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Opening Futures for Nigerian Education – Integrating Educational Technologies with Indigenous Knowledge and Practices

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Abstract

This paper highlights some key historical perspectives and antecedents of African Indigenous knowledge (AIK) and practices while identifying ‘open’ futures and opportunities for the application of digital technologies for educational opportunities that build on this cultural base. The role and negative impact of colonialism in the under-development of AIK is examined in this context together with the impact of post-colonial and contemporary corruption in further undermining the value of Indigenous knowledge systems. Two key concepts are identified as a counterpoint to this: the *resilience* of AIK and ‘local wisdom’ and the *openness* underpinning much of the ongoing digital revolution. This natural alignment can help guide the integration of Indigenous-based knowledge and practices and the deployment of open and distance learning in the re-birth of African Indigenous Knowledge Systems (AIKS). Openness is a pivotal concept here for it is integral to both the architecture of the Web and in its ongoing evolution. Given the identified opportunities associated with digital technology, and despite the challenges, it is argued that there is an unequivocal need for AIKS to explore the advantages of open education resources and practices in promoting this rebirth that is also consistent with modern science and technologies in Africa and beyond.

Keywords: AIK, indigenous technology, open distance education, open education resources, open educational practice, Nigeria

Introduction

There is growing awareness and appreciation that Indigenous knowledge systems and education possess a significant and enduring value that could assist the world in sustainable development (Adeyeye, 2019; Ugwu & Diovu, 2016; United Nations, 2015). Such knowledge systems extend beyond the more visible cultural contributions (such as music) already appropriated into diverse genres of world music. The richness of African Indigenous knowledge systems demands deeper consideration in this global narration and evolution towards a new developmental direction.

This paper represents a foundation for ongoing investigation into how open educational systems might be calibrated when informed by African Indigenous Knowledge (AIK) and practices and how AIK systems can use local utilitarian educational values in building homegrown technologies and solutions for Nigerian domestic needs and aspirations in a sustainable way that could guarantee a sustainable future and place the country on the verge of development and change resilience. The foregoing discussion is therefore first centered on historical perspectives with the aim of shedding light on any key questions that emerge. As such, it is part of a broader research agenda that aims to investigate how open distance learning can be leveraged to address higher educational access

problems in the remote areas of Nigeria as part of world focus in addressing universal access to education for all. The study aims to contribute to the exposition of the values embedded in AIK systems and practices and how this might inform sustainable ways of utilising science and technology.

Background – AIK and the Colonial Legacy

African Indigenous knowledge and practices have deep historical roots. Every country within the African continent has distinctively rich and sound country-specific Indigenous practice systems and beliefs that often extend beyond national boundaries. For every community, local traditional knowledge, beliefs and protocols have persisted in the governance and education of their members, passed from one generation to another. These cultural and ecological diversities have been drawn upon by Africans for thousands of years to solve specific developmental and environmental problems (Mohamedbhai, 2013). Such statements are echoed globally, though often expressed in broader time spans when considering the depth and longevity of Indigenous cultures elsewhere (World Bank, 1991; Hill, Cullen-Unsworth, Talbot & McIntyre-Tamwoy, 2011; Terri Janke & Company, 2018).

Africa has been at the forefront of world civilization dating back to the Pharaonic days and the Egyptian civilization era. Many Africans have contributed greatly to global knowledge and world developmental projects. They have been involved in the origination of theories and various philosophical thoughts; these can be found in the works of Indigenous African scholars as presented within the table 1.

Table 1: Works of Indigenous African scholars

African Scholars & Luminaries	Works and Influences
Imhotep	The African architect of cosmos and father of medicine and designer of the Egyptian pyramid
Ahmes	The mathematician and author of the first mathematical textbook
Frantz Fanon	A psychiatrist and philosopher and the author of the <i>Wretched of the Earth</i>
Kwame Nkrumah	The renowned philosopher and articulator of <i>consciencism</i> philosophy and ideology
Leopold Sédar Senghor	A poet and one of the architects of <i>negritude</i> philosophy
Ali Mazrui	Professor of Humanities and intellectual giant widely celebrated across the globe
Obafemi Awolowo	The African nationalist and proprietor of <i>democratic socialism</i>
Mwalimu Julius Kambarage Nyerere	The African socialist and promoter of <i>Ujamaa Philosophy</i>
Wole Soyinka	Novelist and writer and winner of noble prize in literature,

Among many others are Aimé Césaire, John Mbiti, Chinua Achebe, Williams Abraham. These luminaries have their names registered in the field of arts, literature, humanities, pure science and social sciences (Adigbuo, 2017; Dudley, 2002; Smith, 2009). From a broad historical perspective, civilization itself has beginnings with Africa and is expressed through the richness of its Indigenous knowledge systems and practices. “We have been engaged in drawing lines upon maps where no white man’s feet have ever trod” (Barth 1966, as cited in Adigbuo, 2017, p. 77).

The decline of the rich social and cultural role of Indigenous knowledge of Africa started with the forceful and calculated extinction program of the colonial powers through the instrument of colonialism, most notably from Britain, Belgium, France, Germany and also the United States of America in the recent case of Liberia. This was achieved through forceful division of the continent along boundary lines into different colonies, and the amalgamation of culturally separated communities into single units, primitive exploitation of both human and natural resources, the stolen and instant destruction of African works, arts and artifacts. This systematic extinction was further aided by drivers of globalization and modernity (Adigbuo, 2017; Alinno & Udeze, 2018; Eyong, 2007; Sifuna, 2008).

The colonial agencies established Western institutions and used Christian missionaries to deliberately undermine the African social structures and to replace it with Western civilization (Sifuna, 2008; Adigbuo, 2017). This has grossly affected the proficiency and development of the African Indigenous knowledge systems. The African continent has also suffered more havoc in the hands of pseudo and acclaimed Pan-Africanist leaders of post-colonial and contemporary eras who have corruptly driven the continent into the state of economic and developmental capitulation. Otieno (2013) raises the question as to whether Europe continues to under-develop Africa or if Africa is under-developing itself? He cites Joshua Agbo in his book *How Africans under Developed Africa* as having criticized other authors like Walter Rodney and his likes who have solely viewed the argument of Africa under-development only from the blame side of history. He expostulated that “our future has been placed in our hands long ago...to continually blame Europe as the cause of African underdevelopment is like treating ringworm and leaving leprosy unattended.” This corroborated the popular statement of the Nigerian famous writer and activist Chinua Achebe that ‘The problem with Nigeria is Nigeria’ (Achebe, 1983).

Background – Values in African Indigenous Diversity

African Indigenous knowledge is as diversely rich as African cultural diversities and as exquisitely deep as the continent natural resources. Some of this richness can be found in the traditional use of African fables and folktales for the narration of epical stories and African histories and African proverbs are often used for the conveyance of ideological thoughts, truthful statements, wisdom and Indigenous ideas e.g., “When a king has good counselors, his reign is peaceful”. Moreover, a prominent example of early information and communications technology (ICT) are talking drums, which are used to convey coded messages and to make incitements (Gleick, 2011), while African songs are used to eulogize the ancestral heritage of Africa, to lament loss and ease work boredom. From a global perspective, the complexity and layering of rhythms in African music is also now well known. Spielvogel (in Adigbo, 2017, p. 77) highlights that African music was the basic ingredient upon which the American musical style was developed. This has been predicated upon the musical experiences of the Afro-American artists who are progenies of African slaves shipped to America for slavery

From a perspective of ‘local wisdom’, an increasingly recognised construct that provides a counterpoint to ‘global competence’ (Telaumbanua, 2019) is the craft of Griots and Griotte, aimed at teaching and transferring societal moral values and cultural knowledge. The Griots are the ‘man that knows it all’ (full of knowledge and wisdom), and are employed by families and kings as teachers and advisers, while the Griotte is the female practitioner who sings at special occasions and helps in the preparation of the young girls toward marriage life (World Affairs Council of Houston, n.d).

However, there also exists a diversity of opinion as to the meaning of the terms used for AIK. According to Adigbuo (2017), ‘Africa’ as a concept and as an object of study connotes different meanings to different people. It follows then, that African Indigenous Knowledge (AIK) has

been adopted in various ways and cannot be pinned down to a specific definition. Perhaps less problematic for Makinde and Shorunke (2013), 'Indigenous knowledge' (IK), is also known as 'traditional knowledge' (TK) 'traditional environmental knowledge' (TEK) and 'local knowledge' (LK)" (p.3). In this paper, Indigenous knowledge highlights the accumulated knowledge that was born out of countless iteration by people of Indigenous affiliations demonstrating resilience in coping with change (Melchias, as cited in Eyong, 2007, p. 121).

Contemporary African Indigenous education involves the inculcation of traditional societal norms and values in the young generations through a systemic socialization process which involves the training of the mind, the body and the soul (Sifuna, 2008). It emphasizes moral values and societal responsibilities among indigenes, and, as such aligns with worldwide educational agendas associated with 21st-century skills (character and global citizenship) and social, emotional and ethical learning. In 1998, in a statement that gained traction, Mugabe defines Indigenous knowledge as knowledge upheld by people who "shared the same Indigenous particulars" (as cited in Chiwanza, Musingafi & Mupa, 2013, p. 54).

Challenges for Indigenous Knowledge in Africa: The Nigeria Experience

African Indigenous knowledge can be understood as the underpinning social capital and an asset the African continent has invested in its people through the struggle for emancipation and self-survival (Adigbuo, 2017). "Many of the barriers of Indigenous knowledge are from the older generation and now find it difficult to communicate their beliefs and practice to the scientifically educated younger generation; once the older generation passes away, the knowledge disappears with them" (Muhamedbhai, 2013). The impact of the continual depletion of the Indigenous form of education in the education curriculum and societal operations among Africans have made the so-called scientifically educated and contemporary African generations to lose touch with the rich values of AIK.

Another identified source of challenge for African Indigenous knowledge and practices is its continual shattering by foreign civilizations and influence through the mechanism of formal western education. Yet, there is a clear contribution that AIK can make to global agendas such as the *UN 2030 Agenda for Sustainable Development* (United Nations, 2015).

Indigenous knowledge has a broad knowledge of *how to live sustainably* [our emphasis]. However, formal education systems have disrupted the practical everyday life aspects of indigenous knowledge and replacing them with abstract knowledge and academic ways of learning. Today, there is a grave risk that much indigenous knowledge is being lost along with its valuable knowledge about ways of living sustainably (UNESCO, as cited in Ugwu & Diovu, 2016, p. 23).

The argument was also corroborated by Sifuna (2008) that, "the failure to integrate Indigenous learning and Western education was partly a deliberate effort to eradicate African education" (p. 20). Eyong (2007) also highlighted colonialism as one of the challenges facing Indigenous knowledge systems (IKS) in Africa:

IKS have suffered for decades from several strategies of disinformation embedded in western-centric, colonial and post-colonial education and western religion, science and technology. Today, these systems form a bulk of selective omission of non-European achievements, inventions and technologies in academic works. Often, data on IKS are distorted to confirm the hypothesis of non-Africanist scholars (Eyong, 2007, p. 131).

The greatest of these challenges, however, was the incursion of the Europeans in the contextual development of the African Indigenous knowledge and practices. A significant challenge here is that

AIK was developed and contextualized by non-Africans and outside the spheres and shores of Africa for Africans (Adigbuo, 2017).

The Nigerian political landscape was not spared of challenges, and arguably the country suffers greater punch of the ordeal being the most populous and most resourceful economy in the continent. The Nigerian government and Nigerian people play a vital role in the emancipation of the African continent from colonialism and that is not without its socio-political and economic consequences. Indigenous knowledge in Nigeria has dwindled just like any other country within the continent and has been predicated on the fact that the knowledge has not been properly codified, documented and well preserved. Of course, this is a universal challenge of Indigenous cultures worldwide that have typically preserved cultural knowledge and practices through non-literate oral and performative lineage. Several efforts and strides have however been made for the re-invention of the knowledge in the area of design fabrication, agriculture, food preparation, trado-medics, environmental conservation and biodiversity. The New Economic Partnership for African Development (NEPAD) (as captured in Makinde & Shorunke, 2013) recognized the fact that Africa has a rich knowledge base and technologies that have played a major role in “biodiversity conservation, sustainable use and prospecting”.

So then, *how might these challenges be understood in terms of the application of educational technology in an era of increasing innovation with digital technology?* To answer this, we now consider a key feature of contemporary educational technology: *openness*.

Openness in the Evolution of Digital Infrastructure

Both the evolution of the Internet and the World Wide Web can be characterized by the prominence of the connective power of networks on the one hand and the openness of the underlying digital infrastructure on the other. Thus, while not fully implemented because of innovation superseding standardization, the Open Systems Interconnection Reference Model (ISO, 1984) points to the underlying open architecture of the Internet. It is this openness that has been successfully exploited in the propagation of open source solutions, the invention of the web through an open hypertext protocol, and the emergence open access, open educational resources (OER) and practices in the educational sector worldwide (Mason, 2014; Friesen, 2009). It is no accident that UNESCO (2002) first championed OER as a transformative enabler for the developing world to participate in ‘knowledge-building societies’. This openness of OER is not just an expression of ‘no-cost access’ to educational opportunity but an important underlying architecture that aligns with the resilience of AIKS.

AIK Systems and the Appropriation of Indigenous Technology/Modern Science

In many parts of the world today, AIK has been adjudged as a visible alternative for the promotion of rural communities’ development (Briggs, 2005). The greatest challenges facing African Indigenous knowledge is the inability of African society to transform the richness in African Indigenous knowledge into a scientific, more sophisticated and technologically advanced expression of knowledge that could help in domesticating its affairs for more economic viability and development.

In order to properly conceptualize ‘Indigenous Technology’ two merged concepts need to be separately conceptualized. The United Nations has for over thirty years devoted efforts in its quest to find a universally accepted definition for the concept of Indigenous people, knowledge and community. The United Nations on several occasions among its Indigenous organization working committees disagreed on what should be a common globally accepted definition for Indigenous people and came to the agreement that no formal definition is possible. In its article 8, the UN states: “Indigenous peoples

have a collective and individual right to maintain and develop their distinct identities and characteristics, including the right to identify themselves as indigenous and to be recognized as such” (United Nations, 1994). However, more commonly cited is the UN ‘Special Rapporteur of the Sub-Commission on Prevention of Discrimination and Protection of Minorities’, Jose R. Martínez Cobo (1987):

Indigenous communities, peoples and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions and legal system (Martínez Cobo, 1987).

According to Kim and Berry (as cited in Alinno & Udeze, 2018) Indigenous is being native according to history and scientific analysis. Pollock (as captured in Alinno & Udeze, 2018, p. 158) sees it as the description of people with original inhabitants of a geographical area. For the World Bank (1991), Indigenous peoples “as social groups with a social and cultural identity distinct from the dominant society that makes vulnerability to being disadvantaged by the development process”. Melchias in (Eyong, 2007, p. 121) further caption it as “culturally distinct ethnic groups with a different identity from the national society, draw existence from local resources and are politically non-dominant”. Similarly, though less problematic, *technology* is basically term signifying the application of knowledge in the creation of solutions to humans’ problems:

Systematic knowledge and action, usually of industrial processes but applicable to any recurrent activity. Technology is closely related to science and engineering. Science deals with humans understanding of the real world about them the inherent properties of space, matter, energy, and their interactions. Engineering is the application of objective knowledge to the creation of plans, designs and means for achieving desired objectives. Technology deals with the tools and techniques for carrying out the plans (McGraw-Hill, 1989)

Momah in (Hamilton-Ekeke & Dorgu, 2015, p. 37) thus describes Indigenous technology “as that which has evolved from the traditional and cultural milieu of a people”. Okafor, as captured in Alinno and Udeze (2018), explain it as arts and sciences that are locally developed in accordance with culture to meet the needs of people.

For the purposes of this paper, we suggest a synthesis where Indigenous knowledge and technology are understood as the inculcation of local wisdom in the educational preparation of individuals and community through a systemic socialization process –which involves the training of the mind, intellect, body and soul for the realization of cultural heritages and exploration of its key values through the dispensation of Indigenous cum modern science technologies in education processes.

Given the contemporary trends and tensions in world global economy and the un-abating competition in technology innovations, developing countries such as Nigeria needs to identify new and sustainable ways of engaging in the fields of science and technology to close the gap of development. The shift in civilization and technological trends coupled with the rising needs of locally defined initiatives has also called for the domestication of African economic operations and developmental plans through various innovations and Indigenous knowledge applications. Essien (as captured in Alinno & Udeze, 2018) argues that “the imperative of identifying Indigenous knowledge to technological progress is crucial for the sustenance and propagation of our country’s cultural heritage as a basis for technological advancement and economic development” (p. 158). However, the creation of indigenous technology is not without its challenges. Some of the challenges as

explained by Hoekman, Maskus and Saggi (as cited in Alinno & Udeze, 2018) is the high cost of investment in technology and the risk of innovations. While Hamilton-Ekeke and Dorgu (2015) admit to the differences in forms and models compared to the Western.

Given the foregoing, it becomes apparent that the domestication of Nigerian affairs has become an issue of emergency. Education technology in the Nigerian school curriculum should occupy a prominent role into the future to equip graduates with technological know-how that will serve the local needs of Indigenous people. Moreover, there exists an important reflexive relationship with Indigenous knowledge in the distinctiveness of local application of educational technology. Of course, Indigenous knowledge technology systems are distinct from modern-day scientific technologies. While the former refers to a form of unique knowledge systems that are peculiar to a given culture, the latter represents a scientific research base generated in institutions of higher learning (Tharakan, 2017). The current economic and developmental stage of Nigeria, particularly on its national bio-resources development agenda, calls for a marriage between the Indigenous Knowledge Systems and the modern scientific systems of technologies. This will, in turn, pave way for innovative pathways that are needed for sustainable developments, economic transformation for global competitiveness, and revitalization of agricultural produce for food security towards the improvement of life for the common people. If this could be achieved the technological narratives of Indigenous technology and its exploration of numerous indigenous knowledge among the Indigenous people will be massive.

Open Distance Learning (ODL) within Re-Expression of AIK

African Indigenous learning can, therefore, be viewed as the core foundation for 'Education Self-Reliance' in modern education (Hamilton-Ekeke & Dorgu, 2015). Open distance learning is a form of technologically based education or an off-campus based system of learning enabling flexible, and often self-directed, educational access to those who might have missed the opportunity or have been denied access for various reasons in the on-campus mode of educational delivery in higher institutions. For Greenberg (in Chawinga & Zozie, 2016) contemporary distance learning represents "a planned teaching/learning experience that uses a wide spectrum of technologies to teach learners at a distance" (p. 4). This explains the relevance of technology-enhanced teaching/learning which ODL represents in the re-expression of AIK particularly in Nigeria. According to UNESCO (2002), the term

"open and distance learning reflects both the fact that all or most of the teaching is conducted by someone removed in time and space from the learner, and that the mission aims to include greater dimensions of openness and flexibility, whether in terms of access, curriculum, or other elements of structure" (p. 8).

The transference of IK has always been a direct form of reciprocated skills which are handed down through generations. ODL will aid in the expansion and transformation of Indigenous knowledge through technological means to support its proper documentation, management and dissemination, which will be devoid of time and space.

Open distance learning is increasingly growing owing to its affordances that allow learners to learn without the need for direct and physical contact with the school and its flexible focus regarding the needs of individual learners. ODL has the attributes that inform the application of educational technology in educational processes that could spring up the discovery of new knowledge and ideas needed by the world to surmount the pressure of human insatiable needs through the exploration of Indigenous knowledge and value systems. Indigenous knowledge with less sophisticated technological use has been explored in the trado-medical field and has been instrumental to cure series of deadly

ailments and diseases also in the field of agricultural sciences Indigenous agronomy has been very successful in Nigeria. The knowledge has been applied in fields such as environmental conservation, management of disasters, management of natural resources and many more areas. The infusion of Indigenous technology and ODL as a developmental tool-pack for local educational transformation will not only aid in the re-invention process of the lost value of AIK among its peers but will also serve as an instrument of realization of new technological discoveries for the world benefits.

Adding Indigenous Values to Open Education Resources (OER)

THE UNESCO 2002 forum on the impact of Open Courseware for Higher Education in Developing Countries birthed the term OER (Friesen, 2009). The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2012) defines open educational resources (OER) as “teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions” (p. 1).

In guidelines on the use of OER for the promotion of educational access rights for everyone, UNESCO urges states in their capacity and authority to ensure: the fostering of OER awareness, development of strategies and policies for the reinforcement of OER, promotion of the use of open licensing framework, development of quality learning materials, fostering of strategic alliances for OER, encouragement of research on OER, adoption of appropriate standards to ensure sharing and retrieving of OER among others.

Following this, it suffices to say that if African nations are serious about preserving and nurturing African Indigenous knowledge to be repositioned and re-invented then OER becomes an option and avenue to be exploited for such repositioning to take place. Access to OER for the promotion and reinvention of AIK is a very pertinent issue that requires holistic dedicated policy efforts to drive it. The Internet provides enormous scope for ongoing development and dissemination of Indigenous educational resources created by Africans for Africans. Building on this perspective, Mason (2014), argues that the “open agenda is a natural place to reposition development of inquiry-based learning into the future — thereby broadening the agenda beyond issues of access, licensing, enrolment, and technical interoperability to also embrace processes of inquiry” (p. 108).

The need for Indigenous knowledge re-creation is crucial in the creation of Indigenous technology that will serve the local people. Nigerian Indigenous knowledge systems have impacted and informed the application of education technology in so many ways. For example, it has provided useful information for farmers about agricultural resilience on how to absorb their agricultural produce and recover from all sorts of shocks that could either have a severe impact or slowly erode farmers' ability from farming. Education technology has helped in sharing information on resilience to equip crops and farmers with information and technology to protect their crops and livestock from diseases. Other similar instances are, ‘Gegemu’ (Jimsonweed), if soaked, the water can be used as repellants for livestock, ticks and other stuff? ‘Ewe-Iyeye’ (Spondias mombin) is being used for natural weight loss without chemicals. ‘Dongoyaro’ (Neem seed/oil) is now a universally accepted bio-pesticide for over 200 insects. Its cake is used for prevention of nematodes in the soil. Blood of certain animals such as dogs and lizards are used to protect vegetable from all kinds of insects and diseases. This local knowledge had been with the Indigenous people for ages. Modern science and technology are just beginning to talk about *genetically modified* organism (GMO) plants, one of such are the blood of mentioned animals, and it's called Transgenic GMO. If such knowledge can be well codified, documented, managed and made accessible through the medium of OER the world we benefit more than enough from AIK and the knowledge will survive extinction and help build a sustainable future.

Conclusion

Indigenous knowledge and practices are increasingly a consideration for world growth and sustainable development agendas. The world is tilting towards embracing Indigenous values and domestication of affairs to meet up with the needs of the local people and the recognition of cultural values and orientations. OER is considered to be a major asset and avenue towards the revival and development of the Nigerian-African Indigenous knowledge systems. If Nigerian/African leaders could foster efforts in ensuring the establishment of Indigenous-based technologies and promote broader-based open distance learning, this will help in the repositioning of the social-infrastructure and economical values of its people.

African cultural heritage is poised for renewal and educational technology through OER and ODL look to be natural instruments to assist in this. Arguably, Nigeria will not be a completely independent and economically stable nation until it is capable of developing its own independent technological based systems that combine both Indigenous and scientific values; Indigenous knowledge has contributed immensely to the development of technology in the world depending on the level playing ground accorded to its custodians and opportunities created for its explorations.

Based on the findings of this paper the next steps will be to investigate how open distance learning can be further leveraged in designing learning environments for rural contexts as part of an attempt in bridging higher educational access gaps in remote Nigeria.

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