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Digitalization of Higher Education in Ethiopia

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This article was not written with the assistance of any Artificial Intelligence (AI) technology, including ChatGPT or other support technologies.

Abstract

This paper examines the digitalization of higher education in Ethiopia. It mainly focuses on better understanding the policies, practices, and challenges of digitalization of higher education in the country. The necessary data were mainly generated from continental, national, and institutional policy and strategy documents. Publicly available transnational and national reports and other documents and the author's views and lived experiences were also used to substantiate data generated through policy review. The data were analyzed using deductive thematic analysis. The themes were mainly developed based on prior research and existing literature. The findings indicate that there are sufficient and feasible policies and strategies to promote and ensure the digitalization of higher education in Ethiopia. The findings also reveal that there are initiatives that promote the practice of digitalization of higher education. However, poor internet connection, lack of adequate ICT infrastructure, lack of skilled human resources, and staff resistance to change were found to be the major barriers to enhancing the digitalization of higher education in Ethiopian higher education. The results imply that having feasible policies and strategies is a necessary but insufficient condition to ensure effective implementation of digitalization of higher education. It necessitates the government's commitment as well as a shift in focus from the expansion of HEIs, which was the case in the last two decades, to ensuring the quality and relevance of HEIs through digital transformation.

Keywords: digital transformation, digitalization, Ethiopia, higher education, ICT

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አህጽሮተ ጥናት

ይህ ጽሁፍ በኢትዮጵያ የከፍተኛ ትምህርት ዲጂታላይዜሽን ያለበትን ሁኔታ ይመረምራል። ጽሁፉ በዋነኝነት የሚያተኩረው ዲጂታላይዜሽንን በተመለከተ በሀገሪቱ ውስጥ ያሉ የከፍተኛ ትምህርት ፖሊሲዎች፣ አሰራሮች እና ተግዳሮቶችን በተሻለ መልኩ መረዳት ላይ ነው። ለጽሁፉ አስፈላጊ የሆኑ መረጃዎች በዋናነት የተገኙት ከአህጉራዊ፣ አገራዊ እና ተቋማዊ የፖሊሲና ስትራቴጂ ሰነዶች ነው። ከነዚህ በተጨማሪ በኢደባባይ የሚገኙ ሀገራዊ እና ሀገር-ዘለል ሪፖርቶች እና ሌሎች ሰነዶች እንዲሁም የአጥኚው እይታ እና የህይወት ተሞክሮዎችም በፖሊሲ ግምገማ የተገኙ መረጃዎችን ለማረጋገጥ ጥቅም ላይ ውለዋል። መረጃው ዲዳክቲቭ ጭብጥ የትንታኔ ዘዴን በመጠቀም ተንትኗል። ጭብጦች በዋናነት የተዘጋጁት ቀደም ባሉ ጥናቶች እና አሁን ላይ ያሉ ክለሳ-ድርሳን ላይ በመመስረት ነው። ግኝቶቹ በኢትዮጵያ የከፍተኛ ትምህርትን ዲጂታላይዜሽን ለማስተዋወቅ እና ለማረጋገጥ በቂ እና ሊተገበሩ የሚችሉ ፖሊሲዎችና ስትራቴጂዎች እንዳሉ ይጠቁማል። በተጨማሪም ግኝቶቹም የከፍተኛ ትምህርትን ዲጂታላይዜሽን አሰራርን የሚያበረታቱ ውጥኖች እንዳሉ ያሳያል። ነገር ግን የኢንተርኔት ግንኙነት ደካማ መሆን፣ በቂ የአይሲቲ መሰረተ ልማት አለመኖሩ፣ የሰለጠነ የሰው ሃይል እጥረት እና ሰራተኞች ለውጥን ለመቀበል አለመፈለግ (*resistance*) በኢትዮጵያ የከፍተኛ ትምህርትን ዲጂታላይዜሽን ለማሳደግ በሚደረጉ ጥረቶች ላይ የሚስተዋሉ ዋና ዋና ማነቆዎች ሆነው ተገኝተዋል። የውጤቶቹ አንድምታ እንደሚያመለክተው የከፍተኛ ትምህርትን ዲጂታላይዜሽን ውጤታማ ትግበራን ለማረጋገጥ ሊተገበሩ የሚችሉ ፖሊሲዎች እና ስትራቴጂዎች መኖር አስፈላጊ ቢሆንም ይህ በራሱ በቂ አይደለም። የመንግስት ቁርጠኝነት እንዲሁም የትኩረት አቅጣጫን ባለፉት ሁለት አስርት ዓመታት ውስጥ ከነበረው የከፍተኛ ትምህርት ተቋማት ማስፋፋት ወደ በዲጂታል ትራንስፎርሜሽን ጥራት እና ተገቢነት ማረጋገጥ መቀየርን ይጠይቃል።

ቁልፍ ቃላት፡- ዲጂታል ትራንስፎርሜሽን፣ ዲጂታላይዜሽን፣ ኢትዮጵያ፣ ከፍተኛ ትምህርት፣ አይሲቲ

Introduction

Quality Education is one of the 17 Sustainable Development Goals of the 2030 Agenda of the United Nations, and it aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (United Nations Educational, Scientific and Cultural Organization (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2015). Achieving the objectives of this goal requires digital transformation, among other things. Digital transformation is "a series of deep and coordinated culture, workforce, and technology shifts that enable new educational and operating models and transform an institution's business model, strategic directions, and value proposition" (Grajek & Reinitz, 2019, p. 1). Digital transformation provides higher education institutions (HEIs) with opportunities to facilitate access to quality education and the necessary tools and skills that contribute to ensuring equity in higher education (Kaputa et al., 2022). The higher education sector has well-noted the substantial implications of technological advancement for the development of society and the provision of equitable quality higher education regardless of learners' backgrounds (Chankseliani et al., 2021). That is why most HEIs across the world are striving to integrate digital transformation as part of their institutional strategic plan (Jensen, 2019).

However, the process of digitalization of higher education is not an easy task for least developing countries (LDCs), among others, because of access to the internet. Data from the International Telecommunication Union (ITU) shows that the population using the internet in developed countries and LDCs is 90% and 27% respectively (ITU, 2021). This unequal access to the internet among developed and developing countries leads to "unequal access to information, knowledge, and international networks" (Jensen, 2019, p. 17). In turn, this has an impact on a nation`s global competitiveness and economic development.

The ITU report indicates a significant increase in the number of internet users in the LDCs between 2019 and 2021, and this is mainly because the internet has become a necessity for working, learning, accessing basic services, and keeping in touch more than ever because of COVID-19 pandemic (ITU, 2021) which forced the closure of universities and workplaces and limited social contacts of individuals. National regulatory frameworks and institutional policies also have a significant impact on enhancing the digitalization of higher education. Accordingly, in Africa, many countries (e.g., Botswana, Cameroon, Kenya, Mozambique, Namibia, Senegal, South Africa, and Uganda) have focused on developing national Information and Communication Technology (ICT) policies to support their socio-economic development efforts and policies for ICT in education (Yonazi et al., 2012). However, most African countries are not yet satisfied with the quality of their national internet infrastructure. Yet, in most African HEIs compared to HEIs in other continents, African

HEIs also consider their institutional digital infrastructure as a significant barrier to achieving their missions (Jensen, 2019). Their networks are inadequate to provide service to the university communities because of the levels of broadband connection which are insufficient to support their community beyond the basic uses of digital technology (Bashir, 2020).

Challenges associated with access to the internet and ICT in the LDCs are well-noted, and consequently, the United Nations Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure) targets to significantly increase access to ICT and strives to provide universal and affordable access to the internet in the LDCs by 2030. However, the progress report indicates that "there is a danger that in Africa, where many of the LDCs are located, this target will be missed, both in terms of access and affordability" (ITU/UNESCO Broadband Commission for Sustainable Development, 2019).

The Continental Education Strategy - 2016-2025, which aims to reorient the continent's education and training systems in line with the African Union's vision and Agenda 2063, recommends improving ICT capacity in Africa to improve access, quality, and management of education and training systems (African Union, 2016). To harness digital technologies and innovation and to promote Africa's integration, the African Union also developed a continental digital transformation strategy (2020-2030) that sets out a vision to ensure an integrated and inclusive digital society and economy in Africa by 2030. The African Union considers digital transformation as a driving force for innovative, inclusive, and sustainable growth, the Agenda 2063, and the Sustainable Development Goals (African Union, 2020).

In its continental digital transformation strategy, the African Union emphasizes the importance of developing and implementing national, regional, and continental digital transformation strategies to enable the scaling up of digital initiatives to address developmental challenges affecting the African continent (African Union, 2020). The strategy also identifies digital education as one of its priority areas. The growing focus on the use of digital technologies and digital education for continental development necessitates a digitally skilled workforce. This in turn requires the digital transformation of higher education at national and institutional levels.

Digital transformation has become one of the priority areas for HEIs across the globe (Castro et al., 2020). Ethiopia is one of the African countries that has shown ambition to support its development through a digital transformation at the national (National Planning Commission, 2016) and HEIs levels (Molla, 2018). However, there is a lack of comprehensive studies that show the digital transformation status in Ethiopian HEIs, except reports by the government and different national and international organizations. Accordingly, this study examines the digitalization of higher education in Ethiopia.

Brief Background of Ethiopic and its Higher Education

As indicated in its ten years development plan (2021-2030), the Government of Ethiopia envisions becoming an "African beacon of prosperity" and transforming the country from a largely agriculture-led low-income country to an industrialized lower-middle-income country by 2030 (Federal Democratic Republic of Ethiopia ([FDRE], 2020c). In line with these, the government developed a Homegrown Economic Reform Agenda which mainly emphasizes macroeconomic, structural, and sectoral reforms that enhance investment, job creation, and growth (FDRE, 2020a). Ethiopia considers digitalization as an enabler of the country's development and a key to achieving its development objectives. This is reflected in the second five-year Growth and Transformation Plan (2016-2020), which emphasizes enhancing the ICT infrastructure development as one of the major strategic directions to support the overall developmental process, enhance the competitiveness of the economy, and create job opportunities (National Planning Commission, 2016). To support this plan, in 2016, the government revised the national ICT policy and strategy which was endorsed first in 2009, and it also endorsed the digital Ethiopia 2025 which is a digital transformation strategy for the country's inclusive prosperity (FDRE, 2020b).

Although Ethiopia has one of the oldest public telecommunication service providers in Africa which was established in 1894 (Adame, 2021), its services lag behind its peers (FDRE, 2020a), and it remains one of the least developed in the world (Adame, 2021). The population using the Internet in Ethiopia is 25% (Kemp, 2022) which is lower than the LDCs (27%) and Africa (33%) respectively (ITU, 2021). Ethiopia also lags in key digital indicators compared to other Sub-Saharan African countries, and retaining the national telecom monopoly on all telecommunications services was the main reason for this (World Bank, 2021).

Modern higher education in Ethiopia started in 1950 with the establishment of the University College of Addis Ababa, now Addis Ababa University. Currently, there are about 50 public universities and 278 private and non-government HEIs (Woldegiyorgis & Adamu, 2022). The Ministry of Education (MoE) was leading all levels of education and training in the country until 2018 when the government established the Ministry of Science and Higher Education (MoSHE) to

oversee the development and functions of HEIs and Technical and Vocational Education and Training (TVET) Institutes. However, MoSHE became part of the MoE, a move by the new government of Ethiopia which was established on 4 October 2021. The decision to merge the two ministries is a mirage and came as a surprise to the higher education sector because there is no information and evidence on the success or failure of the former MoSHE (Adamu, 2021). The national and institutional ICT policies were developed by MoSHE and there was a good opportunity to build momentum. MoE could capitalize on what has been started but there is no foreseeable great moment for digitalization as a result of the merger. In Ethiopia, there are four generations of public universities based on their year of establishment. Recently, public universities were also differentiated as Research Universities, Comprehensive Universities, and Universities of Applied Sciences based on their mission and focus (MoSHE, 2020b). Institutional development including digitization is often associated with universities' year of establishment, and accordingly, first-generation universities which are now categorized as research universities have better infrastructure for digitization.

HEIs play significant roles in a country's digital transformation through the creation of knowledge, research, and development, and the provision of high-quality human resources. Similarly, in Ethiopia, higher education has been seen as one of the key sectors that drives the development vision of the country (Molla, 2018). The sector is also expected to contribute to the development of the digital economy that Ethiopia envisions because it plays significant roles in preparing highly qualified personnel, conducting quality research, and generating innovations (Kholiavko et al., 2020). However, thus far, the higher education sector in Ethiopia is not contributing as much as expected to the competitiveness and knowledge-driven economic development of the country. According to Molla (2018), "In the context of 'imported' educational models, …unaddressed structural educational inequalities, …poorly prepared university entrants, and under-qualified academic staff, it is improbable, if not impossible, for a HE system to make a meaningful contribution towards knowledge-driven economic development" (p. 196).

Research Method

The paper used a document and thematic analysis qualitative research methodology that helps to better understand the issues under study based on data available from documents and the author's views and experiences.

Data Collection

The paper uses secondary data sources. Data were mainly generated from continental, national, and institutional policy and strategy documents (Table 1).

Table 1

Secondary Data Sources

Continental	e.g., the continental education strategy for Africa (2016-2025) and the digital transformation strategy for Africa (2020-2030)
National	e.g., education and training policy, education sector development plans, the national ICT policy and strategy, a digital strategy for Ethiopia's inclusive prosperity, ten years development plan, growth and transformation plan II, Ethiopian education development roadmap, a plan for accelerated and sustained development to end poverty, higher education policy and strategy, digital skills country action plan, national ICT policy for higher education and TVET institution, and national ICT strategy for higher education and TVET institution
Institutional	e.g., institutional ICT policy for higher education in Ethiopia

Other data used come from publicly available transnational and national reports and other documents. The documents were selected mainly based on their relevance to achieving the purpose of the study. Except for the education and training policy, which was published about three decades ago, the documents selected for this study have been published since 2015. The author's views and lived experiences (as a teacher, researcher, mid-level leader, and higher education expert

for two decades) regarding the practices of digitalization of higher education were also used to substantiate data generated through policy review. The data were analyzed using a codebook deductive thematic analysis. The themes were mainly developed based on prior research and existing literature. Accordingly, policies, initiatives practices, and factors that daunt digital transformation were identified as major themes.

In the following findings section, I shall first discuss policies and initiatives that promote digital transformations as well as current digitalization practices in HEIs. In the last section, I look at factors deterring digital transformation.

Findings

Policies that Promote Digital Transformation in Ethiopia

National and institutional policies promote the digitalization of higher education as reforms and functions of higher education are often informed through policies. The African Union (2020) also asserted that digital transformation requires appropriate policies. In Ethiopia, the plan to become an "African beacon of prosperity" and boost its digital economy has been supported by different policies and strategies that promote digital transformation at the national level and also in the HEIs. The 2005-2010 Plan for Accelerated and Sustained Development to End Poverty shows the government's plan to enhance ICT infrastructure development (Ministry of Finance and Economic Development (MoFED), 2006). This is associated with improving access to ICT as a means to support the overall developmental process in the country. The second five-year Growth and Transformation Plan (GTP II) also emphasizes enhancing the ICT infrastructure and human development as one of the major strategic directions to increase productivity, enhance the competitiveness of the economy, access timely information to the public, create job opportunities, and generate foreign exchange earnings. The GTP II goes even further, stating that the government provides support and incentive packages to encourage and attract the participation of private enterprises in the ICT sector (National Planning Commission, 2016). The Homegrown Economic Reform Agenda, which is the blueprint to drive the country's economic progress, considers ICT as an integral and essential part of the country's growth strategy (FDRE, 2020a). The ten years development plan (2021-2030) of the country (FDRE, 2020c), and the digital strategy for the country's inclusive prosperity (FDRE, 2020b) also identify ICT as one of the government's priority sectors for job creation, export, and inclusive growth.

In addition to the above policies and strategies that emphasize the relevance of digital technology, the government of Ethiopia also developed the national ICT policy and strategy which sets the direction and pace for the further development of the digital economy in general and the ICT sector in particular. This policy considers education as one of its strategic pillars in the transformation of the Ethiopian economy and society (FDRE, 2016). These national-level policies and strategies show the government's interest in and attention to the digital economy and sustainable development. The policies and strategies also potentially support the development and use of innovation and digital technology in HEIs.

The Education and Training Policy, which was endorsed in 1994, does not provide perspectives regarding digitalization/ICT in education, except recognizing educational technology and facilities as educational support inputs (FDRE, 1994). However, the Education Sector Development Plan V (2025/16-2019/20) also aims to improve "the use of ICT in education by expanding and improving ICT infrastructure at all levels, producing and widely distributing digital education resources and building the ICT skills and capacity of teachers and leaders to support curriculum delivery" (FDRE, 2015, p. 55).

No policies and strategies directly focused on advancing digital transformation in higher education until the establishment of a ministry responsible for science and higher education in 2018. In its three-year lifespan, MoSHE was able to develop different policies and strategies that potentially promote digital transformation in higher education (MoSHE, 2020a; 2020c; 2020e). One of the policies developed by MoSHE is the National ICT Policy for Higher Education and TVET (MoSHE, 2020e). The policy aims to respond to the challenges that academic institutions are facing and exploit the opportunities ICT could provide to enhance the functions of HEIs. The policy also envisaged ICT to improve access, equity, relevance, and quality of teaching-learning, research, administration, community engagement, and the development of the culture of science, innovation, and technology (MoSHE, 2020e, p. 22). The ministry understood that effective implementation of this policy requires high-quality ICT infrastructure. Hence, as indicated in the Higher Education Policy and Strategy, the Ministry envisages establishing a high-end ICT infrastructure as a strategy for ensuring adequate and quality infrastructure conducive to teaching, learning, leadership, management, and research (MoSHE, 2020d, p. 42). It also

developed the National ICT Strategy for Higher Education and TVET (2021-2030). The strategy focuses on achieving "secure, reliable, and integrated technology infrastructure and solutions in alignment with academic, research, community engagement, and administrative goals of higher education and TVET institutions" (MoSHE, 2020f, p. 3).

Most importantly, MoSHE developed the Digital Skills Country Action Plan for Higher Education and TVET for the years 2021-2030. This action plan aims to address most of the digital transformation challenges facing HEIs. The action plan strategies include establishing enabling policies, digital skills framework, and digital skills assessment; reforming digital skills programs; enhancing the use of technology in teaching-learning; connecting higher education and TVET institutions to affordable high-speed broadband and improving campus network digital services, and building capacity reengineering processes (MoSHE, 2020c).

The above national policies provide a strategic framework for harnessing the benefits of technology while addressing potential challenges for development. The policies are also relevant for building and maintaining the necessary digital infrastructure that is essential to improving the quality of education and facilitating research and development. Generally, the policies help to stimulate and create a conducive environment for innovation, entrepreneurship, and job creation that enhances a country's economic growth and competitiveness in the global market.

Although HEIs need to have institutional policies to support the digitalization of higher education in achieving their missions and visions, most universities do not have appropriate ICT policies (Alemayehu, 2010). To address this gap MoSHE developed an Institutional ICT Policy for Higher Education in Ethiopia. MoSHE understood that there is no one-size-fits-all ICT policy for academic institutions, and thus, it provided a mandate to each university to customize the policy "to suit their specific needs for managing resources and enforcing smooth ICT access and use at the institutional levels" (MoSHE, 2020a, p. 4). This policy emphasizes the importance of an institutional ICT policy and proposes ICT policies that need to be adopted by Ethiopian HEIs. The policy is very detailed, and it goes to the extent of identifying potential areas of ICT functions and related policies. For example, regarding research, it suggests institutions develop a research support policy, research data management policy, and identity management policy.

Initiatives that Promote Digital Transformation in Higher Education

Ethiopia has taken major digital initiatives to promote the digitalization of higher education. These initiatives include the establishment of the National Research and Education Network (NREN), the National Academic Digital Repository of Ethiopia (NADRE), and the National Academic Digital Library of Ethiopia (NADLE).

NRENs in Africa are developed through the World Bank support as part of its commitment to connect all African HEIs to high-speed internet. The primary mission of an NREN "is to act on behalf of the higher education community in providing advanced information technology (IT) and communications services for connecting academic institutions to each other's networks, and to each other's resources, both nationally and globally" (Foley, 2016, p. 1). Ethiopia is one of the African countries that have an NREN which is referred to as the Ethiopian Education and Research Network (EthERNet). Although the MoE initiated EthERNet in 2001 as part of the national capacity-building program, it became functional in April 2016. EthERNet aims mainly to build the capacity of public universities to share educational resources and research among member institutions locally and globally. It provides different services including website hosting service, data center expansion, capacity building, a national academic digital repository, and a national academic digital library, but many of these services are at the infant stage. As of 2021, EthERNet was able to connect only about 36 out of 200 plus universities, colleges of teachers' education, and research institutions, and just 25 of the roughly 1,500 technical and vocational education and training institutions (Bashir 2020; World Bank, 2021).

Some universities provide limited access to online resources (e.g., journal articles, books, and book chapters) through their digital library. This forces students to go to a physical library to get access to different library services including reading and borrowing books. To address some of the challenges faced by students, researchers, and teachers, the MoE initiated NADRE and NADLE. The NADRE aims to provide access to research works of Ethiopian universities and research institutions. However, thus far, it was not able to have most of the academic resources needed by students and researchers. It also lacks visibility among researchers, students, and other stakeholders.

NADLE provides access to learning and training resources and all the resources can be accessed without being logged in. However, based on the information available on the NADLE website (http://ndl.ethernet.edu.et/), as of October 2022, it was able to host only 81,959 academic learning resources. There are also a few universities in Ethiopia (e.g., Addis

Ababa University) that have their own institutional repositories consisting mainly of collections of theses and dissertations. In recent years, most universities have also introduced institutional digital libraries but with limited academic resources. Despite the introduction of EthERNet, NADRE, NADLE, and digital access to important educational resources remain one of the challenges to be addressed by universities.

Digitalization Practices in HEIs

Governments potentially influence the way HEIs handle digitalization through, for example, funding, setting requirements, and initiating and supporting the development of technological infrastructure (Tomte et al., 2019). The government of Ethiopia vows its commitment to the expansion of ICT use in education to improve the quality of teaching and learning (FDRE, 2015), and comparatively speaking, there is improvement in ICT infrastructures. Digital transformation influences all core missions and activities of HEIs (Rampelt et al. 2019). Therefore, HEIs are expected to actively participate in the advancement of technologies and use digital technology to improve teaching-learning, research, and community outreach endeavors. In this regard, like in most African countries, ICT is not used satisfactorily to improve teaching-learning and research in Ethiopian higher education (Alemu, 2015; Ferede et al., 2022), and the digitalization of higher education is not more than adapting technologies to facilitate activities and improve service provisions. Practice shows that among Ethiopian universities, ICT has been mostly used to facilitate day-to-day activities and improve service provisions such as moving from paper records to computers, implementing student information management systems, and providing digital services. The practice also shows that Ethiopia HEIs are more engaged in adoption rather than innovating technologies and the use of digital technologies for improving teaching-learning and research activities is still in its infancy. This was seen when Universities and MoSHE struggled to transition into digital teaching-learning when the government of Ethiopia closed down universities in March 2020 because of the outbreak of COVID-19. At that time, many universities around the world, mostly from developed countries, moved to online teaching-learning (Crawford et al., 2020) which was the only alternative mode of delivery.

The crisis during the COVID-19 outbreak highlighted the urgent need to extend broadband infrastructure to facilitate teaching-learning, research, and administrative work in higher education (World Bank & Knowledge Consulting Ltd, 2021). It also accelerated the digital transformation of higher education across the globe more than ever (Bekele, 2021; Dick et al., 2020; Bygstad et al., 2022; Fareen, 2022), and this was the case in Ethiopia (Ferede et al., 2022).

Enough lessons have been learned - as a result of COVID-19 - about the importance of online learning, and subsequently, the government is taking some measures to promote digital transformation in higher education. For example, online degree programs were not allowed in Ethiopia because no directive allows public and private universities to offer online degree programs. However, soon after the outbreak of COVID-19, the Higher Education Relevance and Quality Agency (now the Federal Education and Training Authority) developed the first directive that grants HEIs to run fully online degree programs (MoSHE, 2020g), though moving towards teaching provided fully online is not a major priority of both the ministry and HEIs. However, this and other digital transformations in higher education could not be successful, because most teachers lack the interest, digital capacities, and skills to meet the demands of digital transformation and engage in blended and online learning. Moreover, there are not many opportunities for teaching and administrative staff to build their digital skills. Students also lack the necessary digital skills to meet the demands of the digital world (Yigezu, 2021).

The MoE aims to address some of these gaps in collaboration with its development partners. For example, in collaboration and with the support of the Mastercard Foundation, it aims to improve the learning management system across selected public universities. The Ministry has also collaborated with Microsoft to support the digital transformation of the education sector by implementing a Higher Educational Management Information System. In consultation with HEIs, the Ministry also introduced a course entitled “Introduction to Emerging Technologies” across all first-year undergraduate programs as of 2019 (MoSHE, 2019).

Factors Deterring Digital Transformation

Similar to many African countries, teaching-learning, research, and evidence-based decision-making in higher education in Ethiopia has been suffering from a lack of finance, highly qualified human resources, comprehensive data, and the use of digital technologies (Adamu, 2022; Yigezu, 2021). In the Ethiopian education development roadmap (2018-2030), poor internet connection, a lack of access to ICT facilities, and technical expertise to properly develop and use ICT

for academic and research purposes were identified as major challenges that most universities in Ethiopia are encountering (MoE, 2018, p. 54). The MoE vowed to overcome existing and foreseen challenges of the digitalization of higher education through developing different policies, strategies, and interventions. However, poor internet connection, ICT infrastructure, lack of skilled human resources, and past experiences continue to be some of the factors that deter digital transformation in higher education.

Poor Internet Connection

High-speed internet is a prerequisite to reaching the goals of continued learning (World Bank and Knowledge Consulting Ltd, 2021). All public Universities in Ethiopia provide wired and wireless broadband services but do not have access to affordable and reliable high-speed broadband internet connections on their campuses. Hence, most university teachers and students do not stay long online using their private internet connection for academic purposes because of the relatively high costs of getting online. During COVID-19, students and teachers were forced to continue teaching-learning from home. However, this was not successful because of the lack of good internet connection at home for most students, and some teachers. The situation was even more difficult for students with disabilities and students who live in remote and rural areas (Woldegiyorgis & Adamu, 2022).

According to ITU/UNESCO Broadband Commission for Sustainable Development (2019), "in Sub-Saharan Africa, the cost of 1 GB of data for the poorest 20% of the population is almost 40% of monthly income" (p. 35). The range of bandwidth in most Ethiopian universities is 100 Mbps (Bashir, 2020; Foley, 2016), which is good compared to some other African countries. However, 100 Mbps is considered a benchmark for small campuses with less than 10,000 students (Bashir, 2020). The internet connection is also significantly disrupted by the electric outage, poor ICT infrastructure, and data traffic. The bandwidth benchmark for research universities is 25-50 Gbps (MoSHE, 2020f) which makes the situation worse for the recently differentiated research universities in Ethiopia. In addition to the economic strength of the country, the state monopoly on telecommunication was the major reason for the low accessibility and use of the Internet in Ethiopia and its HEIs (World Bank, 2021). The national ICT strategic plan for higher education and TVET aims to address this problem by strengthening the EthERNet network and increasing the total bandwidth subscription to 100 Gbps by 2025 and 120 Gbps by 2030 (MoSHE, 2020f).

ICT Infrastructure

Although Ethiopia is identified as one of the African countries that has recently made great strides in ICT adoption, there is a gap between its ICT ambitions to support economic growth and the policy and regulatory instruments to enable fulfillment (Gillwald et al., 2012). Moreover, although the education and training policy of Ethiopia states that due attention will be given to the supply and utilization of educational technology and facilities to promote the quality and relevance of education (FDRE, 1994), the digital infrastructure of the country within which the HEIs operates is not well developed. This is indicated in SIEMENS's African Digitalization Maturity Report which indicated that digital maturity in Ethiopia (33%) is far less than in other African countries such as South Africa (82%) (SIEMENS, 2017).

Ethiopia is also below the LDCs average in terms of the percentage of the population with access to electricity (ITU, 2018), and access to reliable electricity is a major limitation to facilitating and ensuring access to reliable and affordable internet in the country. This constraint is expected to be addressed when the Grand Ethiopian Renaissance Dam, which is going to be the largest hydroelectric plant in Africa, starts generating power and double the country's electrical capacity.

Ethiopian HEIs were under huge pressure to continue the teaching-learning process during the closure because of the COVID-19 pandemic. This forced them to direct their teachers to adapt their courses and teaching methods to an online format to reach out to their students who were sent home. This was not possible for HEIs which were not well prepared and had no operating digital solutions to handle the crisis. During COVID-19, online learning in Ethiopia was next to impossible because the higher education sector was not at all prepared for online learning in terms of infrastructure and curriculum.

Lack of Skilled Human Resources

Digital transformation requires HEIs to improve not only the digital infrastructure but also their community's digital skills. As indicated during and post-COVID-19 although there are dedicated units for ICT support and implementation in almost all universities, their contribution is very limited because of not only the lack of necessary ICT infrastructure on

campus but also the lack of skilled ICT personnel. Teachers' and students' digital skills and online learning readiness are also some of the barriers to the digital transformation of higher education in Ethiopia (Woldegiyorgis & Adamu, 2022). Hence, universities tried to continue course offerings (sharing learning materials and sending assignments) using email and social media channels. Studies also indicated that university teachers' technological skills are the most formidable barrier to the digital transformation of higher education in both Ethiopia (Ergado et al., 2021; Yigezu, 2021) and other countries (Borte et al., 2020). Yet, developing digital skills of the higher education community was not given enough attention by both the Ministry and HEIs. This limitation is recognized by the government, and accordingly, the digital skills country action plan aims to address this by developing the intermediate and advanced levels of digital skills of teachers, students, and administrative staff in HEIs (MoSHE, 2020c; MoSHE, 2020f).

Resistance to Change

Digital transformation in the context of higher education should not be considered as more of a disruptive intervention, because it significantly complements HEIs' efforts to achieve their core missions including enhancing teaching-learning, research, and community outreach. The higher education community needs to understand that change is inevitable to achieve the envisioned objectives of education and training (Adamu, 2021), and like all other changes, digital transformation brings new challenges (OECD, 2020) and involves intense adjustment/re-adjustment (Mohamed et al., 2022). By adapting to the impactful changes associated with digital transformation, HEIs are likely to become more innovative (Mok, 2008), visible, and internationalized. However, in Ethiopia, there is some resistance to change from teachers and administrative staff. The resistance is mainly because of a lack of accountability and professional integrity, and teachers' and administrative staff' past experiences with changes and their results. For example, the MoE has introduced different management tools (e.g., Business Process Reengineering, Balanced Scorecard, Kaizen, and Deliverology) across all public universities without clear needs and contextualization, and in the end, all failed to achieve their intended objectives. Inappropriate changes that fail could harm educational reform as the higher education community becomes more resistant to change which could be reflected in different ways.

Implications and Conclusion

Digital transformation was not a priority for the Ethiopian government for many decades. The government realized that it is impossible to achieve its plan and objectives without integrating digital transformation in different sectors including education. In Ethiopia, some feasible policies and strategies promote digital transformation in higher education and other sectors. The establishment of a ministry that was responsible for only science and higher education contributed to the development of policies and strategies that promote digital transformation in Ethiopian higher education. However, policy and strategies are necessary but insufficient conditions to ensure effective digital transformation in higher education. There should be an enabling environment within HEIs including digital infrastructure, digitally skilled human power, good leadership and governance, and access to reliable and affordable internet which are critical to ensure the achievement of the core missions of HEIs.

Poor internet connection and ICT infrastructure, and resistance to change are also the other major factors that deter the digitalization of higher education in Ethiopia. Current practices also showed that there is much work to do to ensure effective and efficient digitalization of higher education in Ethiopia. This implies that in addition to improving the digital infrastructure and internet connections, there is a significant need for professional capacity development that targets improving the digital skills of university teachers, leaders, ICT experts, and administrative staff which is a prerequisite for successful higher education digitalization in Ethiopia. There is also a need to capitalize on current teaching and training that aims at improving students' digital skills.

The findings imply that the implementation of current and future digital transformation is expected to be different for three reasons: first, enough lessons have been learned from experience; secondly, the government understands that it is impossible to realize the effective implementation of a digital economy strategy without HEIs producing graduates with the required digital skills; and thirdly, it is difficult to ensure the competitiveness of HEIs in the era of globalization and knowledge economy without digitalizing the higher education sector. This requires the government to shift its focus from the expansion of HEIs, which was the case in the last two decades, to ensuring the quality and relevance of HEIs through digital transformation. It also necessitates the effective implementation of national and institutional policies and strategies

that promote the integration of digital transformation in higher education. Future studies could include primary data from different HEIs which is the limitation of this study. It is also important to investigate the impact of digitalization on the different core missions of HEIs.

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