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The State of Instructional Technology in Pre-colonial, Colonial and Post-colonial Africa: A Survey of Literature

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Abstract
This article examines the evolution of instructional technology in pre-colonial, colonial, and post-colonial Africa's educational systems through a survey of existing literature. It stresses the position that education pre-dates colonization of Africa as customary education taught morals and the essence of communal living from the cradle with the goal of molding decent human beings who would preserve the cultural heritage of the people. However, with colonialism, beginning with the Portuguese, who first introduced their brand of education in the continent, the earlier focus was fundamentally altered to making the African embrace the mannerisms and ways of life of the colonists. This trend continued with the British, French, and German colonial administrators who balkanized Africans among themselves. As the literature on the subject revealed, what started as distance learning through the aid of radio and television metamorphosed into many variants. The paper noted that the emergence of the computer and the accompanying internet connectivity has made instructional technology a challenge and opportunity in many educational settings across the continent.

Keywords: distance learning, educational technology, e-learning, information communication technology, instructional technology

Introduction

There have been many definitions of technology as a concept by as many scholars that broached the topic over time. One that is particularly significantly related to the subject matter was by Saettler (as cited in Gentry, 2011) "The word technology does not necessarily imply the use of machines, as many seem to think, but refers to any practical art using scientific knowledge" (p. 2). A further clarification of the 'practical art' suggested technique, which makes possible the instructional applications of the machine. Technology has undoubtedly revolutionized learning, in the same way it has transformed all aspects of human endeavor in modern times. Kohut,

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Taylor, Keeter, Parker, Morin, and Cohn (2010) argue that significantly, technological and generational change happen to be two sides of the same coin as they move together side by side in a natural progression. Another perspective on the definition was by Simon (as cited in Gentry, 2011), "Technology is a rational discipline designed to assure the mastery of man over physical nature, through the application of scientifically determined laws" (p. 2).

There is a connection between this definition that presupposes the mastery of man over nature with attempts to leverage technological development in information technology to improve learning outcomes in educational institutions. Related to the topic also, is the perspective of Finn (as cited in Gentry, 2011):

> In addition to machinery, technology includes processes, systems, management and control mechanisms both human and non-human, and… a way of looking at the problems as to their interest and difficulty, the feasibility of technical solutions, and the economic values – broadly considered – of those solutions (p. 2)

Instructional technology, broadly speaking, is leveraging Information and Communication Technologies (ICTs) to impart knowledge in educational institutions. Education per se, brought instructional technology to Africa. Education as an avenue to learn new things preceded the colonialists who held sway over African countries for several decades in their colonizing mission. In various parts of Africa, customary education taught morals and the essence of communal living from the cradle. In the traditional African society (pre-colonial), education was stepped down through the family, clan or village settings (Mazonde, 1995). It was organized in such a way that everyone, especially among the adults, had a role to play in the proper upbringing of the younger members of the society. The importance of being your brother's keeper was the underlining factor in the morals taught to the younger elements in face-to-face settings in the absence of technology. Basically, the methods of stepping down instructions were both formal and informal.

Mazonde (1995) situated much more poignantly, the main objectives of the African customary education; firstly:

> To preserve the cultural heritage of the extended family, the clan and the tribe. Secondly, to adapt members of the new generation to their physical environment and teach them how to control and use it; and to explain to them that their own future, and that of their community, depends on the understanding and perpetuation of the institutions, laws, language and values inherited from the past. (p. 2)

In contrast, the purpose of colonial education, in addition to helping the colonists in the colonial civil service, was to make the African become a complete European in thoughts and in deeds. This position was succinctly put by Wa Thiong'o (1981), a Kenyan scholar, who noted that . . .

> . . . the process annihilates a people's belief in their names, in their languages, in their environment, in their heritage of struggle, in their unity, in their capacities and ultimately

> in themselves. It makes them see their past as one wasteland of non-achievement and it makes them want to distance themselves from that wasteland. It makes them want to identify with that which is furthest removed from themselves. (p. 3)

The advent of colonialism by the European political elite and the collaborating missionaries and their business counterparts brought to Africa what is today known as modern education. This genre of European-style education, which was first started by the Portuguese missionaries in the fifteenth century, was popularized by other European missionaries across Africa in the eighteenth century in the wake of colonialism (Mazonde, 1995). The British, French, and Portuguese colonial administrators formed a perfect partnership with the missionaries in the spread of this Western-style educational system in the various African countries where they had a foothold.

Then, school was the special prerogative of the children of kings, colonial civil servants, and the *nouveau riche* of the society. With the imperial powers' wholesale involvement in the educational nurturing of Africans began the gradual introduction of technology into the school system as it evolved in the various metropolitan countries over time. However, at the initial stages, Mazonde (1995) noted that the educational emphasis was on liberal arts as there was not much of instruction in the technical, vocational, and professional fields. Instructions were stepped down directly through a class-style sitting of face-to-face arrangements as instructional technological aids were a rarity.

Research Questions

Based on the gradual evolution of instructional technology approaches into the African educational system, the research questions that guided this study are:

- What has been the state of instructional technology in Africa during the pre-colonial and colonial periods?
- What is the level of access, utilization and quality of instructional technology in post-colonial Africa?

Literature Review and Conceptual Framework

The purpose of this study was to review the state of access, utilization, and quality of instructional technology during the pre-colonial, colonial, post-colonial periods in Africa. With the way the rest of the world is adapting to changes in information and communication technologies in pedagogy, Africa's growth in ICTs appears to be sluggish. This article highlights some of these inadequacies with a view to putting them before educational policy makers on the continent. Advancement in educational offerings in this new information age is viewed through the lenses of the progress attained in forging ICTs strategies in instructional technology.

Instructional technology applications in educational settings evolved to aid learners realize learning outcomes through the channels of multi-media, CD ROM, projectors, as well as the Internet. In precolonial and colonial periods in Africa, these modern innovations that aided instructional technology in the classroom were rare in the same way that literature on them are not readily available. In contrast however, the post-colonial era became the boom time for instructional technology solutions in the classroom and many African countries have embraced the synergies amid some hiccups (Okah, 2010). Due to its phenomenal impact on students' learning, many of the countries on the continent have enacted IT policies to guide implementers of this strategy that has thrown up many vistas of learning. As the literature would show on access, utilization, and quality of instructional technology in mainly post-colonial Africa, amid the glitches being experienced by many countries in the region, there is no let off in creating a favorable environment for this strategy to thrive.

Access to Instructional Technology

There is dearth of literature on any form of instructional technology as contemplated in the definitions by Saettler and Simons (as cited in Gentry, 2011) during the pre-colonial and colonial epochs in Africa. However, technological approaches to instruction were being gradually deployed in the immediate post-colonial period owing to the massive enrollment witnessed across all schools in the provision of education in the various African countries. These forms of technological strategy of instruction in African education began in the wake of the measured introduction of distance learning through television and radio broadcasts as means of educating the mass of the population (Mazonde, 1995). In many African countries, open universities have emerged as a potent way of learning through technological aids in the modern era. Technology has, understandably, remained a boon to education and it has changed the face of learning in various societies across the world, including Africa. Clearly, the evolution of multi-media channels, CD ROM, projectors and the like in classroom instruction have advanced the cause of learning in later epochs in Africa (Okah, 2010).

How does technology aid educational pursuit? Simply put, technological synergy in the educational arena is euphemism for e-learning or online learning as well as the use of other electronic aids to step down learning. Okah (2009) defined e-learning as the online delivery of information. In another paper, Okah (2010) saw the concept as integrating learning with technology. This definition subsumes the use of all electronic aids for learning purposes. For Landon and Landon (2010), e-learning is synonymous with instruction distributed through purely digital technologies such as CD ROM, the internet and private networks. In their own perspective, Hagg, Cumming, and Dawkins (2000) saw the concept of tele-education in various dimensions, among them, e-education, distant learning, distributed learning, and online learning, which are all delivered through various channels of Information Technology (IT) such as chatrooms, videoconferencing, e-mails, and the internet. It is a form of self-directed learning that has assumed an important place in education, which affords students greater autonomy and leaner control.

Technology has undoubtedly revolutionized learning, in the same way it has transformed all aspects of human endeavor in modern times, and Africa has not been left behind in the scheme of things especially in the post-colonial era. Significantly, technological change and generational change happen to be two sides of the same coin as they move together side by side in a natural progression (Kohut, Taylor, Keeter, Parker, Morin, & Cohn, 2010).

One of the strategies that facilitates active learning in educational institutions in this age is text messaging, due essentially to its instantaneous effect. Innovative mobile learning has assumed a very significant portion of educational offerings in Africa, and mobile applications (e.g., Multimedia Messaging Service (MMS), Short Message Service (SMS), which is also euphemism for text messaging, internet-based tools, mobile phones, and the others) have become avenues to promote learning (Gurocak, 2016). The mobile phone's portability, coupled with its wide reach to populations far and near, has increased its attractiveness in educational settings; and faculty across African schools have taken advantage of its offerings.

Over the years, the emergence of mobile wireless technologies has been a source of enthusiasm among professionals in industry and, especially, faculty in higher education institutions because of its potential in shifting the classroom learning environment from the conventional settings to mobile learning (Kims, Mims, & Holmes, 2006). The advantage of wireless technology over the erstwhile wired technology is huge given its limitless freedom to operate from anywhere regardless of time and location and this is where text messaging through mobile phones remains one of the attractions in the mobile learning technologies of this era.

Kims et al. (2006) made a clear distinction between mobile or wireless technologies and mobile wireless technologies. Specifically, Kims et al. (2006) defined mobile wireless technologies as:

> Any wireless technology that uses radio frequency spectrum in any band to facilitate transmission of text data, voice, video, or multimedia services to mobile devices with freedom of time and location limitation. (p. 79)

This is where the mobile phone electronic device perfectly fits into the freedom of being located anywhere, anytime into the context of using it for instructional purposes for students. Many Educational institutions in Nigeria, for instance, have adopted this technological approach towards instructions in various schools across the nation (Okah, 2009).

Elsewhere in the Southern African nation of Zimbabwe, the country is still grappling with acquiring basic utilities such as telecommunication infrastructure, hardware, software and networks and it is only when these are easily available that consideration could be extended to serious educational and training issues like pre-service teacher education and integration of technology instruction (Chitiyo & Harmon, 2009). The paper noted that there was the urgent need for African countries to develop the use of ICTs in instruction in order to revitalize African universities to meet the crucial needs of the population in the 21st century. Chitiyo and Harmon (2009) noted that the political instability in Zimbabwe in the last ten years has not only seriously incumbered the growth of technology instruction but has culminated in the backward slide of ICTs capabilities in the country. It was the contention of the paper that the situation in Zimbabwe was a

true reflection of what has been happening in other African countries as it relates to technology integration into instruction. In the East African country of Tanzania, there are a legion of factors militating efforts towards institutionalizing instructional technology in order to liberalize access to the majority of people.

According to Hennessy, Onguko, Namalefe, and Naseem (2010), some of these constraints include inadequacy of electricity supply which culminates in incessant power outages, poor technology infrastructure, large classes and overcrowded computer labs, low bandwidth, high costs of (mainly satellite) internet connectivity (especially for rural schools located outside the national telecommunications network and electricity grid), software licenses and equipment maintenance, insufficient and inappropriate software. Added to these hiccups, the authors stated that there was also lack of qualified teachers to birth a seamless integration of instructional technology. They called for a proactive government policy that would drive ICTs integration policies in the country's educational system.

Utilization of Instructional Technology

The West African country of Nigeria, which has a blossoming Internet connectivity reach in both rural and urban locations has a national information and communication technologies' (ICTs) policy that is geared towards the education of the mass of the people. Since one of the fundamental features of the Nigerian IT policy is to leverage the huge potentials of ICTs to enhance education, it also has one of its general objectives of fostering pedagogical innovation in the area of e-learning (Vooslo, 2012). The Nigerian IT policy was approved more than two decades ago, and it became fully operational almost immediately. As of today, virtually all universities (both public and private) and other allied institutions have Internet connectivity that navigate their operations using the processes of the new information age. Other levels of educational training are leveraging the potential of instructional technology in advancing the cause of learning.

In higher educational institutions across Nigeria, a study by Allen and Seaman (2013) stated that as of 2012, more than 6.7 million students participated in at least an online course in pursuit of their various educational degrees. This represents the growing number of students signing up to the technological platform of learning which is fast taking roots in the country. The frequent labor disputes over wages and provision of other amenities between the members of the academic community and the Nigerian government, which owns most of the universities, have increased the attractiveness of online learning. When such disputes result in closure of classes, people resort to online course offerings to satisfy their educational diet.

In another West African country of Ghana, where the ICTs revolution has since taken roots in the educational institutions, a study conducted by Boabeng-Andoh (2012) noted that there is a positive correlation between the use of ICTs and the teachers' competence. The study noted further that both traditional and adult learners appreciate the integration of ICTs into their study. Computer technologies remain the most essential information and communication technology tools being deployed in the world today, and with increased pressure on educational

institutions in Nigeria to do more with less resources, ICTs has come to the fore as the veritable instrument to realize the goals of education for many more people (Nwachukwu, Eke, Uzorka, Ekpenyong, & Nte, 2009).

In a policy brief on the instructional technology situation in South Africa, Mdlongwa (2012) contended that the resort to ICT in educational institutions to improve learning could assist in overcoming some of the difficulties of improving the effectiveness and productivity of both learning and teaching in the country's schools, and in the process, reduce the digital divide. The paper noted that ICTs utilization in South Africa was not at the desired point since out of a population of 48 million as at 2002, only about three million had internet access. However, since the introduction of computers to South African schools beginning with private, and then public, in the 1980s, the growth of its widespread use has been very sluggish owing to paucity of funds and lack of prioritization among competing demands.

Quality of Instructional Technology Used

In their appraisal of this strategy, Iloanusi and Osuagwu (2009) contended that ICTs-enhanced instruction tended to stimulate critical reasoning and provided a much wider variety of means for accomplishing educational goals. Nwachukwu et al. (2009) also stressed that while there might not be any iota of illusion that instructional technology would address all the challenges of education, but there is no denying the fact that technology has intruded into every facet of life in today's world. The use of internet-enabled strategies to step down instruction, has, therefore, become widespread among educational institutions in most African countries, ostensibly, for ease of learning in the post-colonial era. It is the contention of Nwachukwu et al. (2009) that ICT boosts value to the methods of learning and to the organization and management of learning institutions. The paper noted that technologies are a driving force behind much of the development and innovation in both developed and developing countries, and this would explain why African countries keyed into the strategies in the post-independence era.

In Nigeria, Yusuf (2005) stressed that ICT has contributed to the quality and quantity of teaching, learning, and research in conventional and distance educational institutions in the country. This is due to its dynamic, interactive, and appealing content; and it also provides real prospects for individualized instruction. However, despite these overwhelming advantages, the quality and spread of ICTs is at a low ebb in Africa. Yusuf contended that with a total contribution to world population standing at 12 per cent, the continent has just about two per cent presence in ICTs use in its operations. The reasons accounting for this appalling situation could be attributed to low Internet connectivity, inadequate access to ICTs infrastructure and low involvement to software development. This overall poor quality has undoubtedly affected the rapid integration of instructional technology strategies in all facets of educational offerings. Against this background, the Nigerian ICTs policy has as one of its major themes the integration of IT into the mainstream of education and training.

In the East African country of Kenya, there are complaints against the quality of instructional learning facilities. Ndirangu and Udoto (2011) noted that the quality of the library,

online resources, and lecture facilities provided by Kenyan public universities have failed to meet the test of quality. The paper added that institutions were incapable of supporting the desired educational programs effectually in order to facilitate the development of learning environments that support students and teachers in realizing their objectives. In a policy brief on the situation in South Africa, Mdlongwa (2012) had made similar critique about disjointed facilities which has affected the smooth utilization of ICTs solutions on a wider scale.

Methodology

This article sprang from a survey of literature on the subject of instructional technology in pre-colonial, colonial, and post-colonial epochs in Africa and the need for its uptake in current educational offerings across the continent. Relying on a variety of literature on the subject, the intent is to examine the state of access, utilization and quality of instructional technology during the pre-colonial, colonial post-colonial periods in Africa. The article explored the extent of instructional technology integration into the educational systems in selected African countries under the various epochs. The countries include Nigeria, Kenya, Zimbabwe, South Africa, Ghana, and Tanzania. This was a convenient sampling to include countries from different regions of Africa. As would be expected, the development of technology infrastructure and the accompanying components were the major challenges for the countries at the very early stages of their nation-building. This proved a major concern for many others that hindered appreciable progress.

Databases such as Google Scholar, ERIC, and JSTOR were the sources of data where all the relevant articles were selected. The procedure was to use keywords such as instructional technology, educational technology, information communication technology, distance learning, e-learning in Africa using the resources of the Ohio University Alden Library to generate the articles. Table 1 below shows related articles on the various search engines from where the reviewed articles emanated.

Table 1: Database and Keyword Search

Database	Keyword	Documents
Google Scholar	Inst. technology in Africa	159, 000
	Information comm, technology	3, 400
	e-learning in Africa	71, 000
	Distance learning in Africa	2, 590, 000

ERIC	Inst. technology in Africa	33, 335
	Information comm, technology	245
	e-learning in Africa	106
	Distance learning in Africa	18, 702
JSTOR	Inst. technology in Africa	6, 144
	Information comm, technology	54, 457
	e-learning in Africa	1, 050
	Distance learning in Africa	45, 592

Once the articles were assembled from the aforementioned data bases, I used the conceptual framework of access, utilization and quality of instructional technology in order to analyze the reality of selected African countries during the pre-colonial, colonial, and post-colonial periods.

Findings, Discussion, and Analysis

To effectively deal with the research questions for this paper, this section has been broken into the precolonial and colonial epochs. Thereafter, the findings and analysis would turn its searchlight on the post-colonial period when this revolutionary instructional technology synergies were birthed in Africa. Under the postcolonial period, we examine closely the topical issues of access, utilization, and quality of instructional technology strategies that are on offer in the selected African countries.

Precolonial and Colonial Epochs

From the definitions of technology offered by Saettler and Simon (as cited in Gentry, 2011) earlier in this paper, it is worth noting that the customary education offered in pre-colonial African societies was devoid of any scientific body of laws. Although it is within the realm of knowledge passed on from one generation to the other, there was no extant body of scientific laws guiding it. To that extent and related to Mazonde's (1995) description of the type of education offered in that era, instructional technology synergies as we know them today, were practically non-existent and therefore, inapplicable. Colonization by European imperialists supplanted the pre-colonial era as European missionaries and their business collaborators established their foothold across Africa.

As Ngugi wa Thiong'o (1981) contended in his treatise, colonial education came with the idea of Europeanization of Africans to fit into the colonial civil service. Also, Mazonde (1995) noted that the educational emphasis was on liberal arts since there was not much of instruction in the technical, vocational, and professional fields. Suffices to say that instructions were stepped down directly through a class-style sitting of face-to-face arrangements as there was little semblance of instructional technological aids. So, for most of Africa, instructional technology

was not a feature of their educational offerings during the colonial period with the exception of a few who remained under colonization until the 1980s. Related to the first research question therefore, it can be argued that there was little or nothing of instructional technology in the educational systems of both pre-colonial and colonial periods in Africa. Since we cannot establish the use of instructional technology applications in both precolonial and colonial eras, it would be difficult to contemplate its access, utilization, as well as quality.

According to Mazonde (1995), in the pre-colonial era, customary education was mostly stepped down through one-on-one family circle or via the instrument of peer groups as passed on from one generation to the other. The family setting was the strongest citadel of learning, and any aberrant behavior was dealt with at that level before it rears its ugly head in the public sphere. Effectively, what we know as instructional technological aids in the modern era were absolutely non-existent. The colonial setting was a little different even though it was also devoid of any tangible technological aids. This is because, in the Western metropolitan countries, which were lording it over the colonies at the time, what is today known as instructional technology education were equally absent. Therefore, you cannot give what you do not have, or you give little of what you have! However, to meet the requirements of the colonial civil service as stressed by Ngugi wa Thiong'o (1981) colonial education was organized in class-style setting of students being grouped together with the teacher at the helm leading the instruction for them. It was an improvement over the pre-colonial variant as students progressed to the next level of education based on their mastering of content taught in their class.

Post-colonial Period

According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 1984), computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, and has impacted the construction and distribution of knowledge and power around the world (1984). The United Nations agency believes that science and technology are crucial components of development and growth, and many of the problems of underdevelopment had been attributed to weak indigenous science and technology capacities, inappropriate technological choices, poor technological development policies, and dependency-producing transfers of technology (UNESCO, 1984). To redress this, since 1968, UNESCO aggressively advocated for developing countries (a large chunk of which are in Africa) to pursue science and technology policies that would aid sustainable development (UNESCO, 1984). Since most of the countries in Africa had become self-governing by this time, it was the spur of the moment that crystallized into the various technology-enhanced educational policies by the various countries on the continent in order to put technology at the center of development.

Another United Nations agency at the forefront of campaign for learning globally is the United Nations Children's Fund (UNICEF) and its work has been very remarkable in the post-colonial period in Africa. Based on its entrenched policy of "Every child has the right to learn", UNICEF advocates strongly for the right to education for the world's children (UNICEF, 2019). Even though UNICEF (2019) statistics show that over one billion children go to class daily

around the globe, yet another 617 million children and adolescents around the world are unable to reach minimum proficiency levels in reading and mathematics – even as two thirds of them are in school. In fact, the statistics estimate that one in five children are entirely out of school globally. Unfortunately, a sizeable number of these are in crisis-torn African countries and other parts of the world ravaged by poverty, the main factors fueling the unfortunate development. Over the years, in addition to working in health-related fields on the continent, UNICEF tacitly promotes education under three planks. These include, access, where it advocates gender equity, learning and skills, quality learning outcomes and skills development where innovative instructional technology aids are taught; and finally, emergency and fragile contexts, where it campaigns for improved learning and protection during emergencies.

As postulated by Kohut et al. (2010), technological change is synonymous with generational change as humanity undergoes transformation over time. Therefore, the post-colonial period started in the age of fast-paced technological innovations, which was complemented by the emergence of internet connectivity. These advances in technology and information dissemination synergies across the globe hastened the introduction of instructional technology solutions in Africa's educational offerings. This development upped the ante for African countries, which prompted some to begin the enactment of IT policies as studies such as Vooslo (2012), Yusuf (2005), and Okah (2010) showed on Nigeria, Mdlongwa (2012) on South Africa, as well as Chitiyo and Harmon (2009) on Zimbabwe. As these developments unfolded all over Africa in the years following independence, we will briefly look at access, utilization, and the quality of the offerings in the selected countries. With the gradual implementation of these policies in the various countries, instructional technology aids were being launched at all levels of educational offerings.

Access to Instructional Technology

In terms of access, as the post-colonial advances in the use of instructional technology in educational institutions continue to expand, Nigeria has recorded a surge in recent years (Allen & Seaman, 2013). Studies by Allen and Seaman (2013) showed that as of 2012, more than 6.7 million students participated in at least an online course in pursuit of their various educational degrees. Also, in Ghana, a study by Boabeng-Andoh (2012) noted that there was a positive correlation between the use of ICTs and the teachers' competence as the bug of instructional technology spreads in educational institutions in the country. Also, as reported by Mdlongwa's (2012) policy brief on South Africa, there is also a growing awareness on the utilization of ICTs solutions in educational offerings.

In the East African country of Kenya, the government's revolutionary development blueprint christened "Vision 2030" formulated the policy of one laptop per child in order to avail the children the opportunity of using computer for learning to quicken their migration into the digital age (Waga, Makori, & Rabah 2014). Besides entrenching the digital culture from the elementary school as proposed by the Vision 2030 laptop agenda, the study focused on the efforts to build a centralized digital content repository containing e-learning resources, research

applications and tools with a collaborative on-line modern digital library accessible with a controlled right based accessibility in the country. The Kenyan approach to digitization was engineered to assist students on the e-learning synergies, which would address the dwindling instructor-student ratios while universities and research institutes through collaborative ventures would participate alongside their international colleagues with immediate innovation promoting the local industries. Although the implementation of the one laptop per child policy in Kenya has attracted criticism over cost and other issues, it remains a right step at the right time that would bridge the rural-urban divide given that the world has moved on towards a knowledge economy.

Table 2: Top 10 African Countries for Internet Users and Penetration Rates, Year 2020

Country	Population	Internet Users	Penetration (%Population)
Algeria	43,851,044	25,428,159	58.0
Congo, De. Rep.	89,561,403	16,355,917	18.3
Egypt	102,334,404	49,231,493	48.1
Ethiopia	114,963,588	20,507,255	17.8
Kenya	53,771,296	46,870,422	87.2
Morocco	36,910,560	23,739,581	64.3
Nigeria	206,139,589	126,078,999	61.2
South Africa	59,308,690	32,615,165	55.0
Tanzania	59,734,218	23,142,960	38.7
Uganda	45,741,007	18,502,166	40.4

Source: Internet users statistics for Africa. Retrieved from https://www.internetworldstats.com/stats1.htm

Given the fact that access and utilization are both driven by the quality of Internet connectivity in operation in the various countries, it is worthwhile to scrutinize the demographics of the people who have Internet connectivity in the various countries in the table shown below. As Table 2 showed that Nigeria, which had the highest population of Internet users on the continent, but only 61.2 of internet penetration. This would clearly impact negatively on the utilization of technology modulated instruction in the various levels of educational offerings across the country.

Utilization of Instructional Technology

Henessy et al. (2010) and Chitiyo and Harmon (2009) have noted, on Tanzania and Zimbabwe respectively, that the utilization of instructional technology applications is confronted with a lot of challenges. Tanzania is confronted with issues that include inadequacy of electricity supply which culminates in frequent power outages, poor technology infrastructure, large classes and overcrowded computer labs, low bandwidth, and high costs of (mainly satellite) internet connectivity. On its part, Zimbabwe is contending with acquiring basic utilities such as

telecommunication infrastructure, hardware, software and networks in order to bolster instructional technology applications in its educational system. Despite all these hiccups, however, instructional technology synergies are reportedly in use in the countries' educational systems. In Nigeria where appreciable progress appears to have been made integrating instructional technological aids into class offerings, the issue of frequent power outages remains a major obstacle to educators. Even where equipment is available, lack of power to operate them has constituted a major barrier towards seamless class use.

Quality of Instructional Technology Used

While it is indisputable that there is appreciable level of access and utilization across African countries in the use of instructional technology solutions in educational institutions, the quality of what is on offer appear problematic in most of these countries. Studies by Okah (2010) on Nigeria, Chitiyo and Harmon (2009) on Zimbabwe, Ndirangu and Udoto (2011) on Kenya, as well as Hennessy et al. (2010) on Tanzania aptly capture the problems being experienced in these countries, which are summed up in problematic technology infrastructure and strong foundational policy initiative. Okah (2010) noted that the problem of paucity of funds to execute technology-related educational programs was at the core of the challenges facing the quality of what is on offer. Undoubtedly, Africa has come a long way to arrive at its present epoch of access and utilization, yet there is a long way ahead to reach the desired level of quality. This is a challenge that must be overcome.

All the other African countries surveyed, except Kenya, have low to medium percentages of internet penetration, and this reflects the conclusions of Henessy et al. (2010), and Chitiyo and Harmon (2009) on Tanzania and Zimbabwe, respectively, all of which cited poor foundational infrastructure as the bane. The studies show a similarity of conclusions on poor infrastructure impacting negatively on access, quality, and utilization.

Recommendations

Recommendation for policy makers: In the new world information order that has birthed the globe's knowledge economy, Africa's educational offerings must embrace all the dynamics of instructional technology synergies to remain competitive and take active part in educational practices. Anything otherwise is suicidal and counterproductive. Studies by Okah (2010) as well as Chitiyo and Harmon (2009) have acknowledged that the digital divide between Africa and the rest of the world is huge. Therefore, the only option left for education policy makers in Africa is to rise to the occasion and ensure that the current wide gap is substantially reduced. The pathway to this reduction is the enactment of favorable and strong policies consciously designed to institutionalize instructional technology strategies at all levels of educational offerings on the continent. Therefore, it is high time that African leaders seize the initiative and rebuild the existing fragile infrastructure through proactive policies.

Recommendation for practitioners: The reality of today's world is that the much-touted technology transfer is a mirage and practitioners must rally and deepen integration of technology in educational offerings. To that extent, African governments must prioritize human resource development by investing in capacity building and training of the personnel in the education sector in order to realize the objectives of raising a new army of competitive graduates that could hold their own among contemporaries from across the world. Enough financial resources should be devoted to building technology infrastructure across the landscape to enable organizations and educational institutions to leverage upon them to firm up their instructional technology synergies. Instructional technology solutions should be made available and taught across all levels of educational institutions beginning with the kindergarten to the tertiary education offerings. The idea of catching them young should not be lost on policy makers in future, and one such laudable initiative to be embraced by other African countries is the one laptop per child policy in Kenya. Given the huge potential of technological synergies, it's a win-win situation to play an active role. The development of scholars have linked technological advancement to the overall development of a nation; therefore, it is sine qua non for the continent to embrace technology in order to make a headway.

Recommendation for future research: This article had been developed before the unprecedented COVID-19 health challenge, which practically paralyzed the entire world. Many countries of the world with the requisite technology infrastructure quickly reverted to remote working for their workforce and learning for their educational institutions across all levels. You could still feel the motion even amid the lockdown that pervaded these countries, but many African countries apparently lagged behind, understandably! Future researchers should examine closely how African countries could synergize post-COVID-19 and tap from technological advances in their educational offerings. It is only a deepening of technology at all levels of educational pursuits that could galvanize efforts towards desirable development.

Conclusion

It is incontrovertible that the advent of technology has reshaped the modern world in so many ways never contemplated. From the definition of technology by Saettler and Simon (as cited in Gentry, 2011), it is obvious that instructional technology was absent from the category of customary educational offerings prevalent in African societies in the precolonial age. However, the colonial era came with some semblance of instructional technology, which was built upon in subsequent years of development. Although the colonists came with their policy of Europeanization of Africans according to Ngugi wa Thiong'o (1981), the gradual introduction of instructional technology in educational offerings began in that era. This was essentially to reflect the technological changes taking place in the metropolitan countries, since ipso facto, the territories were their extensions overseas, they also benefited from the changes.

Significantly, instructional technology blossomed in various African countries in the post-colonial era. The United Nations agencies led the way in advocating for educational technologies into African schools' curriculum. Of particular importance is UNESCO's

conviction that computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn around the world; and Africa and other developing countries must factor into its offerings to meet the goals of development. This advocacy facilitated policy initiatives that expanded the space for instructional technology for schools in Nigeria (Okah, 2009), the Vision 2030 blueprint in Kenya (Waga, Makori, & Rabah, 2014) that facilitated the distribution of laptops to schoolchildren and several such actions by the other countries on the continent. UNICEF was also a contributory factor to the growing awareness of computerization and instructional technology in several African nations through its collaborative activities with the governments in the post-colonial era.

It is worthy to note that the expansions taking place in the various countries were not without hitches. Several studies, including Okah (2010) on Nigeria, Chitiyo and Harmon (2009) on Zimbabwe, Ndirangu and Udoto (2011) on Kenya, as well as Hennessy et al. (2010) on Tanzania have highlighted problems associated with quality, access, and utilization in the various countries. A major hiccup common to all these countries is the issue of poor communication infrastructure, which would require a deft political will to resolve in order to put the continent on the proper path to integrating instructional technology in its educational offerings. The lackluster development of instructional technology on the continent is aptly surmised by the statistics from Internet World, which showed that Nigeria, which had the largest population of Internet users in Africa, was ranked 129th on the world's fastest broadband speed. In modern times, fast Internet drives pedagogical instructions in the wake of online classes and other hybrid variants of educational pursuits. What this means in effect is that, although the countries have since introduced one form of instructional technology or the other, a lot still remains to be done.

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