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# Challenges of educational digital infrastructure in Africa: A tale of hope and disillusionment

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**Technology-based distance learning is becoming popular throughout the world. In Sub-Saharan Africa, advancements in communication technology more than two decades ago raised much hope since technology-based distance education was seen as a promising cost effective and cost-efficient answer to expansion of access to education. These high hopes in technology-based distance education have, however, turned into disillusionment because of the challenges relating to digital infrastructure affecting most of Sub-Saharan Africa. This article is a reflection on the challenges of digital infrastructure with respect to distance learning in Africa. The article makes some recommendations for practice and research.**

**Key words:** Technology-based learning, communication technology, digital divide.

## INTRODUCTION

Many governments in the developing world revitalized their education systems over the last two decades with a view to meeting goals set by the United Nations. This was done at a meeting where national leaders from all over the world resolved to eliminate poverty by 2015 through achieving a set of goals which were considered to have a causal relationship with poverty. The second of these millennium development goals committed states to ensuring that school-going age children everywhere would have access to primary education (Valk et al., 2010; Shava and Ndebele, 2014). For many developing countries, this goal proved to be a huge challenge because of the mismatch between the rising population of children and the slow pace at which educational opportunities are expanding. With the world economic recession, the resources for constructing new schools,

training and employing new teachers and supplying schools with teaching-learning materials have not been adequate (Wamba and Mgomezulu, 2014).

One of the promising solutions to this dismal situation has been technology-based distance education (DE). As Wanzala (2013) observed, developments in information communication technologies (ICT) brought excitement in Africa because it would lower costs of education and training and improve access. However, the excitement and high hopes raised two decades ago by innovations in ICT have met with some unforeseen challenges down the road. This paper discusses some of the challenges relating to digital infrastructure in Africa, affecting the region's dream of creating societies in which every child regardless of gender will have access to education either through participating in conventional classroom-based

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learning activities or through use of technology-based learning platforms. The paper also makes some recommendations for practice and for research. Before looking at the opportunities and challenges facing Africa with regard to educational digital infrastructure, the paper first refers to the world context in order to demonstrate that Africa's dream for technology-based DE has come true elsewhere in the world.

## Global trends

As Agyemang and Dadzie (2010) and Hoekstra (2013) observed, DE has become an important feature of education systems worldwide over the last few decades. Agyemang and Dadzie reported that the United Kingdom's Open University has broadened access to education to people who would have otherwise been excluded from further education. Ding et al. (2010) reported that DE in China has become a very important strategy for universalizing access to education. Through the strides made by DE in recent years, many people in China's rural areas have had access to basic education. According to Ding et al. (2010) China's delivery mode for DE has transitioned in three delivery mode generations from correspondence to radio and television through to online multi-media delivery which has emerged as the current significant delivery mode.

In Malaysia, DE is getting more and more popular with developments in technology (Ramayah, 2010). According to Githens et al. (2014), the possibility of accessing education through distance learning platforms is a timely solution to the problem facing people in the workforce that need to continue developing their knowledge and skills but are constrained by time or distance. The strategy is bearing fruit because of the availability of internet services which facilitate the delivery of high-quality multi-media learning materials. According to Ng and Confessore (2010), the most preferred mode of delivery from learners' point of view in Malaysia is use of a multiplicity of learning platforms such as site-based instruction and print media, audio and computer-supported interaction (or hybrid). The major goal of adopting multiple delivery modes is to benefit from the advantages of each.

In North America, DE has evolved from the early days when the sole mode of delivery of teaching/learning materials was postal services. Adams (2016) gives an account of how DE evolved from dependence on correspondence as the only delivery system before the current online options. Adams asserts that the exponential growth of internet and web-based course management has led to significant improvement in quality. According to Baggaley and Lee (2005), the most predominant delivery mode of DE in North America is text-based conferencing. Baggaley and Lee explain that scheduling live instructional synchronous sessions is not easy in North America. Because of that, web-based asynchronous sessions are the preferred mode.

In developed countries, the application of technology to DE has been relatively easy because nearly all technological innovations take place in those countries. This has contributed to the decline in cost of services. Bates (2001) reported a significant growth in information communications technology (ICT) capacity in the decade leading up to the time of publication of his article appropriately titled '*The Continuing Evolution of ICT capacity*.' Bates observed that advancements in technology, increased ICT capacity, and the rise in ICT supply had a significant contribution to the lowering of the cost of digital communication (particularly with respect to telephone communication).

This explanation by Bates makes economic sense. However, Africa does not seem to have benefitted much from these trends as can be seen from the fact that access to ICT is still an issue because of costs. According to Miniwatts Marketing Group (2019), only 37% of Africa's population has access to internet, whereas in Latin America/Caribbean (just like in the Middle East) the rate is 67% of the population. Wealthier regions of the world have high internet usage rates per population. For instance, the rates for Europe and North America are 87% and 89% respectively. Interestingly, although Africa has the lowest internet usage rate per population, the region's growth rate in internet usage is very high. During the period 2000-2019, the percentage of growth in Africa's internet usage was 11.533%. This is significant when compared with Asia at 1.825%, Europe at 585%, Latin America/Caribbean at 2.377%, and North America at 203%. It should be borne in mind, though, that wealthier nations are not growing as much as Africa is doing because they are way ahead of Africa and are closer to 100% penetration rate.

The digital divide notwithstanding, however, the general point made by Bates (op cit) as well as Kikis et al. (2009) is valid. ICT is increasingly becoming more available to educational institutions and households across the world and this increase in digital infrastructure is boosting the use of technology in broadening access to education. This overview of global trends in DE has identified the following issues:

(i) DE is growing in popularity in many parts of the world;
(ii) Advancements in technology are aiding the growth of DE;
(iii) Despite the adoption of internet-based technologies in the delivery of DE programs, the traditional delivery methods have not faded away. For instance, computer-supported interactions are still being blended with face-to-face interactions, print media, radio and television;
(iv) The world is still experiencing a digital divide based on economic status of countries. Rich countries have more access to digital infrastructure than poorer countries.

Against this background of global trends in DE, what is the situation in Africa?

## DE in Africa

Sub-Saharan Africa (SSA) covers an area of 24 million square kilometers, comprising forty-nine countries, with a population of 659 million (Mbarika et al., 2002). As mentioned in the introduction, many SSA countries have been revitalizing their education systems over the last two decades largely because of their commitment to the United Nations Millennium Development Goals that required them to provide education to all children by the year 2015. According to UNESCO (2018), SSA has the largest population of children who are out of school, adolescents, with a total of 96.9 million in 2016. Furthermore, the region is still lagging behind other developing countries such as those in Latin America and the Caribbean (12.7 million), Southern Asia (95.8 million) and Northern Africa and Western Asia (18.5).

To address the problem of access, African governments have put many strategies in place, such as building more schools and training more teachers but there are not enough resources to do more (Wolff, 2002). It is partly against this background that DE is seen as a strategy for addressing the problem of access to education. Basaza et al. (2010) make an additional case for DE. They have observed, among other things, that DE has a positive impact on educational costs and enables students to participate in education without having to be separated from their families.

According to Leary and Berge (2007), DE programs in SSA have existed since the 1950s. Out of the approximately 150 DE programs, the most successful ones run in partnerships with universities overseas. For example, the African Virtual University, which is based in Kenya, enables students to receive online instructions from a university in the United States. Leary and Berge have observed that the predominant delivery mode is a blending of learning systems with primary emphasis on print material, radio, text and email.

Leary and Berge (2007) demonstrated that in Anglophone and Lusophone countries, the incidence of video conferencing is lower compared to the situation in Francophone countries. According to Leary and Berge, 40% of colleges in African Lusophone countries use video conferencing as one of their educational media, whereas only 3% of colleges in Anglophone and Francophone African countries include video conference in their types of educational media. With respect to the use of radio, 70% of colleges in Lusophone countries include it on their list of types of educational media and only 2% of colleges in Anglophone countries and 12% of colleges in Francophone countries do so.

It is interesting how the colonial backgrounds of nations in Africa impact on type of instructional media. The low reliance on e-learning delivery systems is surprising when viewed in the light of findings made by Mbarika et al. (2002) indicating that SSA is no longer the technological desert that it used to be. They assert that the region had, by the year 2001, tremendously increased its capacity for ICT, contrary to many reports. They report that a decade ago, twenty-four countries had one thousand subscribers to internet dialup, nineteen had five thousand and six had twenty thousand. Mbarika et al. (2002) have reported that digital infrastructure has significantly broadened educational access. To some extent, SSA owes this rapid increase in adoption of ICT to the support rendered by donors (such as the World Bank, the Rockefeller Foundation, the Ford Foundation, and many others) that have funded projects for development and integration of web-based learning (Mkonongwa and Komba, 2018). Another notable development is the increasing use of mobile technologies (Apuke, 2018; Makinde et al., 2019).

Mbarika et al. (2002) concede, however, that the great strides that Africa is making towards improving internet diffusion do not tell the whole story. One part of the story is that internet diffusion is largely restricted to the major cities. The rural populations are generally outside coverage areas. Other parts of the story have been presented by several writers. For example, Intsiful et al. (2003) list the following constraints to effective and efficient use of ICT:

(i) Prohibitive subscription costs
(ii) Inadequate promotional strategies
(iii) Inadequate relevant user information
(iv) Poor quality of internet services
(v) Unfriendly regulatory framework
(vi) Ineffective network traffic and infrastructure management

In addition to this litany of challenges constraining the use of technology for purposes of DE, Oladejo and Gesinde (2014) noted other factors, including lack of face-to-face tutorial support to learners, unreliable and unsustainable materials development, inadequate staff development strategies to match the ever-changing nature of technology, high course fees, and inadequate funding. Afolabi (2015) observed that some potential DE students are unable to access learning because they lack computer skills.

## RECOMMENDATIONS FOR PRACTICE

Based on the challenges identified in this paper, recommendations can be grouped into two categories. Some recommendations can be addressed to national governments and their development partners, while other recommendations are for the attention of DE institutions.

**(1) National governments and development partners**

Broadening of access to education through adoption and expansion of a well-functioning ICT-dependent DE system has several benefits to national governments. An increase in technology literacy in particular and a rise in the critical mass of educated citizenry in general can translate into an existence of a workforce that will satisfy the human resource needs of a nation's economy. Furthermore, not all governments in sub-Saharan Africa can afford to build and equip schools and colleges to meet the demand for education. ICT-dependent DE is a viable solution to the problem because it comes at a cost that is less burdensome than face-to-face teaching/learning delivery modes. It is prudent, therefore, for national governments and their social partners to create an enabling environment for supporting educational ICT through the following measures:

(i) Developing a friendly legal framework through laws and polices (such as tax incentives) that attract and protect private enterprises providing ICT services (such as internet providers, suppliers of ICT software and hardware, and suppliers of mobile ICT devises); and developing strategies for lowering subscription costs for ICT services.
(ii) Developing strategies for improving and sustaining the quality of internet services.
(iii) Improved management of network traffic and ICT infrastructure.
(iv) Supporting research development in ICT.
(v) Improved public financing to DE institutions.

**(2) DE Institutions**

DE institutions benefit from efficiently run technology-based education and have much to lose from a disappointed clientele when services are poor (e.g. intermittent or poor access to online platforms; uncommunicative learning materials; inappropriate pedagogy for online learning; lack of feedback to learners). DE providers should adopt and maintain best practices for managing and delivering ICT-based learning through:

(i) Selecting user-friendly ICT learning platforms;
(ii) Providing support to students that have no computer skills (e.g. conducting basic computer skills at community-based DE centers).
(iii) Developing and periodically revising learning materials that are appropriate for online delivery (e.g. materials with clearly stated learning objectives, clearly structured content, relevant and authentic student activities, and clear rubrics for exercises).
(iv) Engaging competent IT specialists for managing instructional technology.

(v) Developing faculty capacity to maintain quality (e.g. training faculty in development of online teaching-learning materials).
(vi) Constantly monitoring and evaluating DE activities (e.g. through soliciting feedback from learners and using the data for system improvement).
(vii) Adopting strategies for lowering costs without comprising on quality (e.g. promotion of mobile and personal technology platforms that are more affordable and more popular among the target groups, (Apuke and Iyendo, 2018); use of social media for academic purposes (Apuke and Iyendo, 2017).

**RECOMMENDATIONS FOR RESEARCH**

Use of communication technology is a welcome phenomenon in as much as it contributes to reduction in educational costs and access to free online learning materials (Apuke and Iyendo, 2018; Makinde et al., 2019). However, communication technology has also been known to come with hazards such as pathological addiction to the internet with resultant anti-social effects (El-Kader and Hanson, 2019). The exact nature of unwanted consequences of the use of social media and mobile phones for DE in Sub-Saharan Africa has not been investigated. Neither has the possibility of using ICT-based DE for purposes of technical vocational education and training (TVET) been fully investigated. Research should be conducted to determine the following:

(i) The impact of educational ICT (including social media for educational purposes) on students' social-cultural competences. If there are any unintended consequences that affect academic performance, what remedial and preventive measures should be incorporated into the curriculum for online programs?
(ii) The feasibility and best practices for online delivery of TVET knowledge, skills, and dispositions. To what extent can practical, hands-on skills be acquired through online learning platforms?

**Conclusion**

This paper has discussed the hopes and disillusionment in the use of digital technology in Africa south of the Sahara. The paper has indicated that advancements in ICT made a couple of decades ago have had a tremendous impact on DE delivery systems throughout the world. Although SSA has had some success stories in the use of online-based delivery systems, and although the rate of internet diffusion is rising significantly, the region has still got some issues with digital infrastructure. Challenges slowing down the growth of internet-based delivery systems in Africa include unequal internet access between urban and rural populations, unreliable

internet services and high cost of ICT. Partly because of these challenges, DE continues to be characterized by use of traditional delivery systems, such as print, radio and television, particularly in Anglophone and Lusophone countries. It is hoped that the recommendations for practice will be implemented.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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