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Integrating ICT into Rural South African Schools: Possible Solutions for Challenges

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ABSTRACT The influence of ICT in schools cannot be overemphasized as its utility is changing the way students learn, teachers teach, and support staff work. ICT adoption in South African schools has therefore gained momentum. Whilst ICT is fully integrated into many if not all schools in urban areas in South Africa, regrettably the same cannot be said about rural schools. This has created a ‘digital divide’ between rural and urban schools. Theoretically, this paper is informed by *social justice theory*. Methodologically, the extant literature relied upon to make the case for ICT in South Africa’s rural schools. The same approach is used to identify key challenges militating against smooth introduction of ICT into South African schools. Thereafter, suggestions for overcoming identified challenges are provided. The aim is to help bridge the apparent digital divide between rural and urban schools in South Africa.

INTRODUCTION

Mdlongwa (2012) defines Information and Communication Technology (ICT) as a “global network in which ideas are exchanged, or information and knowledge is shared, through using communication technology like cell phones, and technology like computers, to connect people”. This appears to capture the essence of what ICT means in the literature. However, for the purpose of this study, the definition of ICT is limited only to computers. There is hardly any technological development in this century that can compete with ICT. Equally mindboggling is the dependence on ICT. In today’s *information age* there is hardly any human activity that is not information driven. According to Mdlongwa (2012), ICT permeates all realms of life, from the workplace to the sports field, in schools and on a personal or social level. In fact, for all organizational types it is fair to say that ICT has become indispensable. In South Africa ICT integration in schools has become a key objective for government both national and provincial as well as everyone associated with education. Surely then, there has to be sound rationale for this euphoria surrounding ICT introduction to schools in South Africa.

Rationales for ICT in South African Schools

Rationales provide the backbone for doing anything. As Voogt (2012) alludes to, rationales

for integrating ICT in South Africa’s education system provides justification for the apparent huge amounts of money being committed to the provision of ICT in all schools.

According to Voogt (2012), Hawkridge (1990) first identified six rationales for ICT in education as: social, vocational, pedagogic, catalytic, information technology industry, and cost rationales all of which remain relevant today. Nonetheless, we borrow from Voogt (2012) who asserts that there are really three key rationales for adopting ICT in schools namely: *economic (vocational)* – to meet the requirements for employability in the current information economy; social – to fulfil the requirements for participation in society and the work place; and *pedagogic* – to enhance teaching and learning. The discussion is dully structured along these three categorisations with the additional caveat that the three categorisations are not mutually exclusive but rather interlinked.

In terms of *pedagogy*, ICT is changing the way students learn and teachers teach. According to Bingimlas (2009) and Loyd (2008), integration of ICT into schools provides opportunities for students to learn to operate in the current information age. Besides, every country is yearning to improve the quality of its education sector. In fact, the OECD (2001) has long advised that countries wishing to enhance the quality and effectiveness of the learning pro-

cess in schools must turn to ICT. In South Africa, the Department of Basic Education sees the integration of ICT into the school system as a way of providing quality education to all (Department of Education 2004). Capper (2003) notes that the use of ICT shifts the traditional teaching method to a more learner-oriented approach. However, Cawthera (2001) rejected the suggestion that ICT could enhance quality of education citing absence of scientific evidence that the application of ICT will lead to better results than other resources such as textbooks, teacher training or nutritional supplements. In a similar manner, Fletcher (2003) argued that “the arguments in favour of technology-based instruction are incomplete”. The flaw in these two and similar arguments is that, they assume that ICT in education implies replacing pre-existing resources. However, this is not the case as ICT is meant to complement other resources. The case can also be made that ICT in schools will promote cultural exchange, develop communication skills among learners and assist them with studies. For instance, learners can learn other peoples’ culture over the internet and even exchange ideas about different cultural practices. Further, ICT can add value to the learning process and in the organization and the management of learning institutions (Bingimlas 2009). Kante and Savani (2003) concur by arguing that since ICT has proved successful in business, there is no reason it should not do so in education. Fletcher (2003) elaborate that ICT-based instruction increases instructional effectiveness, reduces the time and cost for learning, makes individualization affordable, and can serve as mediation tool in the teaching process for teachers who are not well qualified because experts can prepare educational materials and this can be distributed to all schools in electronic format. In South Africa where the performance of school leavers has always been a source of concern, it is expected that integration of ICT could well be a strategy to turn things around for the better. Not surprisingly, ITC adoption in schools is a serious matter. Currently, many if not all urban schools in South Africa are fully equipped with ICT. Regrettably, these developments are underscored by difficulties in integrating ICT into rural schools. This has created a ‘digital divide’ between rural and urban schools in South Africa (Mdlongwa 2012). Anyone familiar with secondary school leaving results in South Africa will agree that urban schools always perform

better than the rural ones. Given the ‘digital divide’ between rural and urban schools in South Africa, it is reasonable to conclude that the relatively better performance of urban schools could be attributed to ICT. Studying challenges of integrating ICT into rural schools is therefore in place.

Economics/vocation wise, a decade ago, Kofi Annan the former UN secretary general famously observed that among others, the emergence of the information age (and for that matter ICT) is changing the way people work. Bearing in mind the South African reality of many secondary leavers not getting access to further education, acquisition of ICT skills whilst in school is imperative in order to meet the requirements for employability in the current information economy (Baartman 2003). ICT adoption in schools is therefore essential for ensuring that school leavers enhance their employability. The belief is that ICT skills will create a citizenry of lifelong learners who can adapt to the global economy. Cawthera (2001) notes that “If a country is to be internationally competitive it is essential that its labour force is able to utilize and harness the advantages of ICT. If the education system fails to enable people to do this it also fails to meet the needs of the country and its economy”.

Socially, in South Africa where the constitution makes gender equity mandatory, providing ICT to all schools becomes imperative. There is no doubt that ICT in schools can promote gender equity. For instance, the internet which has numerous sources of information is not exclusively for men. Women can also have access to it. So, female students can obtain information from the internet which they can use to assert their positions in society. For example according to Hawkins (2002), Mauritania and Ghana where girls have indicated that the internet has given them the impetus to assert their freedom and rub shoulders with boys as it affords them the opportunity to access information beyond the controlled information provided to them. Having discussed the need for integrating ICT into the school system, it is important to provide a brief overview of the ICT situation in the South African school system.

ICT in Pre-tertiary Education in South Africa

The apprehensions referred to earlier did not stop educational authorities in South Africa from

introducing ICT into schools. According to Mdlongwa (2012), ICT (computers) were introduced to South African schools in the 1980s mostly in private schools and well-resourced government schools. Democratisation in 1994 has led to the Department of Basic Education stepping up the introduction of ICT into the school curriculum as well as in school administration. A White Paper was released (Department of Education 2004), to guide the process. Among others, the White Paper seeks to (i) provide connectivity to enhance teaching and learning, and (ii) provide the relevant support services such as pedagogical, curricular, assessment, managerial and administrative (Department of Education 2004). This implies that, if successfully implemented, the country's education system will be transformed to produce quality education with equal access to all.

It is noteworthy that the private sector, parastatals and non-governmental organizations (NGOs) are all contributing immensely in supplementing the government's effort to integrate ICT into education. Some of the projects are: the South African Schoolnet - started with the formation of grassroots provincial networks to provide Internet connectivity to communities; Mindset Learn - a satellite channel that broadcasts educational content to schools in South Africa and elsewhere in Africa-schools join in by purchasing a kit which comprises of a decoder, a television set and an orientation training to help teachers utilize the broadcasts optimally; Telkom's Thintana projects - provided some 300 schools with computer laboratories, internet connectivity and teacher training; Microsoft Foundation's agreement with the National Department of Education - to provide free software to South African schools for a period of five years; South African Digital Partnership; Sentech Project; Khanya Technology in Education in the Western Cape Province; Gauteng on-line; Connectivity Project in the Northern Cape Province; and the Intel "Teach to the Future" Project, to mention a few.

It must however be pointed out that almost all of these projects are based in the urban areas. This can be attributed to the fact that urban centres possess good infrastructure needed for the projects. This is in sharp contrast to what pertains in the rural areas where according to Mdlongwa (2012), there is still a struggle among schools to meet basic infrastructure needs. The

fact is, rural schools are faced with overcrowded classes or do not have classrooms at all, have no toilets, lack textbooks, and furniture and other basic infrastructure hence are likely to see the integration of ICTs in education as more of a luxury than a necessity.

There is also the observation that some rural schools are not letting the lack of basic infrastructure deny them the opportunity to use computers – a starting point for integrating ICT into the school system. Educators in rural schools, who have acquired some computer literacy, try to use computers to prepare their lessons and texts. They encourage their School Governing Bodies (SGBs) and School Management Teams (SMTs) to acquire computers for their respective schools. Some schools have managed to acquire computers and even internet connections from sources such as insurance companies, retail outlets, businesses, government enterprises, and the like. Some private entrepreneurs have also acquired used computers, refurbished them and in partnerships with the schools have set up computer literacy classes which educators and learners must pay to attend. Usually, once the entrepreneur has made his money, the computers are donated to the schools for their use. This is a clear indication that with or without the help of government, irrespective of location, schools in South Africa are eager to or are steadily trying to do something to integrate ICTs into the school system.

Though this is a laudable effort by schools, it must be pointed out that some entrepreneurs are providing schools with very old computers which are not compatible with the latest software. The worrying point here is that unsuspecting schools can easily be turned into dumping grounds for disused/obsolete computers. It will be helpful if the Department of Basic Education will provide a policy guideline to protect schools from becoming victims of this unethical behaviour.

To sum up the ICT situation in South African schools, it is quite clear that many schools in rural areas are finding it difficult if not impossible from adopting ICT thus creating a 'digital divide' - a situation where some (urban schools) have access to ICT and others (rural schools) have very little or no access at all. Rural schools in South Africa are finding it really difficult to adopt ICT due to challenges. The next section examines these challenges.

Typical Challenges Facing Schools in Rural South Africa

Based on the literature review, lack of infrastructure; lack of competent ICT personnel; prohibitive cost; and inability of the Department of Education to sustain projects emerged as the key challenges hampering integration of ICT into rural schools in South Africa.

Concerning infrastructure, Cawthera (2001) identifies lack of access to rural schools whilst Herselman (2003) and Kante and Savani (2003) agree on lack of electricity, lack of telecommunication infrastructure, and inadequate storage facilities as key challenges militating against smooth introduction of ICT into rural schools in South Africa. Similarly, South Africa lacks competent ICT personnel to provide technical support to rural schools in South Africa (Jedeskog 1999; Herselman 2003; Kante and Savani 2003; Ward 2003; Rai 2006). Frankly, the infrastructure challenges in rural areas are a direct result of the apartheid policy of segregation and separate development. Although much strides have been made since democratisation in 1994, it is evident that it will take some time before rural areas of South Africa too will have access to sufficient infrastructure needed to make ICT integration into rural schools much easier. Secondly, in the face of the ICT skills shortage in South Africa, it will be unreasonable to expect rural schools not to face ICT support problems. Surely, whatever ICT experts available would naturally prefer to take up jobs in urban areas. It is however noteworthy that since democratisation in 1994, rural areas are receiving attention as far as electricity, telecommunication, and road network is concerned. Hopefully, this may attract ICT experts to take up positions in rural schools.

The prohibitively high cost of installing ICT is also preventing integration of ICT into rural schools in South Africa (Jedeskog 1999; Herselman 2003; Kante and Savani 2003; Ward 2003; Rai 2006). Whilst ICT installation is never a cheap business, the cost of installing ICT in rural areas can be expected to be even higher mainly due to transportation and other logistic costs. It is only natural that costs should be a problem for integrating ICT into rural schools in South Africa. Whilst it is true that all schools may purchase equipment at the same price, transporting the equipment and technicians (to

do the installation) to remote rural areas may be very expensive due to the usual bad roads leading to such places.

Finally, it seems that government can never escape blame when it comes to provision of services to citizens. According to Mdlongwa (2012) the government does not prioritise ICT implementation as compared with other basic services. Incidentally, this view was long alluded to by Herselman (2003) and Kante and Savani (2003) just to name a few when they attributed the lack of ICT in rural schools to the inability of the Department of Education to sustain ICT projects. This argument is not farfetched when one considers government's inability to supply textbooks in some parts of South Africa.

Challenges notwithstanding, it is clear that rural schools cannot be left behind in the drive to equip South African schools with ICT. What is needed is creative solutions. Some of the possible ICT solutions for rural South African schools are discussed below.

METHODOLOGY (THEORETICAL STANDPOINT)

The study on the availability of ICT in South African schools was approached with unwavering commitment to human rights and in particular *social justice*. Bearing in mind that rural dwellers in South Africa have always been the worst of socioeconomically, *social justice* demands that no stone should be left unturned in the quest of making ICT available to South African schools in rural impoverished communities so that they too can have the same chance to participate fully in today's information society just as those from urban schools. Methodologically, it is qualitative in nature and falls under the interpretivist paradigm of research. Accordingly, secondary data collected were interrogated and given meaning by the researchers. The result of this endeavor is presented below.

RESULTS AND DISCUSSION

This paper sought to achieve two objectives. Firstly, it sought to explain why it is essential for South African schools no matter where they are located to integrate ICT into their day to day administration and the teaching and learning process. Secondly it sought to identify suitable ICT solutions for rural Schools in South Africa.

Making the Case for ICT Solutions for All of South Africa's Schools

In making the case for ICT in South African schools no matter the location, the researchers relied on the literature to strongly argued from *social justice* perspective that because ICT is driving employability, it makes absolute sense to spare no effort in integrating ICT into rural schools so that rural school learners become equally employable just like their rural counterparts do. Besides, ICT for all schools will in the long run produce a workforce that is globally competitive.

Possible ICT Solutions for South Africa's Rural Schools

Various ICT solutions are available that could prove useful in overcoming the peculiar challenges of integrating ICTs in all rural schools in South Africa and elsewhere where conditions are similar. The two most recent solutions that stand out are the *National Broadband Policy Review* and the *ICT for Rural Education (ICT4RED)*.

National Broadband Policy Review: The most ambitious effort to bring ICT access to rural areas is the National Broadband Policy Review process. In summary, the policy is intended to ensure 100% broadband coverage for all households by 2020. By harnessing public and private sector investments, government intends to enable access, affordability and coverage (IST-Africa Consortium 2013). While the private sector will focus on urban areas, government will focus and co-invest for township and rural access, school (IST-Africa Consortium 2013). According to the same source, the policy and strategy for implementation is expected to be approved in 2013.

ICT for Rural Education (ICT4RED): Another recent ICT project directed at rural schools is the Council for Scientific and Industrial Research's (CSIR) ICT for Rural Education (ICT4RED) project. According to Vodacom (2013), this project kicked off in late July 2013 with 160 teachers in 11 Eastern Cape schools being given multimedia tablet computers to aid their teaching. The pilot project carried out in an Eastern Cape province secondary school is said to have raised the pass rate of 41% in 2011 to as high as 77% in 2012 (Vodacom 2013). If this re-

sult is anything to judge by, there is hope that ICT4RED provides a means of bridging the digital divide between the urban and rural schools so that *social justice* can be achieved. Besides these two, the following earlier projects have the potential to change the landscape of access to ICT in rural areas hence bridging the current digital divide in South African schools.

Learn-O-Vision: According to Herselman (2003), this system can provide rural schools with first rate ICT capabilities even without electricity. The unit is often described as a classroom on wheels because it can be wheeled and used anywhere. According to Herselman (2003), a complete unit consists of a computer system, a television set, a video recorder powered by a battery that is charged by a two panel solar-energy unit capable of generating energy that can last one full school day. A supplementary source of power could be biogas, a viable source of power in rural conditions. According to Herselman (2003), biogas was able to generate enough power to run 47 computers, video resources and a photocopier in a KwaZulu-Natal school for a whole day. Thus, provided fixed line telephone communication or wireless connectivity is available, rural schools can get connected to internet.

Connectivity: Connectivity refers to the installation of computers in schools and connecting the computers to the internet. Most rural areas in South Africa have very limited or no access at all to the internet. This is largely due to absence of fixed telephone lines (Baartman 2003). Even where it is available, charges are relatively high due to the monopoly they enjoy. With the emergence of wireless systems, many rural areas are now able to access limited internet services. So, schools that do not have telephone lines can opt for wireless systems which are also not really cheap. Fortunately, the four mobile (cellular) phone service providers (Vodacom, MTN, Telkom and Cell-C) are big companies who can be approached to provide services to rural areas at affordable fees.

InfoSat: InfoSat is suggested by Cawthera (2001) as another way of getting information from the web in areas where there are no land lines. InfoSat consists of two parts when connecting to the web. These are, incoming to a PC that receives information from the web and outgoing from a PC which sends or requests information. InfoSat performs the first function with informa-

tion being transmitted down a satellite to a receiving dish and into a PC. For the second part, a telephone connection is needed to transmit signals to the satellite and to tell the satellite which web pages to transmit down. In the absence of landline connectivity, the connection can be made through a GSM system used by mobile phones. This system can be combined with solar power so that schools without landline telephones and electricity can also be connected to the web. The Kwazulu-Natal school mentioned by Cawthera (2001) uses this method of connectivity with much success.

A cheaper method of connectivity which schools can utilise is the wireless-based technology called Wireless Fidelity (WiFi). According to Levy (2003), WiFi technology is far less expensive to deploy than the wireless technologies used by cellular phone providers. Levy (2003) also points out that WiFi transmits data at a speed of 11 mbps (megabytes per second), which is sufficient for all types of multimedia. Because WiFi is cheaper, does not need a wired connection and is easy to deploy anywhere, it is seen as very convenient for schools in rural areas.

Regarding availability and affordability of Internet Service Providers (ISP), it is encouraging to state that there are numerous ISPs in South Africa whose services are quite affordable. SchoolNet has volumes of deals with ISPs so that they can resell these services at discounted rates to schools. Although schools have various ISPs to choose from, unfortunately, most of these if not all are located in urban areas making it nigh impossible for rural schools to benefit from their services. The Department of Basic Education can enter into partnerships with some of these ISPs to customize their services for rural schools at affordable rates. Alternatively the education department can set standards for ISPs that want to provide services to schools to meet.

Educators' Preparedness and Maintenance: The provision of hardware in a school without the proper training and support impedes integration of ICTs in schools. Therefore, there is need for a professional development programme that will enable educators to acquire the appropriate skills. Capper (2003) has pointed to the fact that most schools in South Africa have computers or access to computers but not all educators are using them. This author also observed that many teachers who have access to

technology do not use it due to lack of knowledge, satisfaction with their current teaching methods, feeling that the use of technology is too laden with technical difficulties and not having time to spend on the types of lessons best supported by technology. The challenge thereof is, making technology user-friendly to all educators and motivating educators to utilize ICT resources.

There are quite a number of support programs that can help improve ICT skills of educators in rural school. Some of the notable programs are SchoolNet's *Intel Teach to the Future*, *Telkom Supercentres* and *Thintana, Mindset Learn Thutong*. The department and its partners must ensure that these projects benefit rural schools.

As far as acquiring and maintaining competent ICT professionals is concerned, urban areas will continue to have the edge over rural areas until the education department develops a plan to provide mouth-watering incentives that will entice these personnel to rural areas and keep them there. A bursary scheme can be devised for ICT trainees and after their training, they will be obliged by law to serve the government in rural areas for a minimum period of time.

Finance: Another factor that militates against the successful integration of ICTs in rural schools is the problem of cost. The cost of ICT does not end with the acquisition of computers. Cost includes among others: acquiring software, maintenance and repairs, replacements, training, internet access, insurance, setting up a room to use as computer centre and if possible, the installing the necessary security devices (Cawthera 2001). While it is often easier to secure computers and internet access, the running cost that adds up to the total ownership could be a major drain on a schools' budget. The improper management of these costs will result in an ICT system that does not function as an effective tool in education. Herselman (2003) notes that most rural areas live below the poverty line and this is reflected in the rural schools also. So, because costs can be prohibitive, for the rural poor affordability of ICT becomes impossible. To alleviate this problem, Cawthera (2001) recommends that since the cost of branded computers can be high, rural schools can do well to buy clones rather than branded products. Alternatively, schools can go for second-hand or refurbished computers.

Bakia (2002) suggests that computers in rural schools should be networked to reduce cost. Networked computers do not have hard drives, instead they are connected to either a local server. This method is quite cheaper than stand-alone computers. In addition, work stations on a network require little maintenance or technical support. Upgrades are done on the server so the individual machines need not be replaced or discarded. Despite these advantages, there is the need for a proficient technical support to attend to trouble shootings. Again, the processing speed tends to be slower when the network traffic is heavy – for example, if there is a class session. The machines will not work if there should be a network collapse.

Technical Support Staff and Maintenance:

Once computers have been set up in schools, they need regular support and maintenance. The need for support staff to do regular upgrades, repairs and maintenance cannot be overlooked. This is a specialized role which cannot be left to the educators alone. A formal support structure with full-time personnel to respond to troubleshooting calls must be created by the education department and the schools. This structure can be out-sourced to enterprises in the ICT business or in-house within the education system.

Within the education system, educators who volunteer to do the job can be provided with basic skills to handle minor repairs and upgrades. Care must however be taken to ensure that this duty does not compete with the educator's curricular duties. Alternatively, the educator responsible for ICT can select a few learners who are technologically inclined and train them to do the minor maintenance and repairs. The Department of Basic Education must ensure that there are skilled support staffs that are readily available to attend to calls so that schools are not unable to function just because of system breakdown.

If the Department of Basic Education and the various stakeholders solve the problems discussed above, the question that will arise is, at which point one can safely state that a school is adequately resourced to integrate ICTs into the curriculum successfully. A suggestion will be, considering the cost involved in integrating ICTs in schools and the numerous problems that beset rural areas, while still encouraging individual schools to adopt their own means of integrating ICTs in the various schools, the Department

of Basic Education should form partnerships with the private sector to set up educational network schools in easily accessible points in rural areas. The school will have all the appropriate infrastructure and resources that will enable full utilization without much hindrances. These access point schools must be manned by competent and well-qualified staff with their necessary technical support group. Stakeholders will need to devise a plan on how schools are going to attend the networked school. Furthermore, the Department of Basic Education will have to map out a policy that obliges all schools to use the network school and programmes taught in the networked schools. This programme will ensure uniformity in the curriculum. There must also be a set of monitoring and evaluation tools to ensure that desired outcomes of the programmes are achievable. If there are problems, the situation should be evaluated and remedied by competent personnel tasked by the Department of Basic Education. As time goes and with the availability of funds, integration of ICTs into individual schools can gradually be done to attain the required standard.

CONCLUSION

This paper sought to achieve two objectives. Firstly, it sought to explain why it is essential for South African schools no matter where they are located to integrate ICT into their day to day administration and the teaching and learning process. In this regard the researchers argued from *social justice* perspective that because ICT is driving employability, it makes absolute sense to spare no effort in integrating ICT into rural schools so that rural school learners become equally employable just like their rural counterparts do.

The discussion has revealed that the Department of Basic Education has taken up the challenge to ensure integration of ICT into schools. The researchers acknowledge that the private sector, parastatals and NGOs have joined forces to support the government's effort. The result is projects like Schoolnet, South African Digital Partnership, and Microsoft's agreement with the Department of Basic Education just to mention a few. However, while it is clear that schools in urban areas are doing well in terms of access to ICT, the same cannot be said of rural schools and this flies in the face of *social justice theory*.

RECOMMENDATIONS

This study, has highlighted that typically, rural schools are beset with the problem of basic necessities such as lack of classrooms, lack of electricity, lack of land lines just to mention a few, all of which hinder the introduction of ICT. This leads to the second objective which is to provide suggestions for providing rural schools with access to effective yet affordable ICT. Under the heading “possible ICT solutions for rural schools”, the study has provided a number of suggestions that can make the introduction of ICT into rural schools in South Africa less challenging. As a long term solution it is recommended that Government and the private sector consider a rural school targeted Public Private Partnership (PPP) to complement each other’s efforts in overcoming challenges of introducing ICT into rural schools in South Africa.

Research wise, whilst this study is insightful, it relied on the extant literature to come to conclusions and recommendation. It is recommended that an empirical study will provide further insight. A follow up paper takes up this task

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