Chapter

Higher Education Institutions (HEIs) in Africa Embracing the "New Normal" for Knowledge Production and Innovation: Barriers, Realities, and Possibilities

Christopher B. Mugimu

Abstract

If Africa is to remain relevant and competitive in today's knowledge-based economy, it has to rely on higher education institutions (HEIs) as centers of excellence for knowledge production. HEIs nurture and sustain the production of highly-skilled individuals to support Africa's growing economies. Among all possible ways, this could be achievable through strategic curricula innovation driven by emerging mobile technologies. Consequently, Africa's HEIs need to embrace the 'New Normal' by optimizing online teaching and learning in their pursuit to expand information and communications technology (ICT) literacy as a means to increase students' opportunities in higher education (HE). However, Africa's ability to embrace the 'New Normal' has been marred by inadequate ICT infrastructures, low connectivity, unreliable power supply, and national budget constraints that may undermine Africa's HEIs' potential to augment knowledge production and innovation.

Keywords: curriculum innovation, higher education, knowledge production, knowledge-based economy, the 'New Normal'

1. Introduction

In this chapter the focus is on higher education (HE) curricula innovation geared towards online teaching and learning and responsiveness to the demands of globalization. Globalization is inevitable worldwide phenomenon regardless of the different countries' existing social, cultural, economic and political boundaries. "Globalization serves as the impetus for sociopolitical and economic change and… perpetuates a borderless world where practices and ideas are shared across space and time aided by technology, mobility, communication, socioeconomic relationship, and environmental interdependence" ([1], p. 21). Indeed, the impact of globalization may have fueled many new developments, such as, the increased focus on knowledge-related resources (an innovation, an idea, a solution) as opposed to tangible industrial natural resources (land, timber, rubber) in traditional economies. As such, globalization has led to many "unprecedented developments in information technologies and social media; the pervasive impact of economic liberalization and trade agreements; the increased

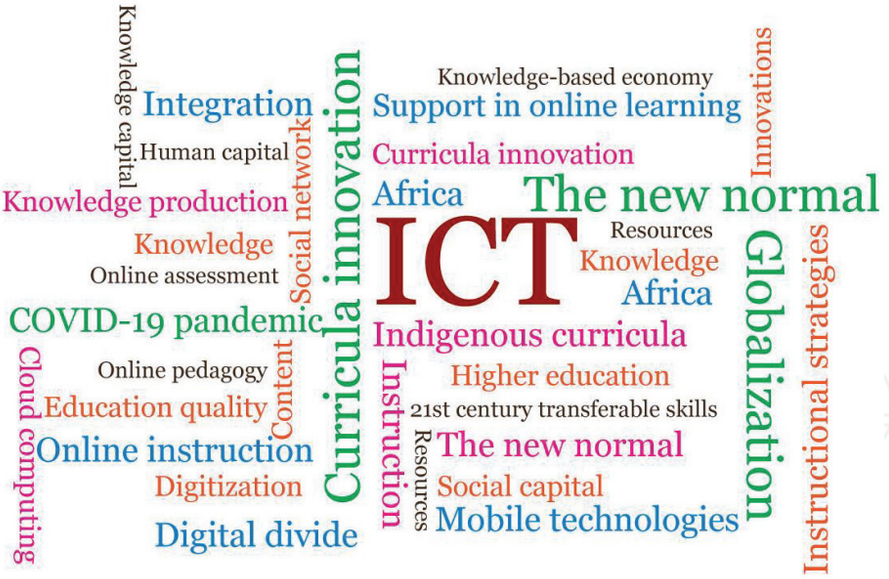

Figure 1.
Shows the complexity of higher education curricula innovation demands for the 21st century knowledge production.

flow of people, ideas, capital, values, services, goods and technology across borders" ([2], p. 5). HE has also been and continues to be impacted by the globalization storm. Therefore, higher education institutions (HEIs) have had to adjust their curricula and the programs they offer to enhance their students' ability to competently face the globalization challenges and opportunities which are many and complex as reflected in **Figure 1**. However, HEIs in Africa have been slow in terms of curricula innovation, yet, the globalization and technological influences continue to emerge and will remain so as an important part of our daily lives and society.

2. Methods

The method of gathering the information presented in this chapter involved thorough in-depth review of literature on embracing online teaching and learning in HE, with particular focus on barriers, realities, and possibilities. Furthermore, relevant literature on curriculum innovation and online pedagogy were used. We also blended this approach using Makerere University as a case study. The College of Education and External Studies (CEES) conducted a needs assessment survey on preparedness for online teaching and learning. Here we report data for both challenges and coping strategies during online teaching and learning. The Faculty shared their responses which were obtained from the college's staff WhatsApp platform in the second week of July 2021 about those courses taught online for semester two academic year 2020/2021 during the COVID-19 pandemic. The faculty who participated in this study are those who actually had taught or were teaching online courses. Although the information gathered from one college may not be generalizable it is credible and valid. This due to the fact that faculty shared their own lived experiences in online teaching and learning.

3. Globalization, knowledge production, knowledge-based economy

Globalization has influenced the way we do business especially as a driving force of the knowledge-based economies around the world. Knowledge has become a

critical resource that is needed to operate in the globalized knowledge economy. The focus is now more on knowledge as opposed to increased emphasis on the accumulation of tangible resources. As such, knowledge is looked at as a commodity or an asset and it is also seen as a catalyst in modern economics ([3], p. 291). Nevertheless, the "use of knowledge is the main driver of economic development and a powerful engine of production" ([4], p. 8). Currently, efforts to accumulate more tangible resources (i.e. building structures, computers, photocopies) without adequate or sufficient knowledge on how to use the resources seems not to make sense anymore. This does not mean that tangible resources are no longer important. However, the value of tangible resources in diminished without the knowledge on how to use them innovatively. Therefore, such people who are capable of generating knowledge or ideas leading to solutions that address current global challenges are on an increasing demand. They are on demand because they contribute both directly and indirectly towards the knowledge production. Knowledge production refers to ability to generate innovative knowledge/ideas and solutions to address real-life situations or challenges. Indeed, innovation is a product of knowledge production. HEIs should play a significant role in knowledge production and likewise incredibly contribute to innovations. In theory, one best way of becoming innovative is by engaging and interacting with innovations [5]. Therefore, HEIs must create conducive environment for students that actually represent the world of innovation through scientific research, technology and knowledge production. Indeed, developed and developing economies of the world increasingly lay much more emphasis on knowledge production in terms of generating innovative ideas and patent creation to optimize their competitive advantage in the globalized market share. "Globalization has also been an important factor in opening new markets and internationalization of trade in knowledge sectors that have exposed the world economies to international competition" ([4], p. 7). This has also stimulated "the creation of global labor markets of highly skilled workers, investment and access to new technologies, information, idea and knowledge flows from around the world that have accelerated the transition to a knowledge-based economy" [4]. Knowledge-based economy refers to economies focusing on "increased specialization, research, innovation, and learning driven by new information technologies" ([6], p. 10). The new information technologies are so important drivers of the knowledge-based economy that if Africa is to remain competitive, it needs to expand its networks for improved information sharing [3]. Most importantly, the knowledge-based economy emphasizes the use of 'knowledge' as an asset to leverage the growth and development of world economies. As a matter of fact, some countries have been so good at flexibly creating and producing new knowledge quickly to address current local, regional, and global problems facing society. These countries have been able to obtain significant economic gains through such innovation and knowledge production. Besides, these countries have continued to prosper in spite of the impact of globalization. However, the majority of third world countries have been unable to make the necessary adjustments in terms of globalization responsive curricula especially for higher education and the quality of their education systems is generally low. Consequently, they have tended to stagnate in their economic, social and technological developments. Yet if Africa to remain relevant and competitive in today's knowledge-based economy, the continent has to revamp her HEIs as centers of excellence for knowledge production.

4. Higher education (HE) in Africa

While HE is not a new concept in Africa, this level of scholarship has been a preserve for the privileged few. Back in the colonial days [1880s–1950s], HE in Africa

was first accessed only by the children of the chiefs and loyal families. However, prior- and post-independence in early 1960s and 1970s many governments in Africa recognized the role of HE in economic and human capital development. Much as African governments at that time committed modest resources to HE, these governments extended HE opportunities to children from poor families who academically brilliant. The motivation was to prepare citizens for the few government white color jobs. However, the 1990s on wards have seen declining governments' commitments towards financing of HE in Africa. Equity in financing of HE remains a huge challenge in Africa [7] and yet, "the doors to HE must be open to all worthy students, regardless of their socioeconomic status, gender, and regional origin" ([7], p. xiv). Interestingly, the demand for HE in Africa is rapidly expanding and the numbers of private HEIs in Africa have more than doubled in the last two decades. For example, "in 2018, there were 1682 universities in Africa, up from 784 in 2000" [8]. HE also contributes to social mobility by enabling low-income students to move up the income ladder [7]. However, Africa's knowledge capital remains very low due to poor quality of education since most graduates lack the needed competences [9].

It is also important to note that the developed and developing/emerging economies of the world have invested heavily in HE compared to third world countries. Evidence shows that "nations increase their knowledge base by investing heavily in HE and research institutions in order to position themselves in the global competition" ([3], p. 292). Thus, African nations should consolidate their efforts towards ensuring the quality of higher education and training with particular emphasis on laying a firm foundation in scientific research, technology and innovation [8]. This of course has serious implication on financing of HE. Indeed, "production of new knowledge is and [remains to be] the core function of tertiary education" ([10], p. 12). This core function can be enhanced even further when HEIs emphasize and promote cross cutting-edge scientific research, technological knowledge and innovation in response to compelling social, economic, political, and environmental problems facing our society.

"Education leaders regardless of their location will need to position their institutions at the intersections of commerce, culture, and technological transfers to gain the most out of the connectivity and knowledge that benefit their local quality of life" ([11], p. 609). Indeed, society should look up to HEIs for the creation of new knowledge and innovation [12] granted that "Universities can also be important magnets for talent and innovation, when attracting top students" ([13], p. 114). The top students with best brains can make a difference through their contribution to knowledge production and innovation. Thus, HEIs are not only engines of innovation but also incubators for economic transformation and development to meet the global challenges [8].

Regrettably, as earlier indicated, there has been declining investment in HE in most African countries. This is reflected by the fact that most HEIs in Africa with the exception of Egypt and South Africa have tended to lag behind in cutting-edge scientific research, technology and innovation [8]. Indeed, African nations continue to be major knowledge consumers and seekers as opposed to knowledge creators/producers. In fact, the continent's research output is extremely low accounting for 1.01% of the global research output [8]. As such, Africa as a continent will continue to be alien to the main players that substantively contribute towards the solution formulation to meet real global challenges. Indeed, "The potential of HE's contribution to Africa's development remains underdeveloped and often misunderstood, [Yet,] in today's globalized world, which prioritizes economic growth through liberalized trade and competitive market strategies, much emphasis has been placed on HE's ability to produce graduates to serve the labor market and produce new knowledge for the knowledge economy" ([2], p. xiii). However, this potential

cannot be achieved if HEIs continue to produce graduates with mismatched skills to the current job market [14]. The question of ensuring that the individuals that graduate from HEIs are employable in the twenty-first century remains a huge concern in Africa [8].

This has serious implication for the existing "institutional missions and curricula" ([1], p. 21). There is need to revisit the relevance of the current institutional missions and curricula especially by focusing on their alignment with the twenty-first century job market demands. Thus widening access and opportunities for HE in Africa without actually ensuring that the rising numbers of graduates are employable and have acquired the twenty-first century skills remains a serious dilemma. However, one cannot dream of graduates being endowed with the twenty-first century skills without the curricula integration of such skills into interactive and engaging activities and experiences for students. This requires to focus on the utilization of pedagogical strategies that can enhance student-centered learning [15]. For instance, encouraging student' led inquiry and collaborations, prepares them to operate effectively, communicate and work independently. Thus, the need to adjust curricula and pedagogical demands of the twenty-first century HE [8] cannot be underestimated.

However, this is unlikely to happen unless HEIs revisit the issue of quality in terms of education and training experiences offered to their young people granted that educational quality is the key to enhancing the quality of citizens/people [9]. Therefore, it takes quality education and training experiences to develop quality knowledge capital. For instance, creating provisions for active participation/engagement of youths in scientific research draws them into increased learning opportunities that can promote the development of innovative ideas [5] and hence, their likelihood to contribute meaningfully in creating innovative projects. In fact those involved in the innovation research projects and processes tend to organically gain competences through interactive learning [5].

5. Embracing the 'New Normal' in Africa

The pandemic has disrupted all walks of life and the most affected sector is education. It has been reported that millions of school and college going children are out of school. Thousands of parents and teachers have succumbed to the pandemic. This has left education, the already overburdened sector with fewer teachers as well as other support personnel. HEls closed in 175 countries leaving over 220 million post-secondary students whose studies were disrupted due to COVID-19 [16]. It is also important to note that even long before the pandemic, many countries in Africa were not ready to fully embrace the "New Normal" [17]. As such, the pandemic has worsened the situation for majority of African countries and stopped them from getting ready to embrace the New Normal by disrupting the basic progress already made in terms of their technological innovation and knowledge production. Consequently, it has also compromised Africa's ongoing economic and social development.

Indeed, if these countries do not adapt modern knowledge systems and tools; they stand a danger of becoming laggards or passive bystanders in the future" ([3], p. 293). Given that the continent's "natural resources are rapidly depleting, and Africa's economic survival and prosperity will increasingly depend on its knowledge capacity and human capital investment [12]. Indeed, there is need of glooming innovative individuals in Africa who are better able to generate both new and local knowledge and ideas or make new use of existing knowledge ([12], p. 301). The failure to do so will accordingly undermine Africa's competitiveness in terms of

technological innovation and knowledge production. However, it is important to explore the current realities surrounding information and communications technology (ICT) potential for HEIs in Africa. The following section presents the current realities surrounding ICTs and their impact in the globalized knowledge economy.

The current advancements in ICTs and mobile technologies have stimulated information sharing and knowledge-based economy which have been driven by even those fast moving sharing ICTs [4]. "ICT is both a driving force and enabler of the processes toward a knowledge-driven global economy. It allows HE providers to accommodate the specific needs of students in terms of mode, pace, place and time of study and to cater for different and new target groups and (niche) markets both locally and globally" ([18], p. 36). However, "the integration of ICTs into teaching is still in its infancy in Africa" [18].

In recent years, there has been an increase in blending of ICTs and emerging technologies as drivers of numerous economic and social activities including education. For instance, mobile technologies have been used to transform the teaching and learning processes in higher education [19]. Increasingly, institutions are looking for ways of reducing costs through the use of emerging mobile technologies. Mobile technologies have become part and parcel of our daily life, hence, the 'New Normal'. Many people also have come to appreciate that more can be achieved with less through the use of emerging mobile technologies.

"This emerging blend will also affect curricula and policy questions, such as what? and what for?" ([20], p. 3). The challenge is to translate the New Normal applications as drivers of interactive learning and innovative ideas. Yet, evidence show that online ICT and emerging mobile technologies could also take education and training to another level in terms of enhancing innovative interactive teaching, learning and skill development post pandemic [21]. The four new roles of technology in helping teachers improve their work include; improved record keeping for student learning, planning for student learning, instructions for student learning, and assessment for and of student learning ([22], p. 370). This allows the teacher to gain control over the facilitation and management of students' learning experiences.

"Technology and integration have led to increased demand for higher-order general cognitive skills—such as complex problem-solving, critical thinking, and advanced communication—that are transferable across jobs but cannot be acquired through schooling ([23], p. 78) transferable social behavioral skills i.e. teamwork, resilience, self-confidence, negotiation, and self-expression ([23], p. 80). Indeed it is recommended that for online learning there is need to move away from "the recall focus... and concentrate more on how to recapture the powerful improvisational and impromptu conversations and interactions that lead to group innovation" ([24], p. 232). "As we move into online and blended environments, there is also need not to focus on what is easier to teach online (information) instead of what is more difficult but also important (collaboration, creativity, and critical thinking)" ([24], p. 234). The idea is to create activities or tasks that are meaningful and worth of the time that students invest.

However, in an effort for HEIs in Africa to embrace the New Normal it may need to avoid the four most common mistakes in introducing technology into teaching namely: (i) installing learning technology without reviewing student needs and content availability; (ii) imposing technological systems from the top down without involving faculty and students; (iii) using inappropriate content from other regions of the world without customizing it appropriately; and (iv) producing low quality content that has poor instructional design and is not adapted to the technology in use ([18], p. 37). In an effort to move forward HEIs need to avoid the above mentioned common mistakes of integrating technology in teaching. This could enhance

their optimum utilization of meager resources as well as avoid unnecessary investments. As earlier indicated that advancing ICTs and emerging mobile technologies such as cloud computing solutions has the potential to actually reduce the cost of education [22, 25]. For instance, digitization of curricula content and instructions could make information storage, sharing and retrieval much easier and cheaper. Subsequently, millions of students and teachers can be able to use and benefit from the same materials without necessarily adding an extra cost for material production. It is also important to note that "knowledge products are inexhaustible and their use is not limited by spatial boundaries or geographical distance" [26]. One of the promises of online technologies is that they can increase access to nontraditional and underserved students by bringing a host of educational resources and experiences to those who may have limited access to on-campus only higher education [20]. However, numerous barriers exist that have tended to undermine the potential of embracing the New Normal in HEIs in Africa. Yet, the New Normal has come to stay which necessitates students to become more tuned to the flexibility and conveniences of programs associated with online/virtual learning compared to face-to-face learning. This almost leaves no chance for those HEIs that shall opt for the traditional option as they are most likely to be outcompeted and will fail to survive.

6. Barriers hindering Africa's HEIs to embrace ICT in teaching and learning

In Africa, embracing the advancing ICTs and mobile technologies to support virtual learning through enriched pedagogy and curriculum delivery remains a major challenge [12]. As such, HEIs have to proactively deal with these barriers in order to respond effectively with associated global demands. These barriers include but not limited to; lack of digital technologies, high cost of Internet and low broadband connectivity, inadequate ICT literacy, emerging information security threats, and unreliable power supply [25]. Other barriers that also hinder innovative use of ICT include "lack of confidence, experience, motivation, and training; access to resources and timetabled use of dedicated ICT classrooms; unreliability of equipment; classroom practices which clash with the culture of student exploration, collaboration, debate, and interactivity within which much technology-based activity is said to be situated" ([27], p. 28). Indeed, lack of online pedagogical skills of teachers and students, negative attitude about online learning, over emphasis on technology at the expense of learning, lack of support for online learning [28] and the COVID-19 pandemic have also compromised the progress made by majority of HEIs in Africa in their effort to embrace the new normal to support online pedagogy.

7. Current realities and repositioning of Africa's HEIs in ICT era

In the context of advancing information technology and knowledge production, a lot has changed in the way we do business. Increasingly people are looking for innovative ways of providing better, cheaper, and affordable services and will continue to do so. It is important for Africa as a continent to appreciate the current realities of the impact of globalization (**Table 1**).

Basing on these realities, clearly the world is moving towards the adoption of online driven virtual business. Thus, there is no way Africa as a continent could afford to lag behind the rest of the world by its failure to build capacity in online tools and opportunities to advance innovation and knowledge creation. Therefore,

- If someone is not willing to make the necessary adjustments in his/her field or profession and move forward; many others may be willing to do so and as such the individual will lag behind. For instance, with advancing technology and knowledge production, the field of agriculture has changed a lot. It is now possible for a dairy farmer to effectively and profitably raise more than 100 dairy cows on less than one-acre plot of land. This is possible as farmers have gained new technological knowledge on how to increase livestock production through improved alternative feeds [silage, hey, food supplements, etc.], organic farming, and genetic engineering.
- The manufacturing industry is also experiencing many changes especially with advancing technologies and increased automation. The majority of manual labor workers are losing their jobs except for the very few gifted ones who are rare to find who are having tacit knowledge and competences.
- The telecommunication industry is also moving from monopoly to competition. Major telecommunication companies (i.e. Uganda Telecommunication Limited, and Uganda Postal Services) are losing the monopoly they enjoyed in the 1970s, 1980s and 1990s—to serious competition from new market entrants—the mobile phone companies such as MTN and Airtel that are exploring many different things—mobile money, short message service (SMS), Internet provisions, and surveillance.
- The recent technological innovation and digitalization of energy is also taking the hydro-electric power industry to another level. This industry is transforming steadily and may give way for other alternative power solutions such as solar energy, nuclear energy, wind energy, and biomass.
- The banking industry has moved to another level in terms of coming up with innovative services such as online banking, mobile wallet, electronic money transfer, and online customer support.
- Current trends are demanding for increased use of digitalized materials and paperless everywhere as opposed to hardcopy materials i.e. e-air tickets, e-applications forms, e-testing and e-results, e-medical prescriptions, and e-interviews.
- Increasingly institutions are looking for ways of maintaining a remote mode of working, teaching and learning in the post pandemic world, cloud computing technologies and solutions will drive in this new direction [29].
- Free online courses are on the increase. Virtual online colleges and universities are also increasing in number and are becoming very popular because of their flexible and appealing programs [13].
- It is now possible to access credible qualifications from world class universities via virtual tools/options without necessarily having to attend physically on campus.
- Today, there are more open educational resources accessible online compared to those available in all physical libraries combined.
- Increasingly more college students are opting for part-time online studies as opposed to face-to-face full-time studies. This is likely to be even more intensified post COVID-19 pandemic.
- Increasingly, parents and their children are becoming less willing and able to spend more on higher education. Technology will improve students learning and likely at a lower cost per student per year than in the current industrial-age paradigm ([22], p. 371])
- Increasingly more people are preferring to work from home as opposed to working from their office. Many people have actually realized that they can get much more done at home without spending many hours on the road traveling to and from their office. Many companies are now looking for e-generation individuals who are already excited and motivated to work productively from home.
- It is now possible to virtually attend an international conference without actually having to meet expenses for travel, visa, and accommodation.
- Many business activities are being and will continue to be accomplished virtually as opposed to face-to-face through zoom meetings and conferences, webinars, online classes and workshops [30].

Table 1.
Current realities for the need to reposition Africa's HEIs in ICT era.

HEIs must play a central role to enhance this urgently needed capacity building by equipping students with the ability to maneuver/utilize emerging online tools for creating innovative business opportunities. By doing so, HEIs can transform Africa's economies to the extent of surviving both anticipated and unanticipated dynamic globalization challenges and opportunities. However, this cannot be realized if African HEIs continue to deliver the same education and training programs

introduced during the colonial days. Thus, curricula innovation is inevitably needed to prepare a new e-generation of individuals who are endowed with the required ICT literacy skills. This will demand for a paradigm shift in the curricula innovation enterprise in a sense that all these current realities should be integrated into the curricula design.

At least something must be done about the curricula enterprise for HE in Africa especially in terms of ensuring the enhancing human capacity in online and ICT skills. This will require a holistic curricula transformation in HEIs to be able to produce a new e-generation of individuals that are capable of contributing to the needed knowledge production through the use of emerging innovative technologies and cloud computing solutions. It will also be vital to ensure that each student, whoever graduates from any HEIs in Africa should have been oriented in online mobile technologies and applications. This could expand online ICT literacy in all HEIs in Africa. Furthermore, all computer engineering programs should also emphasize cloud computing skills and information security management skills. As such a generation of individuals who are confident, comfortable and enjoy working with these tools will increase. However, this requires students' engagement into activities that promote interactive learning in production and application of knowledge [4].

Increasingly there will be need for shifting the focus from curricula content coverage to ensuring learning. As such, "utilizing effective instructional strategies and designing learning experiences that enable the participants to experience the innovation through attributes of innovations" becomes very critical ([31], p. 22). It is also important to note that innovative teaching and learning is much more than just downloading instructional information/materials. Yet, 'information alone is instruction' [32] implying the need for careful scrutiny in selecting appropriate online materials for the students.

Life will never be the same again post COVID-19. The pandemic led to lockdown in all countries around the world and businesses have been closed, public transport is closed, public gatherings prohibited, and educational institutions closed. This has disoriented all people in one way or another and their normal daily activities disrupted. Now people need to think deeper and creatively to be able to survive, yet, the twenty-first century skills are on high demand. These skills could be developed/gained through social interactive learning [33]—enhanced by modern tools and applications.

8. Possibilities for Africa's HEIs to meet the global demands

Many HEIs are faced with serious dilemma of how to go forward with their teaching and learning programs post pandemic. The question of what possibilities HEIs may have to remain vibrant in post pandemic to survive the globalization demands is an important one. However, with advancing ICTs and mobile technologies, many options are now possible.

First, opportunities for remote teaching and learning in institutions can easily be made available and readily possible. For instance, many free tools and apps are already available to enhance online pedagogy (i.e. teaching and learning processes) in higher education. Such tools and apps include but not limited to Google classroom, YouTube, Google docs, Google meet; Google Drive; Facebook, Twitter, Slideshare, Linkedin; edX, Open Culture, Skillshare, Plural-sight, a Cloud Guru; Scribd, Prezi; Skype; Zoom podcast; Padlet, whats-up group; Edmodo; among others [30, 34].

Of course if these tools are to work well, support for lecturers and students is needed to enable them optimize the benefits associated with these tools in the teaching and learning processes. Therefore, the need exists in the integration of online pedagogies in curricula design for online teaching and learning; such as blending asynchronous and synchronous approaches.

Second, utilization of existing online resources will become the center of focus for majority of institutions. HEIs in Africa may not have to create new wheels when many others are already available. For instance, many top world universities already offer thousands of free online courses that can be used by students and lecturers around the world-some of these universities include: MIT, Stanford University, Harvard University, University of California, Berkeley; University of Toronto; Yale University, New York University (NYU); Georgia Institute of Technology, The Open University in UK, and many others.

Therefore, HEIs in Africa can learn from these world universities without having to develop their own online pedagogy programs. This approach makes a lot of economic sense because the investment that would otherwise be required to develop online programs could be enormous in terms of money, time, and knowledge/expertise needed to complete the task.

Third, mobile phones can be used to enhance access to education opportunities for men and women [2] and fortunately the coverage of mobile phone access has expanded rapidly in Africa and majority of higher education students own their own personal mobile phones, smart phones and ipads [30]. Therefore, it is strategic to capitalize on the use of commonly accessible mobile technologies to enhance teaching and learning. If HEIs are to continue serving the increasing numbers of students incommensurate to available physical infrastructures and shrinking national budgets mobile technologies and cloud computing solutions could be the answer [34]. HEIs need to do better when it comes to optimizing the utilization of emerging mobile technologies and cloud computing as teaching and learning tools if substantive curricula innovation is to happen. ICTs could also provide opportunities for developing collaborative learning between HEIs and local communities [35] beyond geographical boundaries.

Fourth, cultural integration in curricula is vital.

Culture plays a big part in our lives and the way we relate with others. It is therefore imperative to integrate culture into curricula as it orientates the young to important values, norms and way of life in society. For instance "if education is meant to bear on the people's cultural background and traditional manner of doing things, remarkable academic achievement would be recorded" ([36], p. 5). Therefore, all curricula should rotate around working with the local environments addressing real life problems. This integration process of cultural values and norms could enrich the preparation of individuals for specific occupational skills and may enhance creativity and innovation relevant to the local environment [36].

Nevertheless, designing curricula in higher education is a complex activity [37] and therefore, HEIs are challenged to produce global citizens who can effectively communicate and work harmoniously to fit in the multicultural context. Thus, universities are required to provide global environments through their adjusted curricula. Withstanding that building some robust curricula that is effective in reflecting global environments is not an easy task. The ultimate goal would be to nurture "among students lifelong learning skills and a mindset for critical thinking, effective communication, creativity, curiosity, collaboration, problem-solving, adaptability, principled, and ethical behavior" [8].

Fifth: utilizing existing social networks.

The use of already established networks offers a huge base of social capital to spearhead HEIs in Africa. Drawing on the Social Network Theory which assumes

that the relationship and ties one has in the network determine the kind of resources which one can access [38] given that majority of faculty in Africa have attended and trained from institutions in the north, Asian and Arabian countries potentially represent/hold significant social capital. Therefore, institutions need to invest/tap in the social relationships and networks of their faculty as a strategy through which resources of other institutions can be accessed, borrowed, or leveraged [38]. Through their existing social networks faculty can be able to make valuable connections to identify the needed resources and move forward to form strategic synergies for sharing these resources. In this case the most critical resource may be knowledge. The knowledge resource could take the form, for example, how to develop programs; how to use a computer application, and how to conduct an online assessment. Furthermore, advancing online technologies could actually leapfrog social networking possibilities in HEIs in Africa especially by enabling faculty and students to access international knowledge (journals, papers, databases, courses, presentations) as well as collaborate with peers worldwide [17]. Indeed, "increasing levels of collaboration and collective planning and strategic decision making across institutions creates new spaces and opportunities for peer to peer learning and fosters new innovations and models for the future of cybersecurity practice in higher education" ([29], p. 29).

Sixth: digitization of curriculum content and regulatory ICT policies [39] to facilitate easy access of materials for increasing numbers of students and faculty. Thus, the digitized content could be deposited into a central pool where all university students and teachers can easily access it. Nonetheless, caution must be taken to deal with issues regarding digital information security threats, a subject beyond this chapter [33].

Seventh: integration of indigenous education in HE.

The indigenous education curricula's focus was/should be on preparing the young to deal with real needs of society and the relevancy of what was being taught [40]. HEIs in Africa have a lot to learn from indigenous education curricula. In Africa, the need to introduce and embrace localized curricula is extremely critical and cannot be underscored. HEIs should focus on localized curricula that target and fully integrate the needs of society. Truly, "HEIs have a core mandate to establish close links with and serve local and national needs as well as society at large" ([2], p. xiii). In essence, therefore, HEIs must respond to the local market demands/needs by offering relevant curricula and educational programs [41] that speak directly to local cultural demands to avoid industrial and economic developments that are divorced to local societal needs. Yet, this is the main essence and core value of indigenous education curricula. Needless to say "curriculum is at the heart of HE and as such, transformation must focus on what is taught what is learned and what is relevant to the teaching and learning to society" ([42], p. 13).

Eighth: participation and involvement of students in curricula issues.

Students' involvement in curricula activities is needed to optimize their meaning and real learning opportunities. Indeed, with online tools the universities are losing control over the teaching, research and learning activities [43] and time is now for students to drive their own learning. Learners' ability to construct their own knowledge and experiences through their free interaction with ICT trends show that students' ownership of devices is rapidly increasing in some countries and that reliance on institutional equipment, often poorly managed, is also decreasing ([44], p. 851). Clearly, the institutional dynamics are changing where students and teachers are now in position to determine what to do/educational path.

Ninth: effective instructional strategies.

The best way to assist someone to enable him/her deeply learn is by doing. Therefore, effective instructional strategies are required to solicit and encourage

students' active engagement. These include, service learning, collaborative learning, active engagement, and problem solving activities. As such, African countries should ensure that students are afforded the opportunity to be part of the new and exciting global world with blended and value-adding ICT applications by giving them opportunities of doing/acting through their participation/involvement ([45], p. 984). This challenges the current curricula being offered by HEIs in Africa, regarding its relevance and innovativeness. Generally, most curricula are more theoretical oriented as opposed to practical/hands-on.

Tenth: 'Necessity is the mother of invention' [Plato] or innovation. During the post pandemic, there will be need for people to look for better innovative ways of surviving that are divorced from the traditional means with standard operating procedures (SOPs) in place. For example, people may engage in online businesses startups, e-marketing, e-medicine, e-spare parts, e-foods, e-transport, home-based business and factory/industry, etc. given the available cloud computing applications such as YouTube, Google go, Chrome, Google app, etc. Many young people can also gain a broad range of valuable ideas and skills in gardening, sawing, landscaping, carpentry, homemaking, engineering, camping and survival skills from online resources. As such, young people have so much to learn and gain from online virtual environments through interactive engagements with resources/materials, peers, and teachers. Interestingly, the majority of young people do not only enjoy but are motivated to use these tools confidently and comfortably.

9. Curriculum innovation

What comes out clearly from ongoing discussion in this chapter is that, we learn by doing. This implies that any curricula innovation and reform should be responsive to current demand of society. For instance, in preparation of a generation to spur the knowledge production the curricula must be responsive to these demands of the technological innovation. If young people are to organically become creative and innovative, they should exploit online advancing mobile technologies for knowledge production and national economic development. This preparation has to starts from curricula experiences and the training they receive.

Curricula innovation in higher education in Africa will take a new direction. "Not only instructional formats will need to change, but degree programs and course content will too.... Higher education will increasingly move from knowledge acquisition to skills development, with a shift toward inter and multidisciplinary" [46]. The motivation is to produce graduates who are multi-skilled and multidisciplinary [46]. Attention is needed to promote a holistic and innovative curricula that impacts the job skills of the twenty-first century [8], yet, the current curricula and delivery method are too theoretical and utilize outdated skills [17] for twenty-first century higher education.

Similarly, Africa cannot expect different results without making substantial adjustments in the quality of education and training experiences available to its youth and without actually interrogating the curricula content being offered, how it is delivered, and how it is being assessed. Thus, the curricula business success will also depend on ensuring that HEIs are capable of glooming and nurturing highly skilled individuals that are endowed with transferable twenty-first century skills who will be able to support Africa's economies [12]. Therefore, there is also need for implementing curricula innovation in order to meet the twenty-first century skills through enhanced interactive learning [18].

Tracer studies in Africa indicate that many graduates of professional courses do not actually practice their professions. For instance, Makerere University SIDA/SEREC

• What subject content to be included or discarded?
• What current realities to be integrated into the curricula?
• What approaches to focus on i.e. disciplinary, transdisciplinary, multidisciplinary?
• What instructional/pedagogical strategies to be used?
• What assessment strategies to be used?
• What cultural identity/values/norms for integration?
• What indigenous knowledge could be integrated?
• What resources are locally accessible?
• What social networks opportunities are available for resource mobilization?
• What ICT gadgets are commonly used and readily available for students' cohorts in HEIs?
• What best practices for curricula integration of online tools and pedagogies for students and faculty?
• How to motivate students and faculty for online teaching and learning?
• What best practices of advocating for blended teaching and learning?

Table 2.
Possible questions to guide curricula innovation.

study revealed that majority of the graduating veterinary doctors from the university do not actually practice veterinary medicine or engage in active animal farming activities, but rather end up in other business sectors, i.e. pharmacy, car dealers, real estates, among others. The overarching question is that why are such highly trained people opting not to engage with their professions after graduation? Yet, Makerere University offers some of the top/best Agriculture and Veterinary programs in Africa. There is need to interrogate the curricula of these programs in terms of their content, innovativeness in delivery, and assessment. This may also apply to almost all other courses and professions for HEIs in Africa.

Table 2 shows the keys to guide the curricula innovation and addressing such questions could inform the curricula design process.

These questions may aid the process of undertaking curricula renovation process on issues which are highly complex, embedded and interlinked as reflected in **Figure 1**. We envisage the need to work towards developing a general curricula design framework that identifies the various factors and drivers that are essential to sustain important curricula innovation within the globalization context. Numerous curricula design models on contemporary higher education can be consulted [37, 47].

10. Makerere University as case studies

The College of Education and External Studies (CEES) is one of the nine colleges at Makerere University. CEES conducted a needs assessment survey on preparedness for online teaching and learning. The Faculty whose courses were taught or were being taught online were invited to participate in study via CEES' staff WhatsApp platform. The information was gathered during the second week of July 2021 for those courses that had been taught online for semester two of academic year 2020/2021 during the Covid-19 pandemic. Here we report data for both challenges and coping strategies during online teaching and learning presented in **Tables 3** and **4** respectively.

What comes out clearly from **Table 3** shows that most of the challenges faced by MUK faculty in online teaching and learning were consistent with the barriers highlighted in literature [48]. However, lack of skills in online learning and

- Students' skills and culture in technology is till wanting. They do not have any prior training in use and adoption of ICT in their pedagogy.
- Majority of students do not have the devices to engage in online learning. Lack of devices including laptops and smart phones, for accessing lessons. Some students would come to campus so as to share laptops for zoom lessons, [this makes many students become more vulnerable to Covid 19].
- Unstable Internet i.e. School of Education Internet went off for almost one month. Unreliable Internet could shut off many students.
- Large classes up to 800 students tried to join any session at their convenience.
- Giving tests or quizzes for such a large class was very problematic.
- Teaching huge numbers and multiple groups online has salient challenges of control and pedagogical management leading to uneasiness.
- Some students rioted over Makerere University Electronic Learning Environment (MUELE) usage. Why? Because of haphazard online implementation of the same with no clear support systems.
- Lack of training and orientation in online learning especially how to use MUELE combined with poor digital skills of students. No provision for technical support for both staff and students for technology challenges faced while using MUELE.
- Unstable Internet connection. Power going off during class. Some learners complaining about their data.
- Poor attendance, only 80–100 students attending out of 900 students. Students attended face to face meetings more than online.
- Zoom worked a bit better but students had serious connectivity issues and kept dropping off.
- Less motivation of students because of less interactions with online learning since students have to be muted.
- Most of staff gadgets are outdated only fit for word processing, emails.
- Very poor time management on part of students due to many home distractions.
- Students yelling deliberately disrupting the lecture.
- Students complain of having no data. Data costs were mentioned as high and most students were not aware of how the zero rates thing works on MUELE.
- No contact information [i.e. emails, phones, Facebook, WhatsApp, etc.] to connect with learners.
- Some students turned up to do exams and claimed that they were not aware of online teaching.
- MUELE is too overloaded, too slow, all the time the sessions crashed.
- Lack of staff and students' confidence in using MUELE and zoom.

Table 3.
Challenges encountered during online teaching and learning.

pedagogies for both faculty and students, negative attitudes about online learning, connectivity issues and lack of gadgets suitable for online learning stood to be very critical. Digital divide also remains to be a serious concern [33]. As such numerous technical problems arose and the need for support in online learning is urgently required without compromising the educational experiences for students [33]. In addition, digital divide may continue to exist [30] and yet, it negatively impacts on the teaching and learning experiences [49] as well as extends inequalities in higher education access [17, 50].

Table 4 shows share responses for faculty regarding the coping strategies for online teaching and learning. They shared their insights into what they thought could be done to make online teaching and learning successful.

Clearly, **Table 4** reveals that faculty see the need for technical support for both faculty and students as being vital. The support should focus on promoting skills in online pedagogies for both faculty and students. The need to motivate and encourage positive attitudes about online learning cannot be underscored. It is also crucial to university management to deal with connectivity and digital divide issues for both faculty and students. However, **Table 5** shows recommended action points for

- Train students in usage of online learning resources.
- Train students in MUELE and zoom sessions and how they operate.
- Ensure that zero rating works on MUELE.
- Provide needy students with devices and data.
- Identify and support struggling students.
- Need to train students in designing and facilitating online learning.
- MUELE should be used as just a platform for posting study materials and emphasize zoom.
- Need to emphasize attendance or even take attendance record. Encourage also use of a chat channel.
- Try multiple Internet network providers.
- Staff to be helped by the university to access unlimited zoom versions.
- Encourage learners to have a to-do list and to keep time for online sessions.
- The university should increase the bandwidth to accommodate the increasing numbers of online courses hence more users.
- With orientation training and support, MUELE can be used for interactive and collaborative learning activities like discussion, forums, reflection on the blogs and journals.
- Uploading of multimedia materials accompanied by tasks which enable deep learning to reinforce live sessions using zoom.
- MUELE should not just act as a depository for materials but let us use it as a learning space, where we provide feedback and support to students, where students interact and collaborate with peers, etc.
- Both students and staff need ongoing technical support for both MUELE and zoom so IODEL and other units should dedicate staff to provide this support.
- Need to capture and regularly update students so that when it requires to get to each individual student, it is possible.
- Motivate our students towards online teaching and learning.
- Help students maintain focus and create a sense of community.
- Make discussions meaningful.
- Increase students' engagement.
- Address equity issues in terms of Internet access, gadgets, and all other forms of online infrastructure especially for the impaired students.
- Need to upgrade staff gadgets for newer versions that can handle effectively online teaching and learning.
- Need to build confidence of staff in online teaching and learning.

Table 4.
Coping strategies for online teaching and learning.

institutional leaders and managers in their efforts to embrace online teaching and learning. We find these action points ideal in providing a starting point for all HEIs wanting to embark on the online teaching and learning journey.

The action point presented in **Table 5** are consistent with our understanding of what we perceive to be new possibilities to online teaching and learning. However, African nations can also take a leaf from Senegal as a step to embrace online teaching and learning. In Senegal, each student in higher education is given a laptop subsidized by the government and is paid for by the student in installments within a period of 12 months. Furthermore, the government has taken the lead in providing connectivity to HEIs. With increased connectivity, the Ministry signed an agreement with Elsevier and other publishers to provide access to journals and databases. Other initiatives of the government which leverage broadband connectivity, include establishment of the Senegal Virtual University, the Knowledge City and Technology Park. Internet access is free for students in all public universities [17].

- Use the most widely used and existing technology and resources available locally: mobile first, public cloud to scale quickly, international content to fill in.
- Set up a one stop space as ab entry to various resources: most universities using their learning management system (LMS) as central platforms- for advice, communications, teaching, learning, support etc. integrating other technologies in the LMS i.e. video conferencing.
- Focus on curating existing (open) content rather than developing content: developing good content takes time and expertise. Instead, focus on existing local and international (open education resources) content and align these to your curriculum.
- Provide regular guidance and support to students and teachers is fundamental: set up virtual help-desk and providing pro-active tips and regular communications.

Adopted from World Bank [16].

Table 5.
Action points for leaders in short- and medium terms.

11. Discussion and conclusions

What comes out clearly from this work is that where we have reached there is no point of return. Globalization, knowledge based economy, and the pandemic are all here to stay. HEIs must take a mantle to boldly address human development and social, cultural, health and governance issues as required [2]. The role of HE in providing relevant skills, technical and entrepreneurial trainings that are on demand, as well as those relevant in developing and promoting technological innovations is critical [12]. The demand for new knowledge and educational opportunities will not only continue to grow but will be password to economic survival in Africa. With declining government spending towards higher education, HEIs must develop alternative affordable options to support high quality education for diverse student' populations [13]. Blended learning in higher education in Africa will become the order of the day. With advancing ICT technologies, mobile and cloud computing solutions are capable of rendering higher education affordable [34] for the increasing number of students who could not otherwise have been able to access it before.

These ICTs technologies especially mobile technologies could easily make education more flexible and accessible in many amazing and unlimited ways [25].

Currently, curricula innovation in HE has become the order of the day especially being able to deliver education amidst the COVID-19 pandemic. HEIs are increasingly challenged to focus on the curricula integration promote/stimulate knowledge production, creativity and innovation of higher level skills that may to be more important in the globalized knowledge economy. Interestingly, more students and teachers are now not only beginning to appreciate online teaching and learning but are becoming more comfortable and confident with it [20]. The need to upgrade online infrastructure to meet the changing demographics of students, curricula and pedagogical demands of the twenty-first century HE [8] cannot be underscored. Additionally, embracing pedagogical changes in terms of curricula design and delivery that involves students as active participants in the learning process rather than passive consumers [8] is the way to go.

This will be vital especially during the pandemic and post pandemic era where online learning/virtual learning environment has become part of our daily lives. Indeed, African nations cannot continue to drag their feet by their failure to do what the rest of the world are doing as far as making available quality and equitable education opportunities to all college going cohorts.

Unfortunately, millions of college students in Africa are at home out of school due to the pandemic lockdown. However, their counterparts in the developed countries are accessing quality educational experiences through virtual/remote learning

environments. Tough decisions have to be made for Africa to become innovative in terms of building capacity for their citizens. Given that the quality of any nation/country cannot surpass the quality of its citizens.

The future of Africa's HEIs will depend on improved collaboration, networking, and information sharing. Indeed, advancing online mobile technologies and cloud computing facilities could enable Africa's HEIs to develop communities of practice [35] and embrace the 'new normal' for the knowledge production and economic growth. This chapter has emphasized curricula innovation effort that are current realities' driven if these reforms are to make a difference. However, further research is needed on how to carry out curricula design intended to integrate current realities associated with the New Normal to meet the demands of the globalized knowledge society. Further research should generate innovative curricula design frameworks to guide future curricula innovation interventions and processes that target technological knowledge production and innovation.

Author details

Christopher B. Mugimu
College of Education and External Studies, Department of Foundations and Curriculum Studies, Makerere University, Kampala, Uganda

*Address all correspondence to: cbmugimu@gmail.com

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