

# IMPACT OF ICT APPLICATIONS IN PERFORMANCE: SEARCH FOR EVIDENCE

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The Information and Communication Technology (ICT) applications in the western world are well established. This is shown by extensive use of ICT based services such as e-commerce, e-governance, etc. as well as many businesses operating through dot coms. There were lot of controversies as to ICT impact on performance. Nobel Peace Prize winner economist Robert Solow is one of those who echoed lack of impact. He called it the computer productivity paradox. The issue is re-visited to look for possible answers as to how this controversial topic has been tackled and whether it still exists. The effects of internet growth will also be investigated. A lot of previous research concentrated on improving technology to have features that can support performance as well as how organisations must re-align themselves to take advantage of ICT opportunities. There has been little research done to cover developing countries. However, unlike previous technological developments, which excluded developing countries, e.g. industrial revolutions, ICT applications have penetrated even the poorest countries. This paper is part of a broader research, which looks at the development of a framework for proper exploitation of ICT in Botswana. The paper will highlight Botswana's investment in developing ICT infrastructure. It is shown that ICT applications are not leading to improved performance; hence this research aims to establish why it is not delivering to the expectation.

Keywords: Botswana, developing countries, information communication technology, performance.

## INTRODUCTION

There has been a lot of debate on whether information and communications technology investments lead to productivity gains. It was mainly the economists like Nobel Peace Prize winner Robert Solow who questioned information and communications technology investments. This was referred to as the information technology 'productivity paradox'. This created an uncertain era in the information and communications technology profession and Ives (1994: xxi) called for the information technology professional to contribute meaningfully to negative publicity of information technology impact on productivity.

This paper argues that the information technology paradox has disappeared for organisations that have positioned themselves appropriately. However, when the information and communications technology success started to emerge, very few academics appear to have reported such developments. There is a need to show that the information technology paradox is gradually disappearing especially as they go through the Nolan (1979: 117) maturity model. This scope of this research is in e-

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government and looks at factors associated with service delivery by government urgencies.

Diffusion of information and communications technology has penetrated even the developing countries. On the other hand, information and communications technology rate of penetration in developing countries will take time to match that of the western countries. This is because developing countries have other major development priorities that take up resources, for example poverty, low economic growth and poor health. There is a need for developing countries to exploit limited information and communications technology infrastructure available.

## **THE 'INFORMATION TECHNOLOGY PARADOX'**

According to literature, numerous academics and practitioners in information technology and related fields such as Hitt and Brynjolfsson (1996) have debated whether investments in information technology lead to improvement in productivity. This was called the 'Information Technology productivity paradox', sometimes referred to as IT paradox. These discussions took place in the early 1990s. The debate continued for most of the 1990s. There was a decline in making reference to this in published academic work from the beginning of 2000. There is still reference to the information technology paradox by researchers, for example, Oz (2005: 789) corroborated that the research on impact of information technology on productivity has led to inconclusive results.

Brynjolfsson and Hitt (1996) published a paper where they claimed to have disproved the IT paradox in 1996. This was immediately challenged by Strassman (1997: 95-97) who noted that even the US government report namely US National Research Council of 1994 which was set up to investigate this did not come to any conclusions. What was really the issue in these conflicting views? It is difficult to pin point exactly what caused this. Probably it was because it is associated with what is claimed to have been said by the Nobel Peace Prize winner and economist, Robert Solow. However, did he actually say this or was it one of the topics that the media blew out of proportion. An intense literature search by Strassman (1997: 83) for Solow's paper did not locate it.

Information technology is a tool among the many tools at the disposal of any organisation, e.g. human resource, assets, capital, etc. It depends a lot on the strategy that is used to implement information technology in an organisation. During the time of the information technology paradox, most organisations had not yet reached Nolan (1979: 116) maturity stage of information technology diffusion model. This model has been used to show that any organisation goes through six stages of growth in the diffusion of information technology. The problem of misalignment of information technology and business strategy was very common at the time. Recent research by McKinsey (2005) showed that an organisation that has motivated and trained human resource as well as appropriate information technology implementation strategy, gains from its information technology investments. It must be acknowledged that motivated workforce and an appropriate human resource strategy are more likely to lead to productivity gains even without information technology.

Increase in productivity in US industry, according to McGee (2000: 42) was linked to information technology by economists. This was a change of view from previous doubt on information technology impact on productivity. McGee (2000) affirmed that US Federal Reserve report of March 2000 evaluated gains in productivity output per year to be about \$50 billion. Another interesting observation from McGee (2000) is

reference to results of InformationWeek Research survey that linked productivity gains not only to information technology but also good management. This was corroborated by McKinsey (2005).

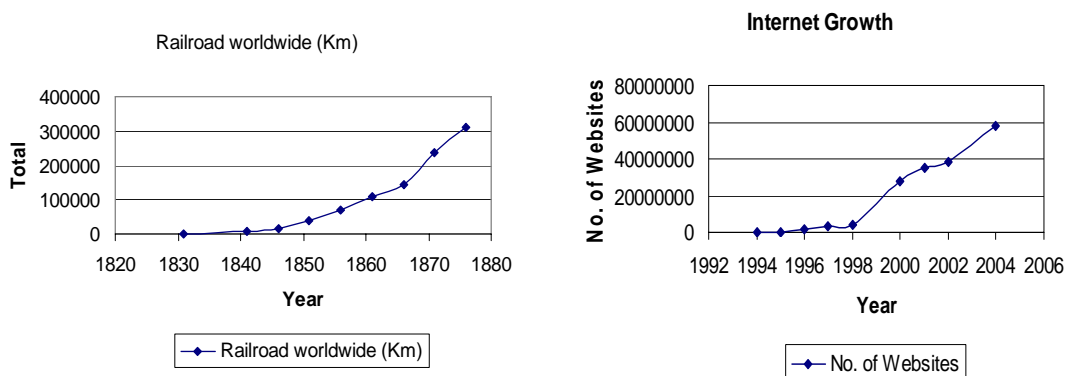
## INTERNET GROWTH

The first internet connection by Roberts (2000) was done on an experimental basis in 1969 in USA. At that time the idea was to connect about 15 computers across the USA. Since that time the internet traffic has grown substantially as shown in Figure 1.

At a time when the information technology paradox was at its climax, i.e. 1994, there were only about 10 000 websites and these were mainly in US. The fact that the use of information technology continued to grow globally despite the information technology paradox is probably an indication that the paradox might have been exaggerated. There were not many computers at the time per population even in the US; hence only top businesses were using them.

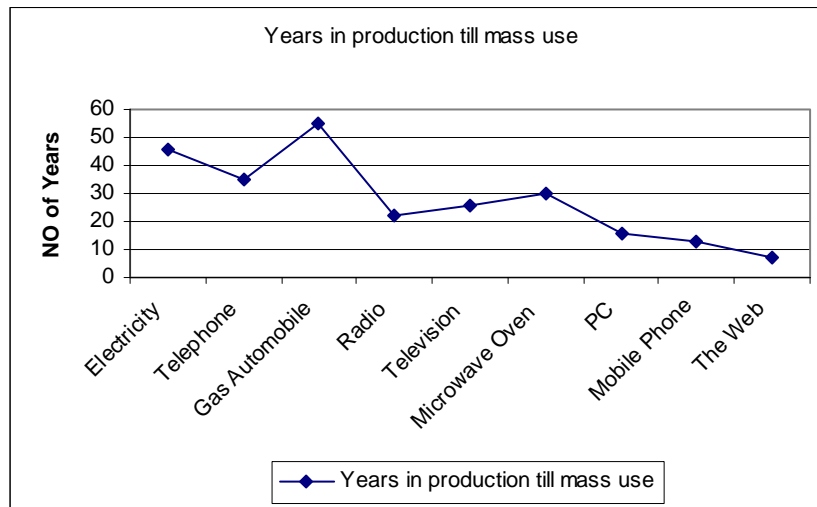
The use of the internet has had impact across the whole spectrum of businesses from small/medium enterprise to multinationals. The main impact has been in globalisation, where geographical location is no longer a barrier to trade. At first the growth was in the Western world, but developing countries are also part of it. The unfavourable political and economic climate in developing countries did not prevent internet penetration. For example, in Haiti, entrepreneurs were able to take advantage of opportunities of the internet, e.g. the country's internet growth exceeded the government telephone monopoly. Haiti's "weak economy, a low literacy rate, etc. ...Despite these impediments, resourceful entrepreneurs have sought to offer and expand internet service" (Peha 1999: 67). According to Petrazzini and Kibati (1999: 31), the full global coverage of the internet was achieved in 1998 when the remaining "unconnected" countries eventually established links to the network

A paper by Carr (2003: 46) showed similarity of internet growth to the growth of the railroad around 1850. Just like other infrastructural technologies of the past, it showed slow growth, followed by increase in investments and capacity then drop in prices that contribute further to the increase. Figure 1 illustrates internet and railroad growth. Railroad growth was gradual while internet growth experience a rapid growth over a short period of time



**Figure 1:** Railroad and Internet growth. Source: Railroad: Hobsbawn (1975: 362) & internet growth: Zakon (2005)

Some of the major factors that let to growth of internet especially in US according to Roberts (2000) were reduction in communication costs and the advent of doing business on the internet, e-commerce, etc.



**Figure 2.** Mass Use of Technological Inventions (Source: (*Reeling In the Years* 1998))

The growth of the internet and its penetration in the US market showed growth rates never experience before in comparison with previous inventions as shown in Figure 2. “Thanks in part to yesterday’s inventions, new technologies are reaching a quarter of the US population faster than ever”(Reeling In the Years 1998).

## ICT SUCCESS STORIES

Information and communications technology applications have led to improvements both in business and social life. “... amazing success stories abound: the billions of dollars already being transacted by firms like Dell and Cisco via the internet are only the latest example” (Brynjolfsson and Hitt 1998: 50). Many business even supermarkets have opened up to exploit information and communications technology applications by allowing on-line shopping. In UK, the success of information and communications technology applications in the private sector was influential in the government’s introduction of e-government. According to the National Audit Office (2002: 7), example of better ways of doing business in the private sector by companies like Oracle Corporation reductions in cost through use of web-enabled operations and British Gas productivity improvements were envy to UK government. The Office of e-Envoy was set up as part of the Cabinet Office to take responsibility of implementing and monitoring the implementation of e-government. Through such monitoring mechanism, Warrington Borough Council was rated to be offering “ a fair service that has uncertain prospects for improvement” (Tomlinson and Smith 2003: 5).

The UK government took an initiative in 1997, according to Martin (2002: 293-294) to encourage local authorities to use information and communications technology to improve their service to the public to meet the e-government targets. Councils were expected to submit their strategies on preparing on-line service provision and were given £250 000. Council’s whose strategies were approved, were allowed to apply for

additional funding to implement their strategies. There was political will to introduce e-governance.

In terms of the success of information and communications technology in UK government, this can be looked at in two phases. Firstly through the monitoring of information and communications technology implementation by Audit Commission, this allows for evaluation of the process. Secondly it allows for remedial action to be taken to improve the situation before it is too late. This enables the UK government to get a feel of impact at grass roots level and it empowers local government agencies to be accountable to the communities they serve. Each local authority has set up its own information and communications technology strategy and many have established information and communications technology facilities in public libraries, hence those with low income who may otherwise be marginalised are able to use these facilities to access online services.

The UK e-governance implementation has not been without challenges. The 1992 London Ambulance Service's Computer Aided Despatch System failure is a case in point. Even today, there are still sporadic reports of information and communications technology failure. Recently a £6 billion NHS computer system was reported by Hawkes (2006) to have put children life at risk. The system was supposed to send information to inform parents about when a baby was due for some routine vaccination and it is claimed not to have worked well.

## **ICT IN DEVELOPING COUNTRIES**

The phenomenal growth of the internet has not been uniform across the globe. It has been in developed countries where the growth and its impact have occurred. A paper by Petrazzini and Kibati (1999: 31) showed that in 1997 about 97% of all internet hosts and users were in the developed world. The main limitation to internet growth has been, and is still, lack of telephone infrastructure and electric power - the two most important basic infrastructures for information and communications technology. Unlike in developed world where almost every household has a telephone and electricity, this is still not the case in most of developing countries.

Information and communications technology diffusion and use within developing countries does not follow a similar pattern. Some developing countries have managed to position themselves appropriately to take advantage of information and communications technology. The Asia Pacific region according to Chowdhury (2003) is experiencing positive impact in the banking industry use of information and communications technology.

The developing countries that have the largest digital divide are those in Sub-Saharan Africa. Using 2001 data from International Telecommunication Union, Chinn (2004) showed that personal computer per 100 people for Sub-Saharan Africa was 1. This is a low figure compared to other developing regions for example; East Asia Pacific and Latin America plus Caribbean had values of 6.1 and 5.9, respectively. A significant portion of Sub-Saharan Africa's internet access is mainly in South Africa. This is also corroborated by United Nations Economic Commission for Africa which stated that internet access in Africa is "1 internet user to every 250 people in Africa... most of whom are in South Africa. This compares with a worldwide average of one Internet user for every 35 people" (*Conference Looks at Africa's IT 2002*).

The diffusion of internet in developing countries, although not adequate, is the only technological revolution that has penetrated them without any exclusion. Previous

technological revolution e.g. industrial revolution was mainly for the developed world. The internet has put information at the doorstep of all developing countries. Developing countries now have to empower themselves to take advantage of this. One area through which information and communications technology and internet can bring benefits to developing countries is through effective use of what they already have in terms of information and communications technology infrastructure, instead of waiting for the time when they will have enough.

Developing countries should try to develop and implement strategies that will enable them to utilise their limited information and communications technology to improve and facilitate their development programmes. Some developing countries in the Asian Pacific regions, as noted by Keniston (2002), for example, India, are experiencing success from information and communications technology. African countries especially Sub-Saharan countries are the ones experiencing significant digital divide. According to Oshikoya and Hussain (1998: 1), information and communications technology can have two impacts for Africa, namely further increase in digital divide or may offer the opportunity to catch-up with the developed world.

It has been argued by Oshikoya and Hussain (1998: 2) that Africa lost world market trade share of about 4% from 1980 to 1995. About 75% of this loss according to African Development Report of 1995 quoted by Oshikoya and Hussain (1998: 2-3) was mainly from information related activities such as quality of products, reliability and many more. The information related activities are areas where information and communications technology can help.

## **ICT IN BOTSWANA**

Botswana is a developing country situated in the Sub-Saharan region. Despite being a developing country, Botswana has made major improvements in developing information and communications technology infrastructure. Research by Duncombe (2002), Saiross and Mutula (2003) showed that Botswana information and communications technology infrastructure is among the best in Africa. Botswana has made huge investments in developing information and communications technology infrastructure. Information and communications technology budget rose from 0.2% to the current 3.7% of the total development budget for National Development Plan 7 (1989-1996) the current National Development Plan 9 (2003-2010) according to Little and Bose (2004a: B3).

The result of these massive investments in information and communications technology has been the development of “a telecommunications infrastructure that is one of the most modern in Africa” (Little and Bose 2004b: F5). The development of the telecommunications infrastructure is carried out by Botswana Telecommunications Corporation (BTC) which is one of the parastatal organisations in the country.

The biggest problem facing information and communications technology developments in Botswana is its unfair distribution. Like in other developing countries, information and communications technology infrastructure and services are concentrated in urban areas. As observed by Sebusang and Masupe (2003: 43), the rural communities have been marginalised by previous technological implementations, for example, there are some areas which are not covered by television and radio signals. However it is the government intention to bring appropriate services to rural communities as well.

Botswana government has done well in terms of infrastructure developments as compared to when the country attained independence in 1966. After a period of nearly 80 years of being under British rule, “ the British government invested very little in the territory” (Little and Bose 2004c: 1). A year after independence (1967), diamonds were discovered in Botswana. Through sound economic and adherence to stable political systems, the country used revenue from diamonds for developments. According to Little and Bose (2004c: 3), the country has enjoyed favourable ratings from Transparency International and World Economic Forum. According to the latest Network Readiness Index Ranking of 2005 by World Economic Forum, Botswana is ranked 56 in the world and 3<sup>rd</sup> in Africa. The report covered a total of 115 countries across the world. However, although Botswana is among the top in Africa, the 2005 also showed the country falling from position 50 from the previous years ratings. This must be a warning as it indicates something is not going the right way. Currently the government is extending the national electricity to cover rural areas. Due to the vastness of the country and other economic factors, this will take some time to cover every village.

## **PRODUCTIVITY PROBLEMS IN BOTSWANA**

According to Mogotlhwane *et al.* (2006: 274), concerns about low productivity in Botswana, dates back to the period prior to computerisation take off in Botswana. The government took numerous intervention measures to tackle the problem, for example setting up of work improvements teams, introducing performance management system and lately introducing performance based reward system. A significant portion of in-service employees were sent for further training. Little and Bose (2004c: 9) corroborate this by stating that Botswana has trained its citizens to some of the best institutions in the world at a heavy price and there is a need to utilise skills acquired. The major landmark was the setting up of a productivity training centre in 1995 called Botswana National Productivity Centre.

Of late, the Botswana government has identified information and communications technology as another opportunity of improving performance of government institutions. “ ... to help government department to use ICT capabilities that government has availed to them to improve management efficiency and service delivery” (Venson 2005: iii). Unfortunately, despite massive investment in information and communications technology and favourable ratings by international bodies, the problems of low productivity still persist. In the Ombudsman Report of 2005, Maine (2005) observed that government officials are still slow to act on official correspondence despite availability of email. This lack of positive impact on service delivery when information and communications technology is available in Botswana, led to this research.

There is a need to establish why information and communications technology is not having positive impact in performance of civil servants in Botswana. Otherwise the use of information and communications technology will be on non work related as was observed in some organisations in USA “... workers spend an average of 8.3 hours a week – more than one entire workday-pecking at non-work-related sites. One in every four employees reports ‘feeling addicted to, or compulsive in’ using the internet” (Stone 2002: 38L). This shows that information and communications technology use may not necessarily be for doing official tasks. Little and Bose (2004a: B9) also affirmed that automation alone can not lead to efficient service delivery if the environment of the business is itself in-efficient.

## **BROAD RESEARCH AREA**

The main question that this research tries to answer is:

Why information and communications technology applications are not having positive impact in service delivery by government departments of Botswana?

To answer the above question, the following hypothesis, aim and objectives have been formulated.

### **Main Hypothesis**

A proper Exploitation of Information Technology could lead to significant productivity gains in public projects in Botswana

### **Aim**

Develop framework for information and communications technology exploitation in aid of improving productivity in public projects in Botswana

### **Objectives**

The objectives of the study are to determine the limiting factors to full utilisation of information and communications technology in government department in Botswana, user level satisfaction and development of methodological instrument to help government departments evaluate impact of information and communications technology applications

## **CONCLUSIONS**

There is now evidence that information and communications technology impact in performance is related to management style and business practice within an organisation. It is organisations that have human resource management that enhance people to strive to achieve more and business strategies that takes advantage of information and communications technology opportunities that are gaining benefits from their information and communications technology investments.

There is a need to do research on productivity problems in Botswana. Such work will shed light on possible solutions to the problem. Previous attempts to address the problem concentrated mainly on employment contracts. As Emmort (1998: ix) pointed out, there is psychological contract, which although can not be enforced before court of law, still have an impact on how people work.

While there are emerging success stories in information and communications technology exploitation in other countries, the models used there may not necessarily be applicable to Botswana environment. Information and communications technology needs a lot of adaptation in Botswana. The natural environment is also not ideal for information and communications technology hardware. Computers will not work well under the dusty and hot temperatures of Botswana. The need for adaptation and not copy and paste is very important. "What is admirable in Zaire is unacceptable in Connecticut" (Strassman 1997: 13).

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