of ICT to offer quality service and hence solve problems of productivity that is perceived to be below expectation. While it may not be economically possible to make ICT accessible to every citizen in Botswana, the way forward is to find ways of exploiting the existing ICT to serve the majority.

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