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Interrogating the preparedness of Uganda's Higher Education and the Role of Information and Communication Technology in the era of COVID-19 Pandemic and its Aftermath

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Abstract

This article is based on a qualitative study conducted to establish the preparedness of Uganda's Higher Education and the role of Information and Communication Technology (ICT) during COVID-19 pandemic and its aftermath. Coincidentally, the dynamics of COVID-19 pandemic predicated the need for urgent adoption and scale up of ICT in education. However, universities in Uganda were strategically ill-prepared to adopt and sustain to digital and online methods of engagement, sighting problems ranging from policy and curriculum deficit, to lack of staff and student preparedness. Ideally, the inability for universities to adopt and sustain to digital and virtual mode of operations demonstrated a strategic irregularity between ICT and higher education systems. In response, this study was intended to address the salient gap by identifying the key pedagogical challenges encountered and recommend appropriate strategic options based on the global best practice in ICT and higher education. Procedurally, the study adopted qualitative study approach, using scoping literature review techniques and content analysis methods of extracting evidence.

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By way of reflective analysis and scrutiny, the study sought to establish how various universities coped with COVID-19 lockdown, while identifying the relevant information in the domain of ICT and higher education systems. Hence, data analysis followed a descriptive approach, linking the identified gaps with the global best practices. Subsequently, the general implication of the study finding is that there was a strategic mismatch between ICT and higher education systems. Thus, the key challenges identified include lack of pedagogical flexibility and inefficient social interaction among learners and instructors, lack of self-directed and independent learning, restricted mode of assessment, and lack of staff competence in ICT and pedagogical approaches. Hence, this study provides a strategic guidelines to higher education planners to formally integrate ICT functions and education systems.

Keywords: COVID-19 lockdown; Uganda's Higher Education; Information Technology; Pedagogy.

1. Introduction

COVID-19 pandemic was only a wake-up call regarding the disruptive waves of changes that shook higher education around the globe [1, 2, 3]. For a long time, more radical signals of disruptions have been gathering momentum that could fundamentally change the configuration of higher education in the near future [4, 2, 5]. However, obscured by tradition, inertia, and resistance to changes, higher education players have not responded to such signals of disruption with the due and deserving attention [6, 7, 8]. Now that the COVID-19 pandemic has shaken institutions out of their comfort zones, educational planners need to proactively swing into reflective action to avoid colliding with unfolding futures. In doing so, the greatest challenge education planners may face include lack of full grasp of the forces shaping the changes in higher education, as well as the nature and magnitude of the ensuing transformation [4, 2, 3]. This renders it difficult for education planners to strategically prepare and reposition higher education for the new era [4, 2]. Coincidentally, the dynamics of COVID-19 pandemic have predicated the need for urgent adoption and scale up of ICT in higher education [9, 1, 10]. For this reason, this study intend to propound on the pivotal role of ICT in higher education, and address the salient gap of strategic mismatch between ICT and higher education systems. Procedurally, the study adopted qualitative study approach, using scoping literature review techniques and content analysis methods of extracting evidence, while focusing on how ICT can formally be integrated with higher education systems. Altogether, the evidence generated would support higher education planners to strategically prepare and reposition higher education for the new era [4, 2, 3].

From historical perspective, ICT have been trivially conceived to support the activities of higher education [4, 7, 8]. At its inception in education, ICT supported mainly the tangential tasks of automation of work processes in education [8]. From the evidence accrued, many surveys have revealed that computers have been used as a supplement to the existing curriculum and much less integrated in the learning of the subject matter [11, 7, 12, 8, 13]. The main use of ICT then was selective and optionally dependent on individual teacher-learner dealing with teaching-learning resources [11, 8]. This situation was witnessed in the development of Computer Assisted Instruction (CAI) tools [14, 15, 16], where a computer is optionally used to present the instructional contents and monitor the learning that take place. Relatively, CAI uses a combination of text, graphics, sound, and video to enhance content delivery and the learning process [11]. Unfortunately, the developed CAIs were not fully

appreciated and rationally integrated into the sound theories of teaching-learning. Thus, curricula development strategy did not fully appreciate and embrace CAI as one of the enabling methods for effective delivery of knowledge and instructional materials [14, 8]. According to Sukanta [8], "one of the most common problems of using ICTs in education is to base choices on technological possibilities rather than educational needs". Nevertheless, the developed CAIs and ICT applications were compared with the traditional (oral) lecture methods and found to be significantly superior [14, 11, 13, 8, 17].

Progressively, ICT innovators and education practitioners continue to conceptualize selective episodes of ICT roles in educational processes [18, 8]. In the long run, many unilateral ICT functions were coined to address various challenges in education, and more formalized educational applications, often referred to as Learning Management Systems (LMS) were developed [19, 20, 21, 22, 12, 23]. Specifically, in 2000s, Blackboard emerged as one of the pioneer LMS adopted by many universities in Uganda and Africa at large [19, 21, 24]. Later on, more customizable LMS including Moodle (Modular Object-Oriented Dynamic Learning Environment), Atutor, Sakai, and Kewl were developed [19, 21, 20]. Subsequently, other general online and virtual applications started finding their way into educational domain [21, 20]. Hence universities started differentiating ICT roles by coining phrases such as synchronous, and asynchronous learning, blended learning, and online (virtual) learning etc. [18, 20]. However, due to lack of their formal integration and origin with the sound theories of educational process, LMS and ICT applications continued to face the challenge of tradition, inertia and resistance to changes, which denied higher education opportunities to effectively leverage educational systems using ICT [11, 7, 12, 8, 13]. Nevertheless, ICT innovations have progressively developed with focus now on artificial intelligence, while higher education have reluctantly continue to borrow selective episodes of ICT practices in their operations [6, 11, 7, 12, 8, 13].

Eventually, at the beginning of this decade, COVID-19 pandemic imposed a wake-up call on educational institutions to question their existing strategies, and compelled them to reflex on the pivotal role of ICT in education [1, 25]. As a result of the economic lockdown, universities were devoid of strategic options except to foster business continuity through digital and online methods of engagement [1, 10, 25]. Coincidentally, various universities and stakeholders quickly realized the pivotal roles of ICT in teaching-learning, but were strategically ill-prepared to adjust to digital and online methods of engagement. Evidently, all universities in Uganda did not meet the minimum requirements for online operations [1, 25]. According to [1], over 80% of Ugandan university academic programmes are not visible on the virtual space, despite available ICT resources. More so, staff and students were not well-prepared in the use of online teaching and virtual learning [25]. Beside COVID-19 pandemic experience, some of the emerging concepts promulgating for reform in higher education include the propounded rhetorical need for lifelong learning, globalization, and information and knowledge society etc. [4, 3, 26, 27]. In line with these forces, ICT advances including internet technology, social media (SM) revolution, digitalization of the economy, and artificial intelligence, are all developing concepts harboring conducive ground for new pedagogy [28, 29, 3, 8]. Nevertheless, players in higher education have remained hesitant to fully attend to these signals of reforms [28, 4, 3]. Other than wait for a spontaneous (knee-jerk) reaction witnessed in COVID-19 situations, higher education planners need to wake up and proactively realign its educational strategies with 21st century dictates, skills, and tools. Otherwise, with the emerging innovations in artificial intelligence (AI), smart systems, globalization, digitalization of economy, and other similar

occurrences akin to COVID-19 pandemic, the future of higher education could be faced with more damming situations in the coming decades [4, 3].

Presently, artificial intelligence is generating new concepts craving for education reform [30, 31, 32, 5]. Predictably, by the end of this decade, more intelligent and smarter systems will have emerged in different fields including education [30]. For instance, in educational domain, adaptive learning, simulations for education, curriculum editing system, expert systems, and intelligent tutoring systems are some of the emerging concepts that would certainly reshape the future of higher education [32, 33]. These new concepts would promote lifelong learning by enabling students and academic managers deal with information and knowledge in a flexible, self-directed, and constructive ways [33, 32, 5]. According to Haseski [32], the use of artificial intelligence in higher education will certainly make learning more self-directed, provide effective learning experiences, enable students to discover their talents, improve their creativity and reduce teacher's workload [32]. Hence, the role of faculty and academic managers would probably shift from traditional control of learning process to facilitation of learning process [31, 34]. Broadly speaking, the 21st century era is characterized by technology-driven information and knowledge society, and any organization that differ from such new normal would certainly risk the chance of being isolated from the global community and socioeconomic development [35, 3]. Thus, a foresighted higher education would then formally recognize and embrace ICT doctrine in their strategies [3]. Therefore, higher education need to proactively strategize in order to remain relevant and avoid colliding with unfolding futures [4, 3]. Altogether, this study contribute towards the cause by providing strategic insight into the current and emerging trends for a systematic, results-oriented discourse on the future of higher education in the age of ICT and emerging education concepts [3].

2. Higher education in Uganda

Formally, higher education in Uganda fall within the benchmark of the global educational systems [3]. By clarification, higher education refer to all post-secondary education training and research at educational institutions, which are authorized as establishment of higher learning by national authority [3, 36, 37]. With respect to this study, we limit our scope to universities, defining them as institutions of higher learning that offers courses of study leading to award of certificates, diplomas, and degrees, as well as conducts research, and provide community services [3, 37]. Overall, Uganda is home to 39 registered private universities, and 11 public universities with the current enrollment of 258,866 students [10, 25]. In line with UN and national development agenda, university education is among the significant form of investment in human capital development through which specialized knowledge it offered contribute to the success of national efforts to boost productivity, competitiveness and economic growth [3]. However, whereas development agencies have placed great emphasis on primary and recently secondary education, less support have been extended towards universities as a means to improve economic growth [38]. Universities in Uganda have thus continued to struggle under the burden of limited funding and increasing expenditure occasioned by increased enrolment [25]. Recently, UN made a universal call to action by UN member states including Uganda to ensure peace and prosperity by 2030. With respect to higher education, UN goal focus on ensuring inclusive and equitable quality education, with emphasis on continuous human capital development through lifelong learning [3]. However, these ambitious educational goal could be hampered by financial shortage, and intrusive factors such as COVID-19 pandemic, globalization,

and rapid technology advancement [1, 26, 38].

In Uganda, human capital development through equitable access to quality higher education and skilling programs has been earmarked as one of the key strategies for achieving the National Development Plan (NPD). However, in spite of the limited funding and support to universities, especially private universities, the outbreak of COVID-19 pandemic in the late 2019 exacerbated the situation by causing widespread disruptions of education at all levels, hence threatening the future of higher education and achievement of UN and NDP educational goals [1, 3]. Thus, governments and managers of higher education institutions have been grappling with how to ensure continuity of teaching-learning in the midst of the COVID-19 pandemic [1, 10, 25]. Coincidentally, the dynamics of COVID-19 pandemic predicated the need for urgent adoption and scale up of ICT given its pivotal roles witnessed in higher education [6, 1, 25]. At the beginning of the first wave of the pandemic in March 2020, NCHE established guidelines and standards for implementation of emergency Online, Digital, and electronic Learning (ODeL) modes to help universities and other tertiary institutions (HEIs) to develop and operationalize their eLearning programmes [9, 1, 25]. Specifically, the intended ODeL was planned to serve the following learning purposes: (a) traditional distance education; (b) eLearning provision; (c) blended learning; and (d) virtual education [9, 25]. However, many of the local institutions were strategically ill-prepared to effectively adopt and switch to digital and remote learning in such a short time, in spite of available ICT resources [1]. Sighting challenges ranging from policy and curriculum deficit, to lack of staff and student preparedness, coupled with financial and administrative difficulties [9, 1]. As a result, the implementation of ODeL was highly irregular leading to many of the universities switching, initially, to an emergency blended learning-teaching and, shortly afterwards, back to full scale physical engagement with its attendant risks [10]. With the new onslaught of COVID-19 instigated by the second wave of infections, many of the reported cases were detected in the universities, leading to a second lockdown of all education institutions [1, 10]. Clearly, this inability for universities to effectively adopt and sustain to digital and virtual mode of operations demonstrated a strategic mismatch between ICT and higher education systems [4, 9, 1, 25].

Nevertheless, beside COVID-19 experience, there is pronounced shift in educational focus in line with global and national education vision, advocating for equal access to tertiary education, as part of the promotion of lifelong learning [26, 25, 3]. By definition, lifelong learning comprise of all learning endeavors undertaken throughout individual life with the aim of improving knowledge, skills and competencies [26, 39]. Thus, the phrase “lifelong learning” embraces both the formal and informal education. In the traditional (didactic) education setting, education system is institutionalized and planned through public organizations and recognized private agents. Whereby, educators create a rigid curriculum and framework that learners follow, and design training interventions by tailoring the time requirements, objectives, goals and resources. Learners would then follow this pre-set journey to reach their educational goals [26, 39, 27]. While informal learning is the term given to education process, which are characterized by unstructured learning approaches, and takes place away from formal learning settings [26, 27]. Comparatively, whereas formal learning has rigid pathways, clear objectives, time restrictions and exclusive, informal learning is undertaken throughout life, flexible, open-access, self-directed and inclusive [26, 27]. Therefore, the vision of the global education community – as posited by lifelong learning notion, advocate for inclusive and quality education, which embraces both formal and informal education [26, 39, 27]. Commensurately, ICT play a major role by enhancing flexibility, accessibility,

and self-directed learning environment [28, 3, 18, 8]. Altogether, beside COVID-19 pandemic experience and lifelong learning notion, globalization and technology advancement would present their own reasons to warrant the cause for the intended change in strategic direction [4, 3, 35, 3]. Therefore, this study contribute towards the cause by providing strategic insight into the emerging educational trends for a systematic, results-oriented discourse on the future of higher education in the age of ICT and emerging education focus [4, 3].

3. ICT integration with Higher Education

Recently, university inability to adopt and sustain to digital and virtual mode of engagement during COVID-19 lockdown could be a manifestation that ICT was not effectively realigned with education systems, in spite of the available ICT resources [4, 9, 1]. Until recently, higher education have continued to borrow selective episodes of ICT practices in their operations, while ICT innovations have progressively advanced with focus now on artificial intelligence [6, 11, 8, 13]. Contrarily, this article advocate for a fundamental change in approach to ICT establishment in pedagogical educational environment [4, 3]. Earlier on, various studies have proposed different approaches to ICT integration with higher education systems. Among them, Wang [40] and Mishra & Koehler [41] proposed a generic model for ICT integration with education systems, envisaging education system into three perspectives – pedagogy, social interaction, and technology. These perspectives could be associated with any learning situation, and a sound design of these elements would enhance effective ICT integration with education systems. According to Shah [34], the pedagogical approach of a constructivist learning environment should have the capacity to support and fulfill various needs and intentions of the learners, including flexibility in learning mode and objectives [42]. While Cassidy and his colleagues [42] defines flexible learning as "a pedagogical approach allowing for flexibility of time, place, contents, and audience". Hence, ICT would enhance pedagogy flexibility by promoting accessibility and self-directed learning multiple ways [43, 42, 26].

On the other hand, engagement theory and Wang's perspective of social interactions emphasize meaningful engagement in learning environments through interaction among learners and instructors [34]. Whereby, such engagement could occur without the use of technology, however, it is believed that technology would facilitate engagement in ways which are otherwise difficult to accomplish through traditional learning approaches [34, 7]. Altogether, engagement theory and the social interaction perspective of Wang's model focus on effective interactions between learners-learners, and learners-instructors. Where learning is considered a social process in which learners collectively construct knowledge through sharing, negotiating, questioning, and modifying the information in a group [7]. Thus, the technological component plays a vital role in ICT integrated learning environment [45]. In this case, the availability and easy access of digital devices as well as internet are the prerequisites for an effective technology oriented learning environment [42, 7]. Therefore, in both situations, availability of technological reinforcements navigates sound design of pedagogy and social interactions [34, 7]. According to Tuckman & Monetti [45], the use of computer mediated class activities would result in significantly better results than teaching the class in a traditional way [14, 11, 13]. While Makewa, and his colleagues [7] study established a positive and strong relationship between competence and application of ICT in teaching-learning, implying that the higher the competence, the greater the possibility of educators to integrate ICT in teaching-learning process [4, 7].

Subsequently, the overall process of ICT integration with higher education system would then be greatly guided by the extent to which the policy and curriculum stipulate and emphasize a particular pedagogical paradigm [4, 34, 8]. Notably, from the vision of the global education community and pedagogical design of a constructivist learning paradigm, teaching-learning approaches is shifting away from the traditional (didactic) learning approaches to flexible and self-directed pedagogy [34, 45]. For instance, in a didactic learning environment, curricula are traditional in process and contents, with main emphasis on reproduction of skills, and whole-class teaching-learning, where learners work in the same sequence, time and pace. In this case, ICT use would certainly be confined to structured activities under the guidance of individual instructors, without much room for exploration by individual learner, or between learners-learners, and learners-instructors [4, 11, 7]. On the other hand, when curricula stipulate prescriptions of contents and processes with respect to ICT – such as compulsory ICT courses in the faculty curriculum – or when examination guidelines stipulate explicitly the use of ICT, some uses of ICT by instructors or students may be selectively stimulated or restricted [11, 7]. However, in the new pedagogical design of a constructivist learning environment, more flexible and student-directed learning methods would require a proficient forms of ICT use to support the newer forms of pedagogy, and would probably require teachers to be proficient not only in ICT, but also in new pedagogical requirements [2, 34, 7]. Therefore, the extent to which ICT is intended for use in the core curriculum will impact on policy decisions regarding ICT adaptations that may be required in the formal curriculum. Overall, for the changes to be effective, it should formally be emphasized and embraced across all the spectrum of educational systems and curriculum design, thus from policy and strategic levels up to tactical and implementation levels [4]. Systematically, taking into consideration the key educational resources involved in the change process. Figure 1 illustrate the hierarchal architecture of higher education system, and potential intrusive factors [25].

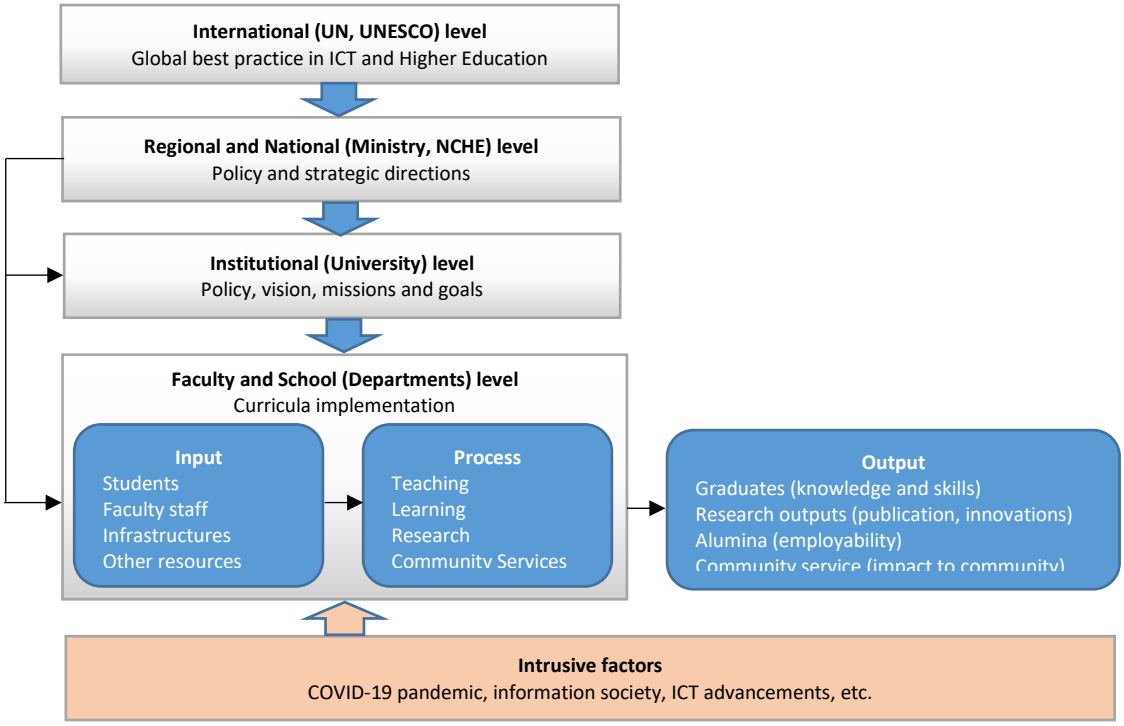

Figure 1: Hierarchal architecture of higher education system, and intrusive factors [25]

Altogether, the nature of the changes that the introduction of ICT into the school curriculum brings about would be conceptualized from the perspective of an education system orientation [4, 3, 34, 8]. Thus, the changes should be conceptualized and embraced across the different hierarchal levels of higher educational system (Figure 1), from policy and strategic levels up to tactical and implementation levels accordingly [46, 3]. Therefore, in line with the study gaps and literature evidence accrued, the integration process would flow through the hierarchal architecture of higher education system, taking into consideration the *policy development, curriculum design, ICT infrastructure, and staff and students competence* accordingly [4, 34, 46, 8, 3]. According to UNESCO [46], three distinctive roles of ICT could be identified and differentiated from the perspective of an education system orientation, and would include; 1) '*Learning about ICT* – which refers to ICT as a unit of learning in the faculty curriculum, such as computer applications, computer literacy, and information systems; 2) '*Learning with ICT*' – which refers to the usage of ICT such as digital resources, online resources, the Internet or the Web, as a medium to enhance teaching-learning or as a supplement for the other media without altering the views about teaching-learning methods; and 3) '*Learning through ICT*' – which refers to the integration and alignment of ICT as an essential tool into a course and curriculum, such that the teaching-learning of that course and curriculum is no longer possible without ICT methods. Similarly, the study adopted UNESCO [46] approaches of conceptualizing and differentiating ICT roles in teaching-learning. Overall, ICT requirements would then be conceptualized and tailored to correspond to these three distinctive roles; '*learning about ICT*', '*learning with ICT*' and '*learning through ICT*' accordingly [3, 8].

Notably, *learning about ICT* and *learning with ICT* conform to the traditional (didactic) learning approaches, where ICT is integrated with the learning of traditional subject matter, but without much changes in the beliefs about teaching-learning methods [46]. However, *learning with ICT* would require more profficient ICT rquirements compared to *learning about ICT* [11, 8, 13]. Contrarily, this study focused on *Learning through ICT*, which is a fundamental change demanding for a new pedagogical design of constructivist learning environment [2, 34]. The change process advocate for a comprehensive shift in the perspective of ICT use to support newer forms of pedagogy, and would require teachers to be proficient not only in ICT requirements, but also in the new pedagogical approaches [2, 34, 8]. Evidently, the strategic gap in *Learning through ICT* was manifested through university inability to effectively adjust to eLearning mode of operations during COVID-19 pandemic, despite available ICT resources [1]. For this reason, this study propounds to fortify ICT roles by providing information and knowledge necessary to guide higher education planners to strategically prepare and reposition higher education for the new pedagogical requirements [4]. Therefore, with respect to ICT and higher education systems, the study was guided by the following research questions; What kind of pedagogical challenges did Ugandan universities experience in forging continuity in teaching-learning using ICT during COVID-19 pandemic lockdown? What are the global best practices in ICT and higher education operations in the new pedagogical design of constructivist learning environment? What are the gaps in ICT and higher education operations with respect to pedagogical challenges experienced by Ugandan universities during COVID-19 pandemic lockdown? What strategies can be recommended to address pedagogical challenges experienced by Ugandan universities during COVID-19 pandemic lockdown? In providing answers to these research questions, the following methodology was adopted.

4. Methodology

With respect to the study plan, the study adopted qualitative study approach, using scoping literature review techniques and content analysis methods of extracting evidence. Commensurately, the research approach was considered appropriate for studying new and emerging subject concepts, which are less precise for systematic review techniques [47, 48]. Notably, the key concepts in this study are contemporary and emerging ideas in the field of ICT and higher education [4]. In this case, the relevant literatures and documents were identified and scrutinised in line with the key concepts in the domain of ICT and higher education. Using the relevant literatures and documents, the key concepts were critically examined and merited to provide the required evidence necessary to answer the research questions, which later helped the researcher to substantiate on the final decisions, discussions and recommendations of the study. With respect to the global best practices in ICT and higher education, comparative analysis process was performed to reciprocate the identified gaps with the global best practices. More especially, the identified gaps with reference to the pedagogical challenges experienced by Uganda universities during COVID-19 pandemic lockdown [9, 1, 25]. Subsequently, a reflective analysis was performed to recommend the appropriate strategic options, and the details of the results and the finding are presented in the following sections.

5. Presentation of results

Logically, the results and the findings are presented in line with the research questions, highlighting the key pedagogical challenges identified and the global best practice in ICT and Higher Education operations. Therefore, with respect to research questions, the results and the finding provided answers to the following research questions; What kind of pedagogical challenges did Ugandan universities experience in forging continuity in teaching-learning using ICT during COVID-19 pandemic lockdown? What are the global best practices in ICT and higher education operations in the new pedagogical design of constructivist learning environment? What are the gaps in ICT and higher education operations with respect to pedagogical challenges experienced by Ugandan universities during COVID-19 pandemic lockdown? What strategies can be recommended to address the pedagogical challenges experienced by Ugandan universities during COVID-19 pandemic lockdown? Altogether, the research questions were ably answered, and the results and the findings are systematically presented in the sections below:

6. Pedagogical challenges identified

Overall, Uganda is home to 39 registered private universities and 11 public universities with the current enrollment of 258,866 students [10, 25]. Evidently, all universities in Uganda were strategically ill-prepared to effectively switch to digital and virtual mode of operation, in spite of the available ICT resources [9, 1, 25]. Relatively, private universities were affected more compared to public universities [9, 1]. The key pedagogical challenges arose mainly from policy and curriculum deficit, lack of ICT resources, and lack of staff and student preparedness [9, 1]. As a result, the implementation of the intended ODeL was highly irregular leading to many of the universities switching, initially, to an emergency blended teaching-learning and shortly afterwards, back to full scale physical engagement with its attendant risks [9, 1, 10]. Clearly, this inability for universities to

adopt and sustain to digital and virtual mode of engagement demonstrated a strategic mismatch between ICT and higher education systems [4, 1, 25]. From the literature evidence accrued, the study identified the following key pedagogical challenges experienced by universities; a) lack of pedagogical flexibility, b) inefficient social interactions, c) lack of self-directed and independent learning, e) restricted mode of assessment, and d) lack of staff and students competence [9, 1, 25]. For each of the challenges identified, the study recommended appropriate strategic option based on the global best practice in ICT and higher education [4, 3]. Table 1 summaries the key literatures indicating the pedagogical gaps, and the corresponding global best practices in ICT and Higher Education accordingly.

Table 1: Pedagogical gaps identified, and global best practices in ICT and Higher Education

Pedagogical gap	Literature references	Global best practices	Literature references
Lack of pedagogical flexibility	(Nawangwe and his colleagues 2021; NCHE 2020; MoES 2020; UNESCO 2020)	Blended learning supported by both ICT and physical mode of engagement	(Siemens & Matheos 2022; Bongani, Oluwatoyin & Olufemi, 2022; NCHE 2020; Worldbank 2020; Shah 2019; Hrastinski, 2019; Boelens, Wever & Voet, 2017; Witthaus and his colleagues 2016; Cassidy and his colleagues 2016)
Inefficient social interactions – collaboration	(Tweheyo & Mugarura 2021; Nawangwe and his colleagues 2021; NCHE 2020; MoES 2020)	Ubiquitous interaction supported by face-to-face and online interactions such as social media, and web based systems.	(Mutebi and his colleagues 2022; Siemens & Matheos 2022; NCHE 2020; UNESCO 2020; Greenhow, 2016; Lewin, 2016)
Lack of self-directed and independent learning	(Tweheyo & Mugarura 2021; Nawangwe and his colleagues 2021; NCHE 2020; MoES 2020)	Synchronous and asynchronous learning modes supported by physical, digital and online resources, including multimedia contents	(Siemens & Matheos 2022; UNESCO 2020; Hockings and his colleagues 2018)
Restricted mode of assessment	(Tweheyo & Mugarura 2021; Nawangwe and his colleagues 2021; NCHE 2020; MoES 2020)	Multiple form of assessment: summative, formative, computer-based and online assessment such as quizzes and tests, including peer-assessment and self-assessment	(Siemens & Matheos 2022; UNESCO 2020; Ishfaq 2020; MoES 2020; Seifert & Feliks, 2019; Bhat, 2019)
Lack of staff and students competence	(Bongani, Oluwatoyin & Olufemi, 2022; Tweheyo & Mugarura 2021; Nawangwe and his colleagues 2021; NCHE 2020; MoES 2020; Yango & Ngussa 2014)	Staff development and support in ICT and pedagogy approaches	(Siemens & Matheos 2022; Kohnke, 2021; UNESCO 2020; Wasserman & Migdal, 2019; Cubeles & Riu, 2018; Tondeur, 2016; Tallvid, 2016)

a) Lack of pedagogical flexibility: According to Shah [34], pedagogical components of a constructivist learning environment should have the capacity to support and fulfill various needs and learning intentions of the learners, including flexibility in learning mode and

objectives [42]. While, Cassidy and his colleagues [42] defines flexible learning as "a pedagogical approach allowing for flexibility in time, place, contents and audience [42]. During COVID-19 lock down, universities were devoid of strategic options except to foster business continuity through digital and online methods of engagement [9, 1, 25]. Coincidentally, various universities were quick to realize the critical role of ICT during COVID-19 lockdown, but were strategically ill-prepared to adopt and sustain to digital and online methods of engagement [1, 25]. Evidently, various institutions did not meet the minimum requirements to operate online or virtually [1, 10, 25]. Nevertheless, effective adoption of digital and online learning method would have provided universities with flexible options to adjust to eLearning mode [4, 9, 25, 49]. From the global best practice in ICT and higher education operations, blended learning approach would enhance pedagogy flexibility in higher education [43, 50, 51, 42]. In this case, blended learning would be a key strategic option introduced in higher education systems as a effective approach to pedagogy flexibility, other than considering it as optional supplement to the traditional (didactic) learning approach [4, 49, 50, 51, 52, 42].

b) Inefficient social interaction (collaboration) among learners and instructors: In a pedagogical design, learning is considered a social process in which learners collectively create knowledge by sharing, negotiating, questioning, and modifying the required information in a group settings [7]. Engagement theory and Wang's perspective of social interactions emphasize meaningful engagement in learning activities through interaction among learners and instructors [49]. Whereby, such engagement could happen without the use of technology, however, it is believed that technology would facilitate engagement in ways which are otherwise difficult to achieve through traditional learning approaches [49, 7]. However, despite available ICT resources, the experience of COVID-19 lockdown demonstrated that over 30% of university students were not reachable during COVID-19 lockdown [1]. Technically, the availability of technological reinforcements would have helped to navigate sound design of pedagogy and social interaction among learners and instructors [49, 53]. Thus, the technological component would provide a vital role in ICT integrated learning environment [7, 53]. In this case, availability and easy access to digital devices, social media, as well as internet are the prerequisites for an effective technology oriented learning environment. Social media allows for classroom activities to be extended outside of the school and gives the students time to collaborate through different medium [54, 55, 56]. Thus, digital devices, social media, and internet would be key strategic option introduced in higher education systems to enhance the effectiveness and efficiency of social interaction among learners and instructors, other than considering it as optional supplement to didactic learning approach [4, 49, 42].

c) Lack of self-directed and independent learning: Self-directed learning can be defined as a process in which individuals take the initiative, with or without the assistance of others in examining their learning requirements, formulate learning goals, identify learning resources, and choose and implement suitable learning strategies [57, 58]. Independent learning is an education process where learners have control and ownership over their learning process, they can learn by their own actions and direct, regulate, and could assess their own learning process [59]. In the traditional education settings, instructors make inflexible curriculum and structure that learners follow, and plan training interventions by tailoring the time requirements, as well as objectives, goals and resources. Learners then follow this pre-set journey to reach their goals [34, 26, 27]. However, during COVID-

19 lockdown, the effectiveness of the traditional (didactical) strategy of lecturers presenting lecture resources directly to their students was disapproved by COVID-19 lockdown [49, 1, 10, 25]. The new pedagogical approach would present curriculum strategies that focus on how specific students could independently learn in different ways [59, 58]. In this case, ubiquitous learning, promoted by online resources, digital devices and multimedia contents would be key strategic option introduced in higher education systems as effective and flexible methods of independent and self-directed learning, other than considering it as optional supplement to didactic learning approaches [4, 1, 25, 49, 9, 59, 42].

d) Restricted mode of assessment: the traditional mode of assessment in Ugandan universities are restricted to physical mode in both summative and formative assessments [9]. Summative assessment evaluate how much a student has learned at the end of the teaching sessions, while formative assessment evaluate in "real time" how much a student has learned, and could include physical quizzes, continuous tests and assignments, which are taken to explain student's thinking, and group projects [60, 61]. In term of flexibility, summative assessment have the highest stake with the lowest level of flexibility, while formative assessment are characterized by moderate level of flexibility [60, 61, 62]. However, both summative and formative assessment are often organized through restricted mode of physical engagement [1, 3]. During COVID-19 lockdown, many students and lecturers were excluded from assessment process due restricted schedules in time, and space imposed by the lockdown [9, 1, 10]. However, a more flexible method of assessment could have salvaged the situations [62]. In this case, computer-based and online assessment method would be a key strategic option introduced in higher education systems as alternative mode of assessment, other than treating it as optional supplement to didactic learning approaches [4, 1, 25, 49].

e) Lack of staff competence: *Learning through ICT* is a fundamental change demanding for a new pedagogical design of constructivist learning environment [2, 34]. The change process advocate for a fundamental shift in the perspective of ICT use to support newer forms of pedagogy, and would require instructors to be proficient not only in ICT usage, but also in new pedagogical requirements [2, 34, 8]. Evidently, the strategic gap in *Learning through ICT* was manifested through university inability to effectively adjust to eLearning mode of operations during COVID-19 pandemic, despite available ICT resources [1]. Hence, lack of staff competence was among the key challenges witnessed during COVID-19 lockdown [9, 1, 10]. In the new pedagogical design of a constructivist learning environment, more flexible and student-directed learning approaches would necessitate a proficient forms of ICT use to support newer forms of pedagogy, and would require instructors to be proficient not only in ICT use, but also in new pedagogical requirements [63, 64, 65, 7]. Makewa and his colleagues [7] study established a positive and strong association between staff competence and application of ICT in teaching-learning, implying that the higher the level of competences, the greater the possibility for instructors to integrate ICT in teaching-learning process [66, 67, 7]. In this case, staff development and support would be the key strategic option introduced in higher education systems as alternative option for effective integration and implementation of ICT and pedagogy, other than treating it as optional supplement to didactic learning approaches [4, 1, 25, 49, 9].

7. Strategic guide to ICT integration with Higher Education systems

With respect to teaching-learning paradigms, two distinct approaches stood out as the possible teaching-learning strategies during COVID-19 lockdown; traditional (didactic) learning approaches, and pedagogy approaches [9, 1, 10, 34]. Each of these two approaches determines how ICT and higher education systems can be integrated [4, 3]. With respect to Uganda higher education, the integration process would take into consideration educational policy and curriculum design [9, 25, 10]. Strategically, ICT integration could be tailored to suit the following learning goals; "*Learning about ICT", "Learning with ICT",* and *"Learning using ICT*. " 1) *Learning about ICT* deals with selective changes in policy and curriculum design, with retention in didactic approaches and appropriate changes in ICT requirements. 2) *Learning using ICT* deals with nonselective changes in policy and curriculum design, with retention in the didactic approaches and appropriate changes in ICT requirements. 3) *Learning through ICT* deals with fundamental changes in policy and curriculum design, with proficiency in pedagogical approaches and ICT requirements. Altogether, Figure 2 illustrate the flow chart concept of higher educational systems, fitting together the activities of higher education paradigms, education resources and ICT roles accordingly.

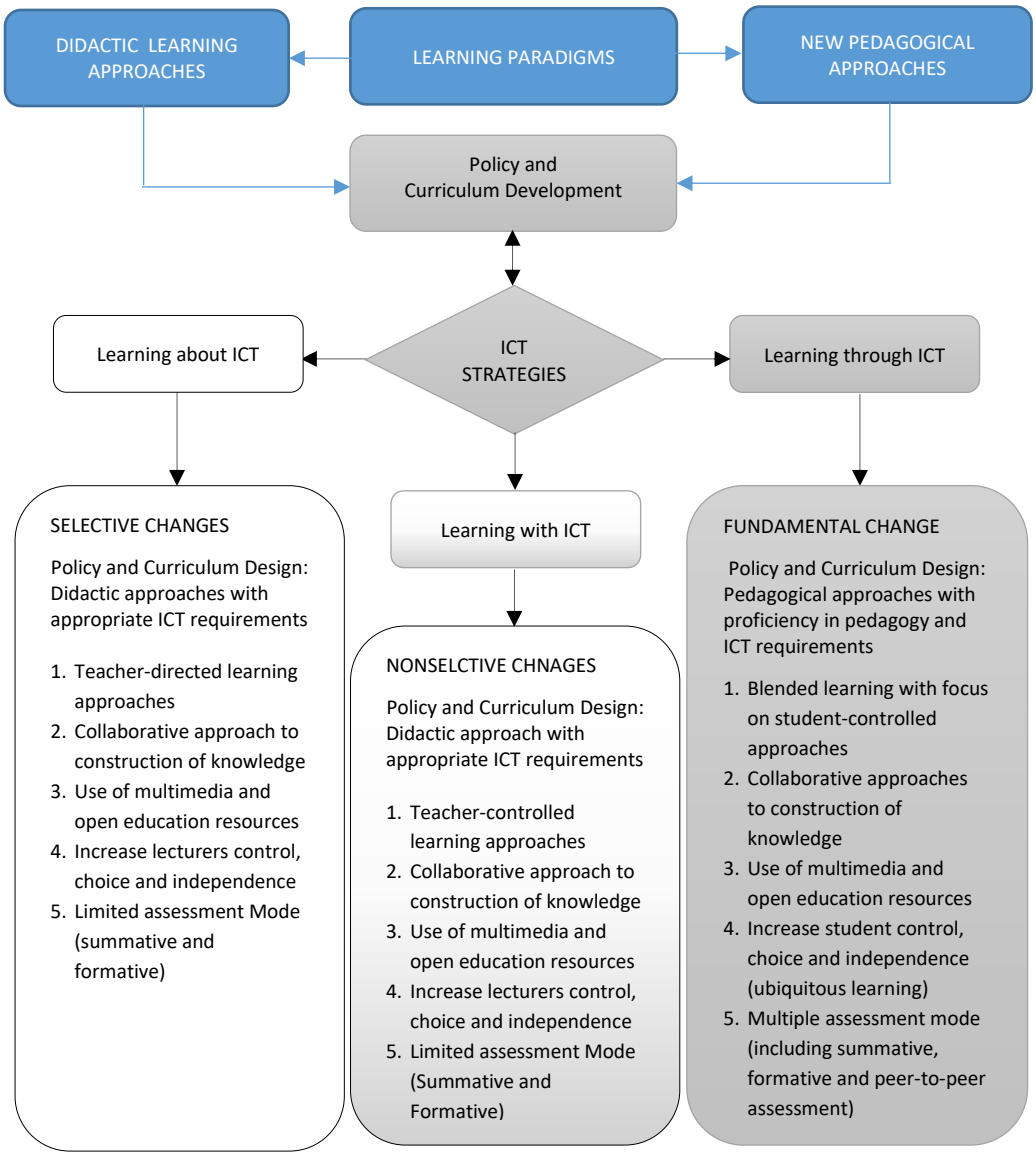

Figure 2: Guide to strategic integration of ICT and higher educational system

From the flow chart guide above (Figure 2), the key concepts were derived based on the evidence extracted from the literatures (Table 1). The general intention of the chart is to inform the integration process of ICT with Higher Education systems. Structurally, at strategic and policy level, educational paradigm would explains teacher-controlled learning approaches – didactic, and student-directed learning approaches – pedagogy [34]. For teacher-controlled learning approaches, the teacher would control the learning process by determining the learning process as would be guided by the policy and curriculum design [4, 3, 34]. While in student-directed learning, students would be facilitated to determine the learning process as would be guided by policy and curriculum design [4, 3, 34]. In the latter case, the teacher would perform more of facilitation roles than directing the learning process. Subsequently, ICT resources would then be conceptualized and tailored to correspond to these three distinctive roles; '*learning about ICT*', '*learning with ICT*' and '*learning through ICT*' accordingly [3, 8]. Notably, *learning about ICT* and *learning with ICT* conform to the traditional (didactic) learning approaches, where ICT is integrated with the learning of traditional subject matter, but without much changes in the beliefs about teaching-learning methods [46]. However, *learning with ICT* would require more proficient ICT resources compared to *learning about ICT* [11, 8, 13]. Contrarily, this study focused on *Learning through ICT*, which is a fundamental change advocating for a new pedagogical design of constructivist learning environment [2, 34]. The change process would then advocate for a comprehensive shift in the perspective of ICT use to support newer forms of pedagogy, and would require teachers to be proficient not only in ICT usage, but also in new pedagogical requirements [2, 34, 8]. Nevertheless, this guideline is not intended to substitute the traditional methods of teaching-learning, but to strengthen and pave way for the new pedagogical approaches [1].

8. Discussion of results and findings

With respect to this study, the key pedagogical challenges manifested during COVID-19 lockdown include lack of pedagogical flexibility, and inefficient social interaction among learners and instructors. The other emanating challenges include lack of self-directed and independent learning, restricted mode of assessment, and lack staff competence in ICT and pedagogical requirements. According to Cassidy and his colleagues [42], flexible learning is a pedagogical approach allowing for flexibility in time, place, contents and audience [42]. In a pedagogical design, learning is considered a social process in which learners collectively construct knowledge through sharing, negotiating, questioning, and modifying the information in a group [4]. However, during COVID-19 lockdown, over 30% of university students were not reachable due to breakdown in collaboration and communication means [9, 1, 10]. Remarkably, various universities were quick to realize the communication gaps and the critical role of ICT during COVID-19 lockdown, but were strategically ill-prepared to adopt and sustain to digital and online methods of engagement [1, 25]. Evidently, several institutions did not have permissible requirements to operate online or virtually [9, 1, 25]. Otherwise, effective adoption of digital and online methods of engagement would have provided universities with flexible options to adjust to eLearning mode of operations irrespective of COVID-19 lockdown. Technically, availability of technological

reinforcements would navigates sound design of pedagogy and social interaction among learners [34, 7]. Thus, the technological component would play a vital role in ICT integrated learning environment [4]. Despite the limitations, availability and easy access of digital devices as well as internet would be the pre-requisites for an effective technology oriented learning environment. [4, 9, 49]. Therefore, from the global best practice, blended learning approaches, digital devices, social media, web-based systems, and internet would enhance pedagogy flexibility and social interaction in higher education [43, 42]. In this case, blended learning, digital devices, and internet technology would be key resources embraced in higher education policy and curriculum as alternative option for effective delivery of flexible pedagogy, and social interactions, other than considering it as optional supplement to didactic learning approaches [4, 49, 42].

Relatively, in a traditional (didactic) education setting, educators create a rigid curriculum and framework that learners follow, and design training interventions by tailoring the time requirements, objectives, goals and resources. Learners then follow this pre-set journey to reach their goals [26, 27]. Meanwhile, the pedagogical approaches enhance self-directed and independent learning [26]. During COVID-19 lockdown, the effectiveness of didactical strategy of teachers presenting lectures directly to their students was disapproved [1, 25]. However, pedagogical approach would involve coming up with teaching strategies that would focus on how students learn in different ways irrespective of time, space, content, and delivery mode [4]. In this case, ubiquitous learning, supported by multimedia contents, and asynchronous learning approaches would be the appropriate practice introduced in higher education policy and curriculum as alternative option for effective delivery of self-directed and independent learning, other than handling it as optional supplement to didactic learning approaches [4, 25, 49, 9, 42]. Similarly, the traditional mode of assessment in Uganda's universities are mainly physical mode, consisting of summative assessment which contribute 60%, and formative assessment 40%, leaving out the other form of assessment such as online, computer-based, and self/peer-assessments. In term of flexibility, summative assessment have the highest stake and the lowest level of flexibility, while formative assessment have relatively moderate level of flexibility, and the other form of assessment would provide highest level of flexibility suitable for lockdown situations and new pedagogical demands. During COVID-19 lockdown, many students and lecturers were excluded from assessment process mainly due to less flexible nature of the assessment mode. Hence, the affected students and staff could not fit into the emergency (ODeL) call to participate in the assessment process. In this case, online quizzes and self/peer-assessment would be the key strategic option introduced in higher education policy and curriculum as alternative option for flexible mode of assessment, other than handling it as optional supplement to didactic learning approaches [4, 1, 25, 49, 42]. More so, in the new pedagogical design of a constructivist learning environment, more flexible and student-directed learning methods would require a proficient forms of ICT use to support newer forms of pedagogy, and would certainly require lecturers to be more proficient not only in ICT, but also in new pedagogical approaches [9, 1, 68].

9. Recommendation and Conclusion

This study was conducted to interrogate the level of preparedness of Uganda's higher education and the role of ICT in the era of COVID-19 pandemic and its aftermath. The study was instigated by the dynamics of COVID-19 pandemic, which predicated the need for urgent adoption and scale up of ICT in education operations.

However, universities in Uganda were strategically ill-prepared to adopt and sustain to digital and online methods of engagement, sighting problems ranging from policy and curriculum deficit, to lack of staff and student preparedness, as well as financial deficit. Ideally, the inability for universities to adopt and sustain to available ICT resources demonstrated a strategic mismatch between ICT and higher education systems. In response, this study was intended to address the salient gap by identifying the key pedagogical challenges and recommend appropriate strategic options based on the global best practice in ICT and higher education operations. Procedurally, the study adopted qualitative study approach, using scoping literature review techniques and content analysis methods of extracting evidence. By way of reflective analysis and scrutiny, the study sought to establish how various universities responded to the COVID-19 lockdown, while identifying relevant information and knowledge in the domain of ICT and higher education systems. Hence, data analysis followed a more descriptive approach, linking the identified gaps with the global best practices. Subsequently, the general implication of the study finding is that the current education systems lack flexibility in pedagogical design. The key challenges identified include lack of pedagogical flexibility and inefficient social interaction among learners-learners, and learners-instructors, lack of self-directed and independent learning, restricted mode of assessment, and lack staff competence in ICT and pedagogy approaches. Hence, this study aimed to address the gap by providing strategic guidelines (Figure 2) and recommendations to higher education planners to reevaluate and formally integrate ICT functions with education systems [4].

Therefore, from the global best practice, the study recommend blended learning approaches to enhance pedagogy flexibility, while digital devices, online resources, and internet would enhance social interaction between learners-learners, and learners-instructors [43, 42]. Altogether, the study recommend blended learning, digital devices, and internet technology as key strategies to formally be incorporated into higher education policy and curriculum as alternative option for effective delivery of pedagogy and social interactions, other than considering them as optional supplement to didactic learning approaches [4, 49, 42]. On the other hand, ubiquitous learning, supported by digital and online systems, multimedia contents, and asynchronous learning approaches would be the recommended best practice to incorporate into education policy and curriculum as alternative option for effective delivery of self-directed and independent learning [4, 25, 49, 9, 42]. Notably, lack of staff competence was among the prominent challenges witnessed during COVID-19 lockdown [1]. In the new pedagogical design of a constructivist learning environment, more flexible and student-directed learning methods would require a proficient forms of ICT use to support newer forms of pedagogy, and would certainly require lecturers to be more proficient not only in ICT, but also in new pedagogical approaches. Hence, the study recommend concerted staff development in ICT and pedagogy competences [69]. Altogether, this study contribute towards the cause by providing strategic insight into the current and emerging educational trends for a systematic, results-oriented discourse on the future of higher education in the age of ICT and emerging education concepts [4, 71, 72]. However, beside COVID-19 pandemic experience and lifelong learning notion, globalization and rapid technology advancement could present their own reasons to warrant the need for the cause of change in strategic direction, the study further recommend for empirical study to be conducted to substantiate the associations between the pedagogical gaps and corresponding intrusive factors accordingly [68, 70].

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