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Digitalization of Higher Education

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Digitalization of Higher Education: An Introduction

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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 special issue reviews and compares the processes of digitalization of higher education. The articles in this Special Issue, covering 14 countries or regions from five continents, show the many commonalities and challenges of the transformation to a digital state and society, but also significant differences between them, especially between the countries of the 'global North' and the 'global South.' However, these differences stem mostly from governmental policy decisions regarding higher education, more so than technological dimensions of digitalization or the stages of economic development.

Keywords: analog, digital, digitalization, teaching and learning

Introduction

To clarify two principal terms used in this Special Issue on Digitalization of Higher Education, *Digitalization* refers to the adoption or increase in the use of digital or computer technology by an institution, industry, country, etc. By contrast, *digitization* refers to the action or process of digitizing, i.e. the conversion of analog data (esp. images, video, and text) into digital form. Digitalization causes fundamental, epochal changes which affect every individual and all sectors, activities, and institutions of society. It raises fundamental questions, for example, about personal freedom and control, the future of work and learning and, ultimately, the future of society and the state, its institutions, and functions. Digitalization transforms the ways things are understood and how they are done. But "(d)igital technology does not exist in a vacuum – it has enormous potential for positive change but can also reinforce and magnify existing fault lines and worsen economic and other inequalities" (UN, 2021, p. 4) This statement from the United Nation's 'Road map for digital cooperation' applies to all sectors, including Higher Education (HE) and its various missions, functions, and operations.

The development of the personal computer in the 1980s was an important starting point for the increasing importance of digital media. The development was accelerated significantly by the spread of the World Wide Web starting

in the early 1990s. The establishment of smaller and more affordable mobile devices - especially the smartphone - has led to an omnipresence of digital technologies in virtually all areas of life. Since its inception in the early 1990s, the Internet has grown at extraordinary speed and is now used by almost two thirds (63%) of the world population. However, access is uneven and there is a global digital divide: 90% of the population in the developed countries use the Internet, whereas only 57% in the developing world do. Broken down by region the divide is even more pronounced: 89.5% of the population in Europe use the Internet, compared to 39.7% in Africa (ITU, 2021). In the poorest countries, there are additional barriers to online teaching and learning as well as to 'big data' based research. The lack of technological devices is seen at HE institutions in poorer countries and among individuals who do not own computers or mobile telephones, or do not have, or cannot afford access to broadband connections.

There are many obvious disadvantages experienced by the lower side of this digital divide. Examples from HE includes the difficulty accessing online learning programs and communication channels which permit participation in and exchange with colleagues at academic conferences, or in inter-regional or international project teams or working groups (see for example Nherera & Mukora, in this Issue). Digital divides of a different kind exist also in many countries of the Global North where a high degree of connectivity exist in big cities and urban regions whereas there are few broadband connections and digital networks available in rural, less populated areas. Another type of digital divide exists between better and less educated populations since the amount of digital literacy and skills decides about access to and participation in data-based activities of various kinds.

This introduction provides an overview of the main themes addressed by the authors of the 14 articles in this Special Issue. Most of them deal with the ways digitalization affects the principal mission of HE, post-secondary education, and learning. Others focus on the ways that higher educational institutions (HEIs) are organized and managed in new, digital ways, or what digitalization means for academic research and development. Many authors debate the impact of digital HE on institutional autonomy, academic freedom, and the personal data and their protection of academic staff and students.

Digitalization of Higher Education

Three historical moments or stages exist regarding the incorporation of Information and Communication Technologies (ICT) in HE settings. First is the massive use of computers in accounting and office automation. Secondly is the development of highly specialized software and their application in almost all other academic activities. Finally, there is a widespread use of communication software and Learning Management Systems (LMS) (see Casillas Alvarado et al. in this Issue). The use of ICT in HE was a gradual process which happened without much systematic need assessment nor any long-term planning or strategy. This has changed recently, caused and partly accelerated by the pandemic, giving way to a more systematic process of institutional, or system-wide planning and implementation.

HE consists of a complex system of institutions that are both vertically and horizontally differentiated providing education and training at the post-secondary level. Besides educating students and providing them with knowledge and skills needed in the workplace and social life, Higher Education Institutions (HEIs) also provide a wide range of services to their communities.

A special type of HEI, found in many countries long before digitalization, were universities and other institutions providing teaching and learning at a distance. The United Kingdom, Germany, Canada, Brazil, Korea, and Japan had early-on ‘Open Universities’ that were providing education by sending out learning materials to learners, mostly in print, and providing some form of communication channels between learners and instructors, often via radio. With digitalization, the print materials have been replaced by learning software, web sites and electronic libraries, and telephone by online communication and electronic classrooms.

Online education became widely known when Massive Open Online Courses (MOOCs) were first developed in the middle of the 2010s, offered to general audiences by a small number of US-universities. While the MOOCs demonstrated the potential of online learning, they did not have, for a variety of reasons, the massive impact on HE as had been expected (McClure, 2015; 2019). Another online-based model of distance learning outside the traditional institutions, are systems of Open Educational Resources (OER), courses and learning materials that are provided by different organizations and generally accessible because authors and publishers waived copyrights. Learners can therefore choose now a learning ‘menu á la carte’ rather than having to follow a ‘fixed meal. ’ This is particularly important for the growing group of ‘lifelong

learners' who, many of whom at a later point in life, choose to either upgrade their professional qualifications or satisfy personal learning needs (Schuetze, 2014). (see Kato and co-authors in this Issue). Many traditional campus-based HEIs have added online elements to their curriculum providing a mix of classroom based and digital learning ('hybrid' or 'blended' learning). To collect academic credit for completing these courses and exams, credit banking systems have been established in some countries (see for example Lee & Lee in this Issue).

Several questions exist for future research, such as: How are or will the traditional missions of HE be affected by digitalization? What changes and challenges are these missions undergoing due to the advancing of digitalization? Is digitalization changing the overall fabric and the purpose of HE? To what extent has digital technology been integrated into HE? What will post-pandemic, digitalized HEIs, and digitalized universities look like? Will digitalization change the way institutions define themselves and their missions or will new organizations or consortia of providers replace them? Will the traditionally dominant model of a campus-based university disappear, or become the exception? What will be the consequences of such a development for traditional elements of HE such as student life, social learning and faculty development?

Teaching and Learning

Teaching on the HE level was traditionally organized in the form of lectures, seminars, classroom discussions and laboratory work, whereas student learning was commonly a combination of classroom experience as individual tutoring by and dialogue with teachers and tutors, as well as self-study, mainly from academic writings such as academic books and journals. Digitalization is changing this: Online teaching and study are replacing, complementing, and partly substituting the traditional forms of imparting and acquiring knowledge.

Online courses and self-study enable both asynchronous and synchronous teaching and learning activities at various locations. Online learning using ICT, and particular learning platforms and learning management systems have made teaching and learning independent of the constraints of time and place. While learning is not just a purely individual activity and 'social learning' has an important role to play, online learning benefits learners as it allows for individual pacing, as well as for individual feedback to and support of learners from instructors/tutors.

The pandemic has spurred an acceleration and deepening of digitalization of all aspects of teaching and learning, especially course design, forms of instruction, assessment, learning analytics and credentialing. There is a growing demand from students and prospective students for more flexible study option, in particular online learning and part-time options. This includes blended learning options and alternative credentials such as certificate programs and micro-credentials (OECD, 2021). However, online and blended programs tend to suit particularly motivated students with a strong capacity for self-study and self-direction, whereas online studies seem less suitable for non-traditional learners (OECD, 2021). Neither is ordinary online learning particularly suited for studying subjects with strong practical components such as medicine, nursing, or engineering.

As discussed in the articles in this special issue, some new digital forms of teaching and learning can adversely affect the equality of learning opportunities, generating inequitable situations for many students from a poor socio-economic background. This effect is a general phenomenon but occurs especially in countries with considerable social and economic inequalities and poverty. New forms of digital or 'blended' learning tend to benefit well-organized and motivated students, but erect barriers especially for learners unfamiliar with the web, its structures and protocols. It also tends to disadvantage students who lack the technical instruments needed to access and interact with online course platforms and other Internet based digital services, such as computers, tablets or smartphones. Online learning and communication with instructors and fellow learners is more difficult for those living in places without broadband and WLAN connections and where Internet services are unreliable and networks are inadequate (see for example Adamu, in this Issue).

In places where connectivity is not a problem, and learners have the necessary instruments, online learning has several other benefits, such as access to open learning resources, digital libraries and other online databanks and learning materials. It also allows for the collection and processing of students' data, which HE institutions and instructors can use to assess the progress of learners ('Learning Analytics') and assist those who seem to fall behind or are in danger of dropping out. On the downside, technology-mediated teaching can present challenges and quality problems for students, such as a lack of personal interaction with teachers and fellow students, little or no immediate feedback, lack of motivation, especially

for students who require a more traditional structure and support. Technical problems due to connectivity disruptions, learning platforms, and the lack of suitable hardware were already mentioned. Moreover, logistical and legal problems make controlling learning results online, for example through 'remote proctoring' difficult so that there is no guarantee that students are completing their exams independently. Digital education has also raised concerns about possible other ethical issues, such as plagiarism by students through copy-and-paste techniques, and the use of Artificial Intelligence (AI) to produce essays and responses to exam questions.

Another ethical issue concerns the privacy of student data which can be compromised by their inappropriate use, especially personal information and online behavior patterns, which intrude into students' privacy. There is also a problem of possible discrimination against groups of students if online education platforms collect and store student data on learning behavior and patterns and of their views and opinions expressed in essays, digital classrooms discussions or communications with their instructors, when such data are compared between students from different socioeconomic, cultural, gender, sexual orientation, disability, race, or other backgrounds.

Digitalization of teaching and learning requires academic teachers to develop new skills and competencies. Online teaching requires more than putting the old lecture scripts on digital class websites and linking them to some of the required or suggested readings. University-based teaching is more than making information available; it entails intellectual exchange and critical reflection. Leading discussions in digital classrooms where learners sign on when it suits them, or when their Internet connection allows them to, is very different from presentations and discussions in a traditional classroom where the instructor (a term that does not fit new forms of teacher-learner relationship) and learners are present at the same time.

When the pandemic forced HEIs to close classrooms and other campus facilities, many academic teachers were unprepared for teaching in a digital mode. Not only was there insufficient support from instructional and web designers but there was a need for new didactical/pedagogical models to enable the learners to use the Internet for finding and critically analyzing relevant information. Traditional 'faculty development' was often not geared towards the teachers' role in the new learning environment. Many experts are therefore convinced that a new 'cybergogy' is required for technology-based learning (see Nherera & Mukora, Barrett & Willliams-Shakespeare; Thu LE, and Bates, in this Issue).

Academic Research and the Dissemination of Knowledge

The use of online tools has significantly changed the way researchers gather information and data, analyze data, communicate and collaborate with other researchers, and publish or otherwise disseminate the results of their research. According to a survey by the OECD, conducted a year after the outbreak of the pandemic, 90% of researchers conducted literature searches online, 80% submitted manuscripts for review or publication that way, 70% connected online with other researchers, 59% used the Internet for data collection and processing, and 47% met with colleagues through virtual conferences (OECD, 2021). It can be safely assumed that by the time of this publication, these numbers have significantly increased. Already in 2014, six years before the COVID-19 pandemic, the European Commission found that research was undergoing fundamental and irreversible changes:

> [Digitalisation] impacts the entire research cycle, from the inception of research to its publication, as well as on the way in which this cycle is organized. The institutions involved in science are affected (research organizations, research councils, funding bodies), as is the way in which science is disseminated and assessed e. g. the rise of new scientific disciplines, innovative pathways in publishing (among them a substantial rise of Open Access journals), new scientific reputation systems, and changes in the way the quality and impact of research are evaluated. These trends are irreversible and they have already grown well beyond individual projects (cited by Franzen, 2017, p.2).

Digitalization allows for analyzing 'Big Data' sets, often collected for purposes other than academic research. This often entails collaboration with individuals and groups outside academia. As the term 'Open Science' suggests, universities and other academic institutions are thus losing their traditional quasi-monopoly as producers of new knowledge. This change also affects the ownership of (big) data as many databases have owners who shield their 'property' from outside use through fire- or paywalls. As a result, much of the existing scientific information remains outside the public domain.

This also affects the dissemination of scientific knowledge. In the past, 'peer review' was the standard mechanism to check and legitimize 'valid' research, a sometimes cumbersome and time-consuming process. Now, researchers often publish the results of their work on Internet-based platforms and blogs without submitting it to peer review or waiting for

its results. As 'Open science' is thus characterized by a different kind of review by not only academic researchers but other experts as well as potential users and social groups. Therefore, since not all publications must pass through the filter of peer review any longer, there is an increasing number of dubious publications, 'predatory' journals, and reports of fake science. With the increasing application of AI this trend can be expected to increase, and it is hard to see how new policies of AI use and ethics that are presently issued by public bodies and academic institutions will stop this trend.

Community Service

HE institutions serve several 'communities,' not just their local communities, but also the various scientific communities to which the different disciplines belong. 'Service' takes several different forms (Papadimitriou & Boboc, 2020; Schuetze, 2010). It includes a variety of activities ranging from research collaboration with industry, community-based research, continuing education for graduates who wish or need to upgrade or complement their professional qualification, and lifelong learning opportunities for non-graduates.

Community services use a great variety of communication and collaboration mechanisms, ranging from shared web sites, online conferences and meetings and leaning management software to joint data banks and streamed video materials. Distance education platforms offer online courses and degree programs to a wider and more diverse audience, digital repositories store and disseminate scientific, cultural, and artistic productions generated by academic staff and students. These repositories, when freely accessible allow the university's research and learning programs to reach a wider audience. Communities can participate in research and outreach projects through crowdsourcing platforms that enable online participation by institutions, companies and people interested in supporting university projects, HEIs can also use social networks to maintain closer and more effective communication with their academic communities and society in general, to share news, events, initiatives, and engage in conversations with students, academics, and other stakeholders interested in the university.

Administration

With the arrival of 'mass higher education' (Trow, 2010), many HE institutions, especially universities, have become big and complex organizations. This had, even before the emergence of the new ICT, important consequences for governance and administration. With the almost ubiquitous use of ICT, administration has also significantly changed.

Traditionally, in autonomous HE institutions, especially universities, academic activities were managed and coordinated by decentralized administrative units (faculties, department, institutes, laboratories, etc.). However, more recently, academic administration has become more centralized as many functions, for example the admission of students and their records, accounting for external funding, information about programs and policies, can be more efficiently administered through centralized data collection, processing and management.

In principle, digitalizing the administration has made HE more efficient and user friendly, at least to those users who have the necessary skills and the technology needed to access the system. 'Improved efficiency', as discussed in the various essays in this issue, means that many administrative workers are becoming redundant and subject to lay-offs, unless protected by their contracts or unions. In many cases, administrative workers need re-training for different jobs within the institution. Because of such implications for job security and career progression, some administrators and bureaucrats tend to be more reluctant than tenure-protected faculty to enthusiastically endorse digitalization.

Among university faculty, although for different reasons, there are also discontents who doubt that the original missions can be carried out under the new digital regime without compromising some of the traditional values and ethical norms that were the foundation of universities. Academic teachers realize that through digitalization they are losing ownership of their courses and class materials as their institutions, or the commercial providers of teaching platforms and analytic software are becoming de facto proprietors. This commodification through digitalization is becoming an important issue, not just with regard to legal copyrights but also the relationship between HEIs and their faculty (see de Vries & Álvarez Mendiola and McLean & Wheaton, in this Issue).

The use of digital processes for academic management and communication has the purpose and effect of improving efficiency and accessibility. Examples are the digitalization of university operations and administration in areas such as student recruitment, admissions, and enrollment management. However, this process can also lead to problems and

challenges related to data privacy and security. It can also contribute to an exclusive or primary focus on performance metrics and quantifiable outcomes, potentially leading to a devaluation of non-measurable aspects of academic work such as original and critical thinking.

The Process of Digitalization at HEIs

Unlike in countries such as China, where institutional autonomy is weak and government regulation and control are strong (see Ouyang et al. in this Issue), HEIs in most countries are relatively free as to how to organize digitalization. In some countries, public consultative bodies provided guidelines or performance contracts between funding ministries and HEIs spelt out expectation as to desired outcomes (for example more graduates with digital or computer-related skills). In many HEIs, private management consultancy firms and commercial producers of learning analytics or management software provided expert advice, and often sold their software to the institution or, more often, to academic sub-structures such as faculties, research centres or libraries, resulting often in uncoordinated, incompatible digital systems in the same institution. Questions on the actual process of digitalization include: (1) How is digitalization affecting the internal structure and governance of universities? (2) Is digitalization a central responsibility at the executive level (is there a Central Information Officer or Committee?) or should digitalization be left to the various units (e.g., faculties, institutes, the library, and other central administrative offices)? (3) What is the role of external consultants and commercial providers for digitalizing academic services? (4) Are there institutional policies obliging the various units to make sure their systems are compatible with those of the other units, or of other institutions? (5) What are the specific objectives of HE digitalization from the university perspective, and what are the expectations of the various external actors and users, e.g., students, community groups, industry, the media?

As many of the articles in this Special Issue show, not all of these questions were actually asked, mainly for two reasons: Firstly, the decentralized organization and management structures of most HEIs; and secondly because digitalization was a gradual process taking many years, even if the pandemic accelerated this process dramatically.

The Ethics of Digital HE

With the increased use of digitalized data and of learning platforms for teaching and learning, many students are asking what kind of data are being collected and stored and how the misuse of their personal data can be avoided or minimized. For the use of personal data in research academic associations such as the British Educational Research Association (BERA) have issued guidelines of how personal data must be protected. Ethics officers and committees at individual universities require the submission by researchers of ethical approval forms for their research projects, together with participant information letters and consent forms. A similar application to ethic officers or committees is required for research involving big data sets or social media data (see Lundie, in this Issue).

For the protection of 'Learning Analytics' data, i.e., of the students participating in online classes or programs, different protocols exist depending on the policies of the respective institution but also on particular learning platforms. Thus, for example, learning platforms such as Blackboard Connect or Canvas collect and store a multitude of data not just on test scores and basic analytics of students but also on how students use their computer, how they interact with the learning system, with their instructors and fellow students, and which web sites they were accessing. So, while useful for online teaching and learning these learning management systems are "double-edged swords" as the vice president for teaching and learning of a large Canadian research university called them (Vescera, 2019).

The Role of Public Policies

Governments hold different positions on digitalization. In some countries, they consider digitalization a political priority, especially for economic reasons, and have enacted legislation, and made available specific funding, to enhance the transition to digital infrastructure and services. Some governments have launched national digitalization strategies or comprehensive plans (see Thu, in this Issue) and are investing major resources in the digital infrastructure (see Schuetze, in this Issue).

Yet digitalization is not merely a matter of making technology available and to increase connectivity. The Digital Economy and Society Index (DESI) for the countries of the European Union (EU 2022) distinguishes and measures data in

four categories. Besides connectivity (assessing factors such as fixed and mobile broadband, high-capacity networks and 5-G coverage) the DESI also measures the stock and development of human capital for digital competence, the integration of digital technology in business activities, and the availability of digital public services. While all four indicator groups are important components of digital society, the central role of human resources is sometimes under-estimated. 'Data literacy', 'internet user skills' and 'advanced digital skills' are components of digital literacy and increasingly in demand as countries make the transition to digital knowledge economies and society (for further detail, see Schuetze, in this Issue).

Public policies can establish an active role of government in promoting and financing various investments and activities for digitalizing HE, but they can also allow the market take charge of the country's digital development. Technology companies can stimulate innovation and tailor-made solutions for education. Ideally, the market incentivizes competition so that companies offer better solutions and prices and HEIs, therefore, can choose from a wider range of technologies available in the market, according to their resources and needs. However, there are risks that large parts of HE's mission, especially teaching and learning, are actually managed through private companies, not only due to the dependence of HEIs on their technologies but also to the control of data they collect - which do not only pose a problem for data security but also the confidentiality of personal data.

In conclusion, while governments and other public bodies play important roles in countries' digitalization policies and activities, the digitalization of HE depends also on the management of (semi-) autonomous HEIs as well as the role technology firms have in this process. As the articles in this Special Issue show, there is a wide variety of policies and approaches. It would be highly interesting to see in a few years how they will have shaped HE digitalization in the respective countries and regions.

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Empirical Article

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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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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 Ethiopia and its Higher Education System

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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Digitalisation of Higher Education in Zimbabwe: A Challenging Necessity and Emerging Solutions

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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 article examines the current thrust to digitalize higher education in Zimbabwe as the country strives to attain its vision to become an upper middle-income economy by 2030. In this regard, Innovation and Industrialisation have been added as missions of special emphasis at all education levels. This entailed that Higher Education Institutions (HEIs) adopt the Education 5.0 model and accelerate digitalisation of their operations and curricula. Further impetus of the digitalisation drive emerged from the responses to the COVID-19, such as lockdowns and travel restrictions. This article examines the policy framework that was put in place to digitalise curricula and operation systems in HEIs. A desk review of literature was conducted to examine efforts underway to embrace digitalisation as a new feature and future of higher education. The study established that the majority of institutions have tended to adopt externally developed digitilisation models without adequately adapting them to local circumstances. The study recommends the need for distinct digitalisation policies at both Ministry and HEIs levels, to guide and prepare for the 'disruptive' effects of digitalisation.

Keywords: digitalisation, economic development, Education 5.0, e-learning, government policy, industrialisation, innovation, higher education institutions, Zimbabwe

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Introduction

Zimbabwe is currently classified as a lower-middle-income economy that is just above the low-income country threshold. However, the country has committed itself to attain an upper middle-income status by 2030. Universities and other higher education institutions (HEIs) have been challenged to play a significant role in the attainment of the National Vision 2030 and its related strategies and plans. As the Permanent Secretary of the Ministry of Higher and Tertiary Education Innovation Science and Technology Development (MHTEISTD) Professor Fanuel Tagwira stated in his

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Statement to the Ministry Strategic Plan 2019-2023, "Our Higher and Tertiary Institutions must become primary tools for national development" (p, III). The Ministry Strategic Plan provided the policy direction for both private and public universities in the country. In the Foreword to the Strategic Plan, the Minister Professor Dr Amon Murwira emphasised the need for the country to embrace, "… cutting-edge, competitive, universal scientific and technological knowledge …." (p. II) The Strategic Plan was presented as "… a promise to deliver a competitive, industrialised and modernised Zimbabwe through heritage-based higher and tertiary education science and technology development." (p. II)

To ensure the alignment of the activities of HEIs to the national vision, development plans, and strategies, the Government, through the MHTEISTD introduced Education 5.0 to replace Education 3.0 which was anchored on three missions that comprised: Research, Teaching and Community Engagement. Also, Innovation and Industrialisation were introduced as additional missions of special emphasis under Education 5.0. The adoption of these two additional missions has entailed that Higher Education Institutions (HEIs) accelerate digitalisation of their operations and curricula. While no explicit policy on digitalisation of HEIs has been pronounced, the emphasis by Government to include innovation and industrialisation as two additional missions of universities have resulted in a strong digitalisation drive.

Prior to the current impetus towards digitalisation of HEIs globally, there had already been a gradual but widespread adoption of information and communication technologies (ICTs) in education over the past two decades. Almost every aspect of humanity has been impacted by digitalisation. Operations have become more competitive with an emphasis on maintaining proficiency in both developed and growing markets. There are rapid changes in both the private and public sectors as digitalisation has increasingly served as a fundamental platform for conducting business. Digital technologies, according to Remko (2020), now permit collaboration for the interaction in global supply chains. Over the past ten years, information and communication technology has grown more widely in Sub-Saharan Africa including in Zimbabwe, with the development of; voice technology, fixed line telephone services, internet protocol (IP) phones, and the expansion of internet services. As the Zimbabwe National Policy for Information and Communication Technology (ICT) Policy document stated, "ICTs are given a key role as enablers for all other sectors to leapfrog in their development" (2016, p. 3). While digitisation of administrative and management systems and records was adopted at HEIs in Zimbabwe at the beginning of the current Millenium, digitalisation in teaching and learning was embraced almost a decade later and at a very slow pace until it was spurred by the COVID-19 pandemic (Tsvuura & Ngulube, 2020).

According to Thuy (2019), strong information technology development and utilisation in education has created opportunities for educators, students, and administrators to design and use efficient tools and instructional methods internationally. The technological revolution has aided people from various socioeconomic backgrounds and nations in developing useful technologies to build a more human-centred future (citation). The digital learning revolution has increased the efficiency of educational institutions by raising faculty members' and students' learning performance as well as the standard of instruction, administration, and working conditions (Abdulrahim & Mabrouk, 2020). While this might be true for developed countries, the situation is different in Zimbabwe and other developing countries where the technological uptake has remained limited. The high financial investments required to develop and maintain the infrastructure required to provide affordable, accessible, and sustainable digital platforms are absent and beyond the reach of their weak economies. Attitudes have also contributed to the sluggish uptake of ICTs in educational provision. Mpofu & Mpofu (2023) established that while "…some lecturers and students were enthusiastic about the implementation of online learning, others were sceptical of its effectiveness and its impact on the quality of education, inclusiveness, and the quality of graduates produced" (p. 73).

Digitalisation in both developed and developing countries was spurred by the global COVID-19 pandemic, which not only impacted health systems, but also educational systems. The pandemic forced policymakers and educators to come up with comprehensive solutions to minimise the negative effects of disruptions such as lockdowns and other social distancing protocols that were enunciated by the World Health Organisation and enforced locally. In attempts to mitigate the associated challenges, education institutions were forced to modify their teaching and learning strategies (Alhumaid et al., 2020). In this context, the adoption of digital learning was a sensible global strategy to speed up adjustments to a new standard and improve educational quality (Humayun, 2020). In Zimbabwe, HEIs used webinars, e-learning platforms, and other technological means to provide instructors, students, and parents with teaching and learning instructions virtually during the lockdowns and continued even after the pandemic. Teaching and learning are now largely conducted through block-release where students spend most of the time away from campus as learner-centred approaches that are supported digitally are now being emphasised.

Although there were some difficulties with technology, courses, teachers, and students, digital learning opened up lucrative potential for educational institutions (Händel et al., 2020; Shehzadi et al., 2020). The challenges included the constraints of technological platforms, poor internet connection, a lack of student-teacher engagement, and teachers' and students' inadequate understanding of the online learning system, which was a factor in how well learning took place in a virtual setting. In Zimbabwe, the intermittent electricity supply further exacerbated connectivity to online platforms. Additionally, the future of online learning would depend on one's capacity to adjust to sudden changes in the environment (Dinh & Nguyen, 2020). The knowledge production system in Zimbabwean tertiary education still lags behind some of the developing and developed countries. Ondari-Okemwa (2011) established that institutions of higher education in Sub-Saharan Africa faced numerous challenges in producing knowledge. Such cchallenges include poor infrastructure, declining budgetary allocations, brain drain and competition in knowledge production. The situation has exacerbated due to economic challenges that have continued to prevail in developing countries such as Zimbabwe. It is in this context that this article examines the policy framework and current thrust to digitalise higher education in Zimbabwe. Lastly, we also explore sustainable solutions to fully embrace digitalisation as a feature in the future of HEIs in Zimbabwe.

Literature Review

The use of digital technologies in education has been on the rise globally over the last few decades. During pandemics, major cyber risks are caused by people's actions as well as failures of systems and technology (Wang & Alexander, 2021). Major technologies include 5G, blockchain, telemedicine, and big data, cyber-attacks, and cyber risks. Blockchain helps, for instance, to mitigate risks of pandemics and improves the privacy and security of health systems. COVID-19 generated new challenges in cybersecurity (Manalu, 2020; Gaffar, 2020). Many people had to work at home, chose telemedicine, and performed distance learning and online schooling due to the pandemic (Wang & Alexander, 2021). Khan et al. (2020) listed malware, business email compromise, malicious websites, ransomware, malicious domains, spam email, and nasty social media messaging as the deadly cyber security threats in the world. Ng et al. (2015) posit that digital systems in education are on the rise globally, coming in the form of computing devices for content delivery, cloud storage, learning management systems, online learning applications, computer-based assessment, and training systems. Educational technologies have become integral to the teaching and learning processes, especially during pandemics such as COVID-19. The use of smart technologies is prioritised in Zimbabwe's National Development Strategy 1 (NDS1) to increase the use of information and communication technology.

Singar and Akhilesh (2020) point out that higher educational institutions are cyber security targets because they have a very intricate digital footprint in relation to the quantity and variety of data they hold and have a lot of actions on the internet and collective computing power. Borgman (2018) explains this, pointing out to the fact that nowadays most educational institutions are digitised, and they are continuously processing, consuming, and producing data that is collected from students and used to access services. The data collection practices have raised concerns about students' privacy (Peterson, 2016). Educational institutions were among the first to use the internet for information sharing and improving academic communication (Peters and Roberts, 2015). "The first network that resembles today's internet, ARPANET, was designed initially to facilitate resource-sharing among academics, not for interpersonal communications" (Fouad, 2021, p. 144).

More than ten years after the introduction of the national ICT policy, Zimbabwe has accredited tertiary institutions but has not integrated information and communication technology into the curriculum up to tertiary level (Edet & Ekpoh, 2017; Lisene & Jita, 2018; Muchemwa, 2017). The new curriculum has given the tertiary education sector a chance to benefit from the fiscus and replace the traditional three-mission Education 3.0 that did not prioritise innovation and industrialisation which are key aspects in the global technological advancement environment (Guvhu & Museva, 2020). The recent introduction of Education 5.0 in the higher and tertiary system has finally provided Zimbabwe with the innovation thrust that has been long overdue.

The fundamental ideas of critical thinking, problem solving, creativity, and innovation were hardly ever required or evaluated in Education 3.0 (Chirume, 2020). Education 5.0, which was introduced as a panacea, has altered how things are done and enhanced the prior Education 3.0 system. According to Godin (2018), innovation is a tool for resolving societal issues, particularly those related to the economy that directly affect the education sector. The introduction of Education 5.0 in the country coincided with the advent and rapid spread of the COVID-19 pandemic globally. The pandemic activated the need for innovation by the education and other sectors locally and internationally. Higher and tertiary education institutions in Zimbabwe were compelled to accelerate the adoption of information and communication technology (ICT) as demanded

by social distancing protocols under the pandemic. The adoption of open and distance e-learning was no longer an option, but a necessity as lockdowns where enforced nationally and face-to-face interaction in teaching and learning was curtailed for long periods of time, particularly between 2020 and 2021. All HEIs were caught unaware and were compelled to adopt and adapt online and e-learning teaching and learning modes to minimise the dangers posed by the pandemic. Most staff and students could not quickly adjust to the new independent ways of teaching and learning as many of them were not even able to interact through the virtual platforms that universities had to adopt and adapt to, such as the Moodle-based e-Learning Management System (e-LMS) that the University of Zimbabwe adopted and adapted from open online sources. HEIs are still to design and develop e-LMSs that are based on local needs and circumstances such as affordability of both hardware and software as well as intermittent electrical power supplies.

From the perspective of the education sector generally and higher education in particular, the adoption of digital platforms and methodologies in teaching and learning is a new reality that has perpetuated even after the COVID-19 pandemic has subsided. It can only be continuously improved in efforts to develop true technological learning ecosystems that develop digital citizenship competence universally and on equal terms for all (Gisbert & Lázaro, 2020). By making all the necessary technological infrastructure and resources (such as libraries, learning and research resource centres, laboratories, and digital classrooms) accessible to both their own academic communities and the public, higher education institutions (HEIs) can play a significant role in such an ecosystem. Additionally, HEIs should support open laboratories that adopt a social viewpoint and are free for any members of the public who desire to visit to foster the formation of digital citizenship. Such laboratories offer a setting and follow a strategy whereby various participants work together to update the processes of discovery and production by utilising procedures that are open and collaborative, both analogue and digital (Lépine & Martin-Juchat, 2020). These expectations are within the capacity of HEIs in Zimbabwe, particularly under the Education 5.0 thrust.

In East Africa, Kenyan schools have encountered a variety of obstacles in establishing the digital economy. Due to inadequate regulation, lack of digital hygiene, and unrestricted access to digital infrastructure, Africa's digital economy has experienced cyber threats and risks like those experienced by other participants in the digital domain (Brand & Todhunter, 2016). According to Kiriti-Nganga and Mbithi (2021), the capacity of people and businesses to access and buy digital technology in Africa is hampered by a lack of infrastructure and restricted access to money.

Ndume et al (2008) stresses that the entrenched traditional paperwork learning culture, particularly among the older academics and students coming from teacher-centred learning systems at school level, is one of the obstacles in adapting to eLearning. Most Zimbabwean academic institutions are more attached to the use of this type of learning that makes it more difficult for academic staff to adopt the new systems that come with technology. Although academic stakeholders are now slowly realising the potential of Information and Communication Technology in conducting their daily activities, there remains a significant number of academic staff, particularly the older generation, and students who are not acquainted with the use of ICTs and are not willing to shift to digital teaching and learning modes. Similar observations were made by Mhlanga et al. (2022) in the case of South Africa as they stated, "The largest challenge that higher educational institutions have in adapting to digital transformation is adjusting to new teaching techniques and learning environments and models, according to popular belief." (p. 14). Their findings and conclusions in South Africa that are also true for Zimbabwe as they pointed to the need to build digital capabilities, despite human resistance to change, as technology can complement and assist educators in their work. Switching to online learning can help to level the playing field by increasing accessibility to quality education. There is no clear, comprehensive, and coordinated approach to digital transformation in higher education. Most lecturers urgently require digital pedagogy training to address the challenges of online learning that is difficult for learners in remote areas (Mhlanga et al. 2022).

Digital Related Theories

This section focuses on theories related to the realisation of a digital economy. The concept of 'digital economy' was introduced in 1995 by Dan Tapscott, a business consultant. Focusing on the knowledge gap hypothesis, or the Leap-frogging perspective, this section analyses the digital economy in the developing world from a theoretical perspective to bring out underlying issues that cut across specific economic contexts. The notion of leap frogging was originally used in the area of economic growth theories and industrial organisation studies focussing on competition among firms. From this perspective, areas that have poorly developed technology or economic bases can move themselves forward faster through adopting modern systems without taking middle steps, "Bypassing intermediate stages of technology through which countries have historically passed during the development process" (UNCTAD, 2018, p. 84). The hypothesis proposes that

big companies holding monopolies based on incumbent technologies are less likely to innovate. Small and incremental innovations lead a dominant firm to stay ahead. Sometimes major innovations permit new firms to leapfrog the traditional dominant firm. This phenomenon can also apply to leading countries in the digital economy. Developing countries can skip the stages followed by developed countries in the digital economy, thereby enabling them to catch up sooner or advance faster in terms of economic growth and development. The leapfrog can arise from the fact that a developed country has reduced earning rents from old technology. Developed nations have less incentive to innovate as compared to their potential rivals, the developing nations. A good example of leap frogging in the technological sector is the rapid uptake of mobile phones in Africa. UNCTAD (2018) posit that Africa has opportunities to leapfrog though it has limited capabilities to innovate.

According to the 'knowledge gap' hypothesis, the distribution of knowledge is uneven across the social system in the world. Just like wealth, the hypothesis posits that people of high socio-economic status are at a lead because they find out about new sources of information first and because they can afford access to them while they are new. The knowledge gap hypothesis is often referred to in connection with social consequences of information sharing. However, the assertion of the hypothesis can also be applied to what happens in the digital economy. The flow of digital infrastructure is not homogenous across the economic divide due to social stratification of society. As new digital systems are infused into the world, developed countries are always ahead and the poor developing countries always lag behind. This is also attributable to research-based knowledge development which is largely conducted by institutions in developed countries which are relatively far more resourced than HEIs in developing countries.

Aligned with the Knowledge Gap, also called Digital Divide Theory, the rich, from personal to national levels, will always receive new information and knowledge before the poor. Developed countries acquire the digital systems at a faster rate than the less developed nations. The gap in the knowledge between these two groups tend to increase rather than decrease (Tichenor et al., 1970). The educated are also ahead of the uneducated because of disparities in access to the internet which on its own is the major factor that widens the digital gap (Nie & Erbring, 2000). With the supply of information by internet, new factors emerge that are not captured through traditional media like televisions and radios on which the marginalised depend on. In most African countries, access to the internet is largely restricted generally as those who have access face exorbitant data charges when compared to their counterparts in developed countries. For instance, the average price of 1GB of data in Zimbabwe was US$4.26 in 2022, while in South Africa the average cost was US$2.04. The median price of 1GB of mobile data in Africa was more than US $5 compared to the European Union (EU), where the price was US $3.5 in 2022. According to the Worldwide Mobile Data Pricing 2021 report from Cable.co.uk, which compared the cost of 1GB of mobile data across 6,148 mobile data plans in 230 countries, Sub-Saharan Africa had the most expensive mobile data prices in the world, with six out of the ten most expensive countries in the world. These observations have implications on the extent to which HEIs in developing countries can embrace digitalisation to keep pace with demands of the digital world and global trends. In attempts to address this challenge, Universities in Zimbabwe have set up the Zimbabwe Research and Education Network (ZIMREN) that is intended to be the leading catalyst for research, education and collaboration in the country, while collaborating with global partners by providing networks and other digital transformation infrastructure, systems and tools that meet the requirements of the research and education community. While its impact is still to be realised, the network is expected to help member universities access internet and mobile data at lower costs that are collectively negotiated with internet service providers and through by-passing unnecessary middlemen by developing their own systems and services.

Research Methods

This article is based on a qualitative array of data sources that include documents and policy statements that have emerged since the inception of the digitisation and digitalisation in Zimbabwe HEIs. As Morgan (2022) observes, desk research is particularly useful where researchers may not have the resources or time needed to conduct field research, as was the case in this instance. The desk research mainly included literature search and review of existing academic and non-academic documents that include written unpublished papers, journal articles, reports, policy documents and case studies. Documents for the literature review were identified mainly through searches on various websites of international publishers and organisations.

Data collection

The study was conducted mainly through desk research and personal observation. Though used to a smaller extent, personal observation mainly drew from the authors' personal experience as practitioners in the area of study. The desk research involved reviewing of relevant literature such as research conducted on digitalisation of HEIs in different countries, as well as conceptualisation of competing theories on digitisation and digitalisation of the education sector. Insights and comparisons were drawn from studies in Zimbabwe and other countries of the world. In addition, an extensive and detailed document analysis was also conducted. This provided a good basis and framework for analysing the study issues.

Results

Besides price that was generally cited in different sources, the study examined a wide array of other obstacles to digitalisation, such as lack of knowledge about the advantages of information and communication technology, in order to increase demand for ICTs. Data sources emphasised that to create prospects for change, there was a need to increase incentives and investments in the tele-communications industry and the private sector. COVID-19 altered how young people in sub-Saharan Africa utilise technology. In order to reach students remotely and minimise disruptions to the educational process, UNESCO also advised using open educational resources and platforms that schools and teachers could use (Ozili, 2020). The higher and tertiary education paradigm in Zimbabwe was compelled by the pandemic to adopt the use of information and communication technology (ICT) for open and distance e-learning. Other forms of student support were offered at some Zimbabwean universities, including the University of Zimbabwe (UZ), Bindura University of Science Education (BUSE), and Great Zimbabwe University (GZU), among others. This support came in the form of electronic devices such as laptops and smart phones, data packages that students needed even before the COVID-19 outbreak. However, Flores (2016) cautions that the more one uses electronic devices, the more susceptible their mind is to being controlled by them (Flores, 2016).

The study established that ICT technology was more in use in institutions of higher learning as face-to-face interactions have been largely replaced by open and distance e-learning. To accommodate the majority of students in Zimbabwe, schools and colleges have developed educational resources and offered instruction through a variety of media that include radio, television, WhatsApp, and Google Class as has been demonstrated in the formal education system. Most parents transformed their houses for internet work, workplace learning, and home schooling. However, this has exposed the growing gross socio-economic inequality in the society as education has become more expensive due to the high costs of the gadgets and data that have now become part of normal learning. Differentials between well-resourced schools and affluent families are impacting on access to quality education by students from the different socio-economic backgrounds, thereby further widening the social divide of communities and individuals. Overall, however, internet technology has played a big role in improving information access and education (e-learning) in academic institutions. The opening of information centres in rural communities, mainly at former post offices and distributions of laptops to rural schools as well as the ongoing rural electrification are some of the positive attempts being undertaken by government to address the digital and thereby socioeconomic divide. The Government of Zimbabwe has adopted a policy to leave no one behind in its development thrust as articulated in the National Development Strategy 1 (NDS1).

Digitalisation for Development: A Case of the University of Zimbabwe

The Ministry of Higher and Tertiary Education Innovation Science and Technology Development (MHTEISTD) has set up Innovation Hubs and Technology Parks at several State universities to offer solutions to the nation's development issues and achieve the objectives of the country's National Development Strategy 1 (NDS1) and National Vision 2030. One of the aims of NDS1 is to provide economic opportunities by cultivating a new generation of young people with an entrepreneurial mind and attitude. The Zimbabwean parliament enacted the Centre for Education, Innovation, Research and Development bill into law. The main goal of this law is to establish technological hubs that will organise and harness research and innovation in higher education institutions that include colleges and universities as well as in industry.

Innovation at the University of Zimbabwe is supported by funding from the Ministry of Higher and Tertiary Education, Innovation Science and Technology Development. The institution is committed to the inquiry of new, surprising, and fundamentally useful discoveries in its quest to create and disseminate knowledge that contributes to national development. For instance, in promoting Heritage-based science and technology for industrialisation, the University of Zimbabwe (UZ) has embarked on the Future Grains for Africa programme. This is intended to develop original products such as food, feed, non-food product from small grains such as Finger millet, Pearl millet and Sorghum in trying to create

an avenue to promote consumption of these cereals for food security. The success of this programme will greatly be enhanced by the establishment of a national network of both small-scale and commercial farmers though a robust digital platform that offers online coordination and support services. Departments under the faculty of Veterinary Science have embraced a research strategic plan that seeks excellence in research. This strategy will also generate innovative scientific information and provide solutions to the current and expected future problems in animal health, production and welfare, again availed though a reliable digital platform that is accessible to farmers across the country to augment onsite visits by university academics and support staff working with specific communities.

A report produced by the Global Special Mobile Association (GSMA) in 2019 showed that there were 12 innovation hubs at universities across Zimbabwe. The UZ is amongst the universities that have so far established an innovation hub and agro-industrial park in the country. The University's Innovation Hub is producing innovative research trainees. Other universities who have also established such facilities in the country include: the National University of Science Technology, Midlands State University, Harare Institute of Technology, Zimbabwe Defence University, and the Chinhoyi University of Technology. Examples of outputs from the innovation hub at the University of Zimbabwe include inventions targeting social protection such as the 'smart blind stick' and a pharmacy locator application among others that are at various stages of patenting. The 'smart blind stick' is based on object avoidance technologies to provide efficient navigation solutions for people who are visually impaired. The pharmacy locator application is connected to the Geographic Information System (GIS) and Google maps to locate medication centres or the nearest pharmacy. The pharmacy locator web application helps the public to better access pharmacies and medication centres scattered around towns, cities, and parts of rural areas in the country.

The Zimbabwe Council for Higher Education (ZIMCHE) is the regulator and quality assurance authority of both private and public universities that fall under the Ministry of Higher and Tertiary Education, Innovation Science and Technology Development. Established with its own Act, ZIMCHE is mandated to spearhead the Zimbabwe National Qualifications Framework. It conducts academic and institutional audits to ensure that standards are maintained at all universities in line with Education 5.0 and international benchmarks. The ongoing digitalisation at all higher education institutions will enable seamless coordination of research and other academic activities that ZIMCHE can monitor and evaluate both onsite and virtually. Also, the universities will be able to share both human and material resources through digitally networked learning and teaching facilities across departments, faculties and institutions including industry and other relevant institutions both locally and internationally. This could be enhanced with the revamping of the ZIMREN initiative which could assist in the coordinated approach to develop the necessary software and even hardware to stimulate the digitalisation drive across all HEIs. ZIMCHE has already developed and, through regular institutional audits is enforcing academic standards that emphasise ICT applications in research, teaching, and learning at all HEIs in the country.

Discussion

The study established that most institutions in the Zimbabwe lacked the necessary hardware, software, and staff who were qualified and experienced enough to make the transition from traditional face-to-face interactions to virtual modes. The unexpected advent of COVID-19 forced policymakers and educators to rapidly develop comprehensive measures to lessen the disruption of the education system. The COVID-19 induced sudden and severe change that required students to rely on their ICT devices, which most of them did not have and could not afford, left them unprepared. Many of them were used to in-person courses where they relied on personal interaction with instructors and other students. As a result, they struggled to quickly adapt to the new autonomous learning styles, and many of them were unable to communicate on the virtual platforms that institutions were required to embrace. One such system is the Moodle-based e-Learning Management System (e-LMS) that the University of Zimbabwe adopted and adapted.

With the strong information technology development and use in education, effective tools and teaching approaches need to be further improved for use by educators, students, and administrators. The digital learning revolution has improved the effectiveness of educational institutions by enhancing the level of instruction, management, and working circumstances as well as the performance of faculty members and students. An intelligent global technique to hasten transition to a new standard and enhance educational quality was the use of digital learning. Notwithstanding various issues with technology, courses, teachers, and students, digital learning provided educational institutions with profitable opportunities. Globally, the use of digital systems in education is increasing. These systems include cloud storage, learning management systems, online learning tools, computer-based testing and training programmes, and computing devices for content delivery.

Among the earliest organisations to use the internet for information exchange and enhancing academic collaboration were educational institutions. Higher education institutions consequently became cyber security targets due to their intricate digital footprints in terms of the volume and type of data they contain, their extensive online activity, and their combined computing power. In Zimbabwe, the new curriculum has offered the tertiary education sector a chance to gain from the fiscus and replace the conventional Education 3.0, which did not prioritise industrialisation and innovation, which are crucial elements in the environment of global technological breakthroughs. As a panacea, education 5.0 was introduced, changing the way things are done and improving the previous education 3.0 system.

Implications and Conclusion

It has become evident that higher education institutions must not only encourage students to acquire knowledge but also to develop their critical thinking abilities and enable them to collaborate with other students to co-create knowledge (Farnell et al., 2021). This can happen between students in different regions once they digitalise. Students, their needs, and their connections to every aspect of the institution must be the emphasis of HEIs. Customised learning paths must be created for each learner. Additionally, student opinions, perceptions, and experiences need to be considered in institutional strategies when designing traditional process maps, and special emphasis must be paid to the relationship and communication mechanisms they employ.

In order to collaborate on this transdisciplinary path, there is need to engage with stakeholder groups including HEIs, NGOs, governments, international organisations, migrant associations, and human rights organisations. There is also a need to share experiences learned across HEIs, particularly during the COVID-19 pandemic, to improve on weaknesses observed and further develop digital learning and teaching to embrace Cybergogy as a new paradigm in technology-based learning. Cybergogy needs to be explored deeper as a pattern of education and skills for 21st Century learning that is based on new epistemologies that might even challenge pedagogy and andragogy and delve deeper into the theoretical underpinnings of digital learning and deep thinking. The implications of digital-based learning are already challenging assumptions that have so far guided conventional teaching and learning strategies and practice based on traditional theories of education. For instance, virtual access to information is already challenging the role of teachers and lecturers, schools, colleges, and universities as well as both teaching and assessment methods in the context of developments in Artificial Intelligence (AI) such as the Chat Generative Pre-training Transformer (ChatGPT) that has ushered in both opportunities and challenges related to the authenticity of academic output of both researchers and students. National and international cooperation is crucial in the future, not only for sharing computer tools, platforms, and experiences in digital learning, but also for collaborative research in rethinking education theory and practice as well as capacitation of both experienced and new educators for their changing roles. There is need to rethink how citizens and professionals must be developed in a digital age, reflect on contemporary society and the new models of knowledge creation that it necessitates, and consider the level of digital inclusion (rather than focusing on the digital gap) that is required to achieve the transformative education that HEIs must ensure.

Also, while HEIs have largely embraced digitalisation as inevitable, policy pronouncements have not been explicit but largely stop at implying the need to digitise and digitalise. For instance, Strategic Plans of the Ministry of Higher and Tertiary Education Innovation Science and Technology Development as well as those of HEIs such as the University of Zimbabwe do not provide specific objectives on digitalisation per se. Given the increasingly rapid developments in information and communication technologies under the current Fourth Industrial Revolution and even Fifth and Sixth, digitalisation needs a distinct policy at both Ministry and HEIs levels, spelling out its full parameters to guide and prepare for its 'disruptive' development and implications for HEIs. Institutions of higher learning need to review their strategic statements such as visions and missions to embrace digitalisation more directly as an enabler for all their goals. Digitalisation need to buttress HEI missions and processes that lead to internationalisation, innovation, and industrialisation.

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Digitalization of Higher Education in Japan: Challenges and Reflections for Education Reform

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Abstract

With the onslaught of the COVID-19 pandemic, Japanese higher education (HE) began the process of full digitalization in the academic year 2020. Considering that Japanese HE was previously dominated by face-to-face learning, the efforts of the stakeholders to implement digitalization deserve praise. However, digitalization has shown varying degrees of progress, both in terms of the type of education as well as between and within organizations. This study investigates the status of HE digitalization in Japan focusing on central government policy measures, the teaching and learning by faculties and students who are the traditional bearers of education, and the concept of lifelong learning and continuing education, which is exponentially attracting attention as a new area of study. This research also examines how those involved can use digitalization to improve HE and the goals and challenges of the transformation. Although the measures against the impact of the pandemic on the education sector greatly improved the digitalization of education in universities, other essential issues for educational reform became apparent. To take full advantage of the benefits of digitalization, it is necessary to re-examine the factors that hinder it, such as the changes in awareness among stakeholders, and take immediate measures to address them. In this context, dialogue is extremely important. The stakeholders should discuss how digitalization can enhance the value of university education.

Keywords: digitalization, education reform, higher education, Japan, lifelong learning, pandemic, policy

Introduction

. According to Iiyoshi (2020), compared to most universities in developed and developing countries, Japanese universities lagged far behind in the use of Information and Communications Technology (ICT) for education prior to the COVID-19 pandemic (hereinafter referred to as “the pandemic”). This was influenced by

the perception that university education should be conducted within walls where students in universities acquire specialized knowledge and skills essential for the industrialized society in an almost uniform and collective manner (Iiyoshi, 2020). Additionally, there were structural factors that did not encourage digitalization, such as the small number of adult students among the undergraduates and the regulations that limited credit scores for distance learning.

However, the pandemic has completely transformed the learning environment in universities. The emergency restrictions, which have been issued intermittently since April 2020, forced universities to immediately change their mode of teaching from face-to-face to full-time online classes (Yamauchi, 2021).

Thus, this study investigates the developing situation in university education in Japan by focusing on four factors: (1) the Ministry of Education, Culture, Sports, Science and Technology (MEXT) as the policy decision maker, (2) academic staff, (3) students, and (4) lifelong learning. The researchers also examine how digitalization, defined as the provision of education through learning management system (LMS) or massive open online courses (MOOCs) (Bygstad et al., 2022), has led to reforms in education in universities.

This study also describes the relevant policies and actors in the digitalization of higher education (HE) in Japan; outlines the responses of academic staff and students, respectively and provides an overview of the digitalization of lifelong learning,

There are 788 universities and colleges in Japan, and they are categorized into three types—national, municipal, and private. Almost three-quarters of the universities are private. Enrollment rates were approximately 83.8 % for postsecondary education and 54.9% for universities and colleges under 4-year degree courses in 2021(Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2021a).

One of the characteristics of Japanese undergraduates is their low average age. In 2016, the average age of first-time entrants to HE in Japan was 18 years, which is 4 years less than the average of 22 years in the Organization for Economic Cooperation and Development (OECD) member countries (Organization for Economic Cooperation and Development [OECD], 2018). This indicates that most Japanese undergraduate students have high affinity for the digital environment based on their generation. Traditionally, Japanese faculties spend extensive time on research (Shin et al., 2014); however, the time spent on education has increased along with that of the total working hours (MEXT, 2022a). This is due to the implementation of policies and efforts of universities, which are based on the Council for University Education's 2008 report highlighting the improvement of education in universities through the substantiation of the credit system. These changes have impacted the awareness and attitude of faculties towards education reform, especially with digitalization.

MEXT'S Policy on The Digitalization of University Education and Related Actors

Prior to the pandemic, MEXT had been planning for the digitalization of the university system. For instance, in 1999, MEXT set the upper credit limit that can be earned through remote learning at 60. However, during this period, demand for remote learning was low among Japanese universities (Funamori, 2017; Shibukawa, 2020). In November 2018, the Central Council for Education, established under the MEXT, submitted a report entitled "Grand Design of Higher Education Toward 2040". The report indicated the digitalization of higher education as an important policy issue for the realization of "Society 5.0", that is a "human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space" (Central Council for Education, 2018).

The emergence of COVID-19 prompted Japanese universities to adopt remote learning. A MEXT survey conducted in June 2020 revealed that approximately 90% of universities were offering remote classes, and approximately 60% were not offering face-to-face classes at all (MEXT, 2020a). In response, in July 2020, MEXT took special measures to allow students to take more than 60 credits of remote classes (MEXT, 2020b). On the other hand, students had complained about the lack of opportunities for face-to-face interaction and the poor quality of remote classes since the spring semester of 2020. Consequently, MEXT emphasized that each university should actively implement face-to-face classes after September 2020, based on sufficient infection control

measures (MEXT, 2020c). In April 2021, MEXT announced a new policy, indicating that courses not offered by more than half of the classes conducted remotely will be considered as face-to-face courses and that, in the future, more than 60 credits of remote classes will be accepted as a special exception in emergency situations such as disease outbreaks and disasters (MEXT, 2021b). In response to this policy, the percentage of face-to-face classes offered at each university increased. Although the timing of the return to face-to-face classes varied among universities, the percentage of universities that offer more than half of their classes through face-to-face was 99.8% in the fall semester of 2022 (MEXT, 2022b). In May 2023, the alert level for COVID-19 declined, but the rules underlying the MEXT's April 2021 policy regarding the balance between face-to-face and remote classes were sustained.

This period also coincided with the deliberation at the Central Council for Education concerning the revision of "Daigaku setti kijun" (the minimum standards for the establishment of universities). In April and July 2021, there were calls from economic organizations and university associations for the elimination of credit limits for remote learning to enable university education to be more flexible and open to a more diverse student population (Industry-University Council on Recruitment of Graduates and the Future of University Education, 2021; The Japan Association of Private Universities and Colleges, 2021). However, the Central Council for Education's report issued in March 2022 did not eliminate the credit limit for remote learning. Behind this decision was the recognition that the rapid expansion of remote classes during the pandemic was accompanied by problems such as few opportunities for interaction and difficulty in deepening understanding through discussions among students. On the other hand, the report also proposed a policy that universities with well-functioning internal quality assurance would be granted special exceptions in terms of curriculum organization, including a relaxation of the credit limit for remote learning (Central Council for Education, 2022). Based on the policy indicated by this report, "Daigaku setti kijun" was revised in October 2022.

COVID-19 also prompted MEXT to implement a supplementary project to promote the digitalization of university education. The Scheem-D project was launched in June 2020. This project was an initiative by MEXT to support the matching of universities with engineers and companies and to measure educational innovation through digital technology. In addition, the Plus-DX Project (launched in December 2020) and some similar projects provided direct subsidies to universities that were digitizing their education. These subsidized projects are still ongoing as of June 2023 (MEXT, 2023).

On the other hand, the Cabinet is also moving in the direction of more aggressive digitalization of university education. In April 2022, the Council for Science, Technology, and Innovation (CSTI) in the Cabinet Office compiled a "Policy Package on Education and Human Resource Development for the Realization of Society 5.0". This policy proposal seeks to realize "a society where everyone can learn as they please, anytime, from anywhere, with anyone" by sharing and utilizing educational data among universities, schools, local governments, and private businesses (Council for Science, Technology, and Innovation [CSTI], 2022). In May 2022, the Council for Creation of Future Education, established under the leadership of Prime Minister Kishida, issued a proposal entitled "Universities and society driving Japan's future." The proposal calls for the promotion of inter-university collaboration using online and the promotion of university DX by linking student registration information with national identification number, nicknamed "My Number" (Council for the Creation of the Future Education, 2022). Further, the Cabinet approved the "Priority Plan for the Realization of Digital Society" in June 2023. This plan calls for the promotion of the use of "My Number" at universities. For national universities in particular, the plan also outlines how to reflect on the evaluation of the use of "My Number" in budget allocation (Digital Agency, 2023).

These measures of the Japanese government are characterized by the overall goal of transforming social and industrial structures, and by extension, the call for the digitalization of university education. However, sharing the digitized academic history of individual students with the government and private businesses also entails risks from the standpoint of personal information protection. In May 2023, system troubles surfaced, such as the linking of one's "My Number" with someone else's information, which led to a trust issue regarding the handling of personal information in public administration (Goto, 2023). Some universities have begun trials of using "My

Number" for authentication of the use of campus services, but there has been controversy over the pros and cons of the system (Nishida & Nakazawa, 2023). Although the digitalization of university education is inevitable, careful political decisions must be made based on the anticipated risks associated with digitalization and the reaction of public opinion.

Challenges and Prospects in the Response to Digitalization from Japanese University Instructors

The Trend of Digitalization of Teaching in Universities Before the Pandemic

How had faculties at universities been using ICT prior to the pandemic? In Japan, the Academic eXchange for Information Environment and Strategy (AXIES) promotes the use of ICT in higher education. AXIES is an umbrella organization with 155 members from Japanese universities and research institutions and 91 supporting companies as of December 2022 (AXIES, 2022). A comparison of the 2015 and 2017 results in the comprehensive survey undertaken by AXIES shows an increase in the use of all ICT tools in university education (AXIES, 2020). However, in terms of specific items, the use of ICT tools in the classroom is limited. In a 2017 survey, the use of document creation software such as PowerPoint was expanding both in and out of the class, whereas the use of LMS and file-sharing tools to support student learning was not progressing and was low (Table 1). The reasons for the lack of promotion of the use of LMS and file-sharing tools are the preference for traditional paper-based education (Kano & Gobel, 2014) as well as the mismatch with their classes and the technological anxiety felt by faculty members regarding LMS use (Ishikawa & Hara, 2019).

Table 1: ICT Tools Used in University Classes in 2015 and 2017

	2015 (n=1694)		2017 (n=1932)	
ICT tools used	% In-class	% Outside class	% In-class	% Outside class
PowerPoint or other slides	86.3	44.6	91.0	48.2
Web-based educational materials and videos	38.7	26.5	53.7	31.4
LMS	20.5	17.5	31.6	28.8
Collaboration tools (Google Docs, Share Point, Office 365, etc.)	-	8.5	21.6	17.4
File Sharing Tools	12.7	11.7	21.0	17.1

Prepared by author based on AXIES (2020, pp. 33–36)

Response in an "Emergency Remote Class" During the COVID-19 Pandemic

The digitalization of universities was an emergency response to the pandemic, and it disrupted the norm regarding the approach to education in universities. To respond to the urgent situation, many universities implemented "hybrid" (a combination of face-to-face and distance classes) and "high flex" classes (in addition to "hybrid" classes, flexible [students can choose how to participate]) (Taguchi, 2020; Sugimori, 2022). The use of this system was perceived as promising (Institute for Research in Private Higher Education, 2020). Considering the implementation status of universities, simultaneous interactive classes, including the hybrid and high-flex formats, were the most common responses depending on the size of the university (Institute for Research in Private Higher Education, 2020). So, how did faculty in charge of actual classrooms respond to this unprecedented situation, and what challenges did they face?

Challenges and Prospects for University Instructors in Implementing Distance Learning

The use of technology in the classroom was low before the pandemic. However, after the pandemic, its use increased significantly. According to the data provided by AXIES (2020), a comparison of the period before

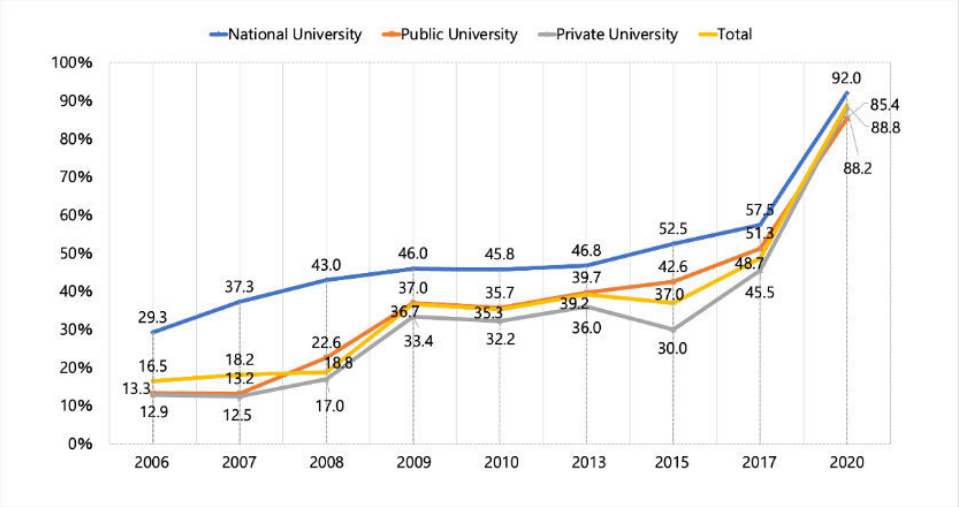
and after the pandemic (2019) shows that the use of distance learning has increased rapidly for all types of universities (Figure 1).

Considering the high diffusion of remote classes, "many faculty members who have not been using technology for distance education, before the pandemic, were forced to use it during the period to cope with the situation" (Center for Research on University Management and Policy, Graduate School of Education, The University of Tokyo, 2021, p. 21). Although the use of technology helped faculty to cope with the new situation at the time, online classes were not without challenges. For instance, the AXIES (2020) survey revealed that online classes do not promote an effective communication environment and were ineffective for practical skills and laboratory exercises, discerning students' responses and level of understanding, providing support and caring for students, and hindered group work management. In addition, the lack of computer literacy among faculty members has also been indicated as a challenge (Nishii. (Ed.), 2020).

Figure 1

"Transition of Distance Education using the Internet"

Adapted from AXIES (2020, p. 23), Figure 3 1-6



How then can faculty overcome such challenges? According to Murakami et al. (2020), several national research universities have begun to publish online examples of good practices in distance learning, which can be accessed from outside the vicinity of the university (Department of Teaching & Learning Support, n.d.; Uteleco n, n.d.; Tohoku University Online Classroom Good Practices, n.d.). The information on these classes is availabl e online on the basis of discipline and faculty members. It sheds light on how to make use of distance learning a nd includes the faculty members' own reflections on their classes and stories of failure. This information can be useful for faculty members not only within the same university but also in charge of classes in the same field at other universities as well as for those seeking to use similar ICT tools. Additionally, in March 2022, MEXT, Hig her Education Planning Division, Higher Education Bureau (2022) notified universities and other institutions to promote learning in face-to-face classes and communication among students and between faculty members whil e taking measures against the pandemic. Considering this, it was necessary for faculty members to also promote face-to-face educational activities while engaging in distance education. The dissemination of empirical informa tion regarding distance learning practices can be regarded as a remote class observation, and it is a useful and va luable asset for faculty members who will be involved in high-flex distance learning at universities in the future.

Iiyoshi (2020) argues that it is essential for educational innovation to focus not only on civilizational aspects such as technology but also on cultural aspects. What is this cultural aspect of education? In light of Iiyoshi's assertion, it is the values and behavioral patterns of people in the context of education based on fixed

patterns of thoughts and actions. Iiyoshi further pointed out that without a transformation of cultural aspects, educational innovation will not occur. Ironically, however, the pandemic has greatly affected this cultural aspect of university education, and we propose that the myth that university classes are conducted face to face between faculty and students in the classroom has been altered. However, it is too early to say that this has transformed the cultural aspect of education and brought about a change in the faculty members' attitudes toward education. It takes a certain amount of time for an educational culture to permeate through a country. Nonetheless, the pandemic has forced those involved in HE to rethink the value that a university education can offer to society. In this context, opportunities for faculty members at universities to think about how they should act have certainly increased. It has been an experience of trial and error for all faculty members, young or experienced, regardless of the academic field they are in, to develop new methods of teaching and evaluating students. This may be considered a welcome byproduct of digitalization.

Recent Digitalization Trends and Discussion Related to Student Learning in Japan

As mentioned earlier, ICT infrastructures for better education had already begun to develop in Japanese universities prior to the spread of the pandemic. However, they were not fully utilized in educational settings. Behind this lies a problem that cannot be reduced to a simple technological or material issue, but is unique to education in Japanese universities, which prevents its digitalization. Though the pandemic revealed new educational possibilities for students supported by ICT, it also presented the problem of having "too many issues." In this section, the digitalization of education in universities has been discussed from the students' perspective based on issues related to students' learning time, which is called the "substantiation of the credit system."

The Issue of the "Substantiation of the Credit System"

The Japanese credit system has been criticized for its lack of "substantiation" (Kaneko, 2013, pp. 29–46; Sugitani, 2021, pp. 44–45). This situation is related to the issue of whether Japanese universities are achieving sufficient results in generating effective "learning" among students in the process of focusing on reformed "teaching."

The Japanese Standards for the Establishment of Universities stipulate that university graduation requires 124 credits, with one credit earned through 45 hours of study time. The basic pattern of these study hours includes 15 hours of classes and 30 hours of self-study. In reality, however, the study time of university students is much less than this. A study shows that the average number of study hours per week for university students outside the classroom setting is only five (Matsumoto, 2018, p. 28).

Multiple reasons exist for the less amount of time students spend studying outside class. First, Japanese undergraduate students take 10-12 courses per week, which is a high number in comparison to international standards (Yoshimi & Hori, 2021). The burden of class time is particularly high for 1st- and 2nd-year students (National Institute for Educational Policy Research [NIER], 2016, pp. 8–9). In Japan, it is also common for university students to receive job offers from companies while they are still pursuing their studies and to begin work immediately after graduation. In recent years, job-hunting activities begin much earlier in the course of study and lasted much longer (Hirasawa, 2021, pp. 20–21; Honda, 2010, pp. 40–51). Moreover, in the 3rd- and 4th- years, students spend more time on graduation research, which will be discussed in the paper. Consequently, students take more classes in their 1st- and 2nd- years. As the students are busy with classes, it is difficult for them to secure sufficient study time outside class for each subject.

Additionally, the Japanese view of education in universities may be a remote factor behind the lack of progress in substantiating the credit system. According to Kaneko, the traditional Japanese understanding of education is strongly based on an emphasis on leisure time and social activities. Apart from the systematic academic knowledge gained in class, it is believed that the time spent independently reading books unrelated to class and the experience gained through part-time jobs and general membership in clubs are appropriate forms of learning for university students. Moreover, in Japanese universities, high educational significance has been attached to the teaching method of assigning graduation theses and research. Many students, particularly those in

the 3rd- and 4th- year, spend a good amount of time on their graduation thesis and research. It is generally believed that students should explore their interests within a relatively free framework (Kaneko, 2013, pp. 42–43).

The Potential and Challenges for Digitalization and Japanese Higher Education

The pandemic, however, led to the development of a substantial credit system. In online classes, there was no guarantee that tests, which are supervised by faculty members in face-to-face classes, could be administered fairly. As in-class evaluation was difficult, many classes operated on a combination of class video distribution and feedback/learning evaluation using LMS and other ICT tools. In each class, many assignments were distributed; thereafter, the data shows that students' learning time outside class has seen an upward trend (Saito, 2021; Miyoshi, 2021). These reports indicate that ICT may provide an effective technological solution to the problem of the "substantiation of the credit system."

At the same time, the problem makes the learning practices of Japanese students clear. Based on the data from the survey, a notable "bad point" of online classes was the increased burden of "many reports and other assignments" (49.7%) (MEXT, 2021c). When students return from online to face-to-face classes and lose the time efficiency of distance learning, many may not be able to continue spending time on learning outside class, regardless of whether they have convenient ICT tools.

Sugitani (2021) explains the function of out-of-class learning, citing the establishment of an evaluation system for out-of-class learning in the U.S., which includes the establishment of task-based learning and the assignment of personnel to assist with the evaluation. She also points out that in Japan, though these "props for university education" were introduced, their significance and functions were not fully understood as a result of which they became a mere formality (Sugitani, 2021, pp. 44–45). However, proposals to improve out-of-class learning, including technical solutions to make the credit system more substantial, are important. Simultaneously, peripheral factors, such as the large number of classes students take and the Japanese view of education in universities, are also important.

Presently, based on the experience of the pandemic, experts are discussing reform proposals that will lead to further improvement in the quality of learning for students. Specifically, it has been argued that the strengths of teaching methodology, such as learning management using ICT tools and enhanced teaching materials, should be combined with the reduction in the number of course credits and university-wide curriculum management (Yoshimi & Hori, 2021). To promote the shift from "teaching" to "learning" without difficulty and maximize the effects of the digitalization of education in universities in Japan, it is necessary to address issues such as the adequacy of the system and awareness of the people which they are accustomed before digitalization, in addition to technological improvements.

Digitalization Trends Related to Lifelong Learning

Lifelong learning in Japan has a relatively low degree of institutionalization (Schuetze & Slowey, 2002, p. 322). The low percentage of working Japanese adults enrolled in HE institutions has often been regarded as a policy issue (Council for the Creation of Future Education, 2022, p. 7).

According to Slowey and Schuetze (2012), lifelong learning in Japanese HE is primarily characterized by third-generation learners, called the "Learners in later life," from a wide range of educational and social backgrounds taking non-credit educational programs for self-development. The typical educational programs they attend are public lectures called *Kokaikoza*, which are recognized as "the most common form of university extensions" (Iwanaga, 2022, p. 24). There are various other noteworthy approaches to lifelong learning in Japanese HE besides *Kokaikoza*.

This section provides an overview of lifelong learning in Japanese HE by dividing it into two types of programs, degree and non-degree, and further organizing the status of digitalization for each type of program.

Degree Programs: Focus on University Distance Learning

According to Yamamoto, lifelong learning in Japanese HE has changed significantly after the Rinkyoshin Report was published in 1985-87 (Yamamoto, 2012). Prior to the Rinkyoshin Report, lifelong learning in Japan was viewed as a leisure pursuit for seniors, and from the 1970s to the 1980s, only a few adults studied at HE institutions. However, after the publication of the report, the MEXT developed postgraduate degree programs, and many adult learners began to study at graduate schools.

Nonetheless, instead of graduate school, university distance learning (including the Open University) has been the "mainstream recipient" of adult learners in degree programs (Kogo, 2020, p. 19) and has been providing educational opportunities for adult learners since the 1990s (Iwasaki, 2018, p. 52). Distance education at the undergraduate and graduate levels was institutionalized in 1947 and 1998, respectively. Recent data show that the percentage of students among those enrolled in university correspondence education over the age of 25 years is about 80% (MEXT, 2021a). University distance learning, therefore, functions as a place for lifelong learning.

The digitalization of university correspondence courses saw a turning point when the 2001 revision of the Standards for the Establishment of Distance Learning at Universities placed Internet-based courses in the system and made it possible for undergraduate students to obtain all 124 credits required for graduation through courses that use such media. Additionally, the establishment of joint-stock online universities, such as Cyber University (established in 2007) and Business Breakthrough University (2010), under the Special Zones for Structural Reform Act of 2003 provided the impetus for the digitalization of lifelong learning.

As described above, the digitalization of university distance education for degree programs has been in progress even prior to the pandemic. During the pandemic, however, the knowledge and skills accumulated through university distance education were not fully utilized in the universities. The main reason for this was that even before the pandemic, there was a division between university distance learning and commuter programs. According to Iwasaki (2018), university correspondence courses are often offered independently from commuter courses because of restrictions, such as not being allowed to attend regular courses offered during the daytime or to receive credit. Moreover, the digitalization of distance education in universities was implemented in a very small number of universities (Kogo, 2020, p. 19). Thus, because distance education in universities remained in a "marginal" position (Kogo, 2020, p. 19) even during the pandemic, its knowledge and skills were rarely utilized for commuter courses, central at universities.

Non-Degree Programs: Focus on Practical Vocational Programs

Non-degree programs include traditional programs with an academic orientation, such as *Kokaikoza*, and new programs with a vocational practice orientation in relation to certificate programs. As already mentioned, the most representative and traditional program for lifelong learning in Japanese HE is the *Kokaikoza*; however, its digitalization has not progressed. According to a survey conducted between 2019 and 2020, though 95.7% of Japanese universities offer *Kokaikoza*, the ICT-enabled percentage of universities offering *Kokaikoza* through distance learning is only 7.6% (MEXT, Education Policy Bureau, Community Learning Promotion Division, 2022). A director of *Kokaikoza* at a national university stated that the reason for this was that the personnel and budget required for distance education could not be secured and the revenue could not be expected (personal communication, 2022). There was also the assumption that third-generation learners, who dominate distance learning, would not have the equipment or skills to take distance education courses.

Alternatively, newer programs with vocational and practical orientations are relatively more digitalized. In recent years in Japan, there has been a demand for educational programs that "emphasize international competitiveness, productivity, and employability" (Iwasaki, 2022, p. 113) against the backdrop of a declining productive population, an aging society, and a falling birthrate, and as a response to rapid knowledge transfer in a knowledge-based society. A typical example is the certificate program, which was institutionalized with the 2007 revision of the School Education Law. This is a system to establish 60-hour long educational programs for learners and issue a certificate to those who complete them. Therefore, the development of short-term, online-based educational programs, which allow workers to study while working, is being promoted under the terms

recurrent education and *relearning for the working adult* (Cabinet Decision, 2018, p. 105; Central Council for Education, University Subcommittee, Future Vision Subcommittee, 2018, p. 20).

One factor behind the increasing digitalization of new types of non-degree programs is that the use of the Internet was promoted from the beginning of the policy in anticipation of the needs of the workers who are the primary target audience for the new programs. Yet, another factor is the pandemic. According to a survey conducted by the MEXT and the Nomura Research Institute, approximately three-quarters of universities reported that the pandemic had led them to implement new types of online-based educational programs (MEXT & Nomura Research Institute, 2022, p. 28).

As seen above, the digitalization of lifelong learning in HE, whether in degree or non-degree programs, was being developed before the pandemic, however, to a limited extent. The growing societal demand for lifelong learning and the impact of the pandemic have led to digitalization, albeit to varying degrees depending on the type of program.

Implications and Conclusion

University education in Japan has changed dramatically as a result of the full-scale online classes offered in response to the COVID-19 pandemic. The content of university education can be visualized with LMS and e-portfolios. Student learning is managed by faculties, and the students manage their learning trajectory with ICT. The digitalization especially offers opportunities for adult learners who are enrolled in fewer numbers in HE institutions than those in other developed countries (OECD, 2018).

Nonetheless, several challenges remain. As Iiyoshi (2020) pointed out, improvement in the quality of education in universities is difficult without an assessment of the culture of the university. Researchers must use this opportunity to carefully address problems such as the "Substantiation of the credit system" and find ways to maximize the effects of digitalization.

With the advancement of digitalization in the field of lifelong learning, universities will be more open to society. However, digitalization is still in its infancy, and lifelong learning itself being peripheral to Japanese universities, there are also many challenges to be faced. The implementation of lifelong learning and digitalization has bilateral consequences as it can be both an income and expenditure for universities. The digitalization of lifelong learning in universities can be a savior for management as well as valuable for other reasons. These perspectives will be key to the future development of digitalization in lifelong learning.

Although the pandemic has greatly expedited the digitalization of education in universities, other essential issues for educational reform became apparent. To take full advantage of the benefits of digitalization, there is the need to re-examine the factors that hinder it, such as a non-existing structure that enhances educational activities. In addition, immediate measures should be taken to address the hindrances.

The above issues can be resolved by developing the infrastructure and systems for the entire HE sector as a part of the reform for the entire society. Apart from the MEXT that acts as the traditional managing actor for HE policies, several ministries, including the Cabinet of Japan, have set the recent policies of transformation of the Japanese social and industrial structure as a government-wide goal; the digitalization of university education is part of this transformation. This could widen the targets for HE. However, sharing the digitized academic record of individual students with government and private entities entails risks calling for personal information protection. Large amounts of data, including individual student learning records, have the potential to generate significant profits when used for business purposes. We have to be careful with this data utilization both in and out of universities. Therefore, the various stakeholders should discuss how digitalization can enhance the value of universities while protecting student personal information.

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Transformation of Korean Higher Education in the Digital Era: Achievements and Challenges

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Abstract

This essay addresses the transformation of Korean higher education (HE) that has occurred since COVID-19, with a focus on the digitization of teaching and learning. Digitization has impacted both remote and traditional universities and colleges. While remote higher education institutions (HEIs) have been quick responding to the changed situation, traditional universities and colleges have also been searching for various instructional methods in their online as well as traditional classrooms, experimenting for the best methods for learners. National policies have also supported this digital transformation of HEIs which has had results of the engagement of more adult learners in HE gaining credits, certificates, and academic degrees online. While new ways of being 'learner-centered' have been intensively explored in these processes, some concerns such as the competency gap of institutions and instructors, and the deepening digital divide among learners have emerged, which needs attention from policymakers, researchers and practitioners in HE.

Keywords: adult learners, COVID-19, digital divide, digital teaching and learning, higher education institutions, Korean higher education

Introduction

Higher education (HE) in Korea has faced two different challenges. First, the educational system in Korea has been mandated with providing excellent quality education for its students, not only Koreans but also international students (Byun et al., 2013; Cho, 2015; Auh & Jeung, 2021). Second, decreasing enrollment originating from Korea's rapid aging and super-low birthrate has negatively affected many of its institutions and has become a 'life or death' issue for them (Lee, 2021).

Digitized teaching and learning are deeply involved in both. On the one hand, many Korean HE institutions (HEIs) have now reached out to their students as well as potential learners in the world and have collaborated with emerging

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global HE stakeholders using information technology (IT) (Yonhap News TV, 2014). On the other hand, many have worked with their regions, delivering their courses to adult learners online and offline and playing a meaningful role in the community development and regeneration (Bae, 2021). In this wide spectrum where globalization and localization are situated at both ends, the current digitization has been much expedited by COVID-19 and engendered many changes related to teaching and learning in Korean HE.

The current essay addresses these two important areas of transformation of Korean HE that have occurred over the last several years since COVID-19, with a focus on the digitization of teaching and learning. Document analysis was used to analyze and synthesize various types of documents such as research papers, government reports, reports from international organizations, and others to understand digitization in Korean HE before and after COVID-19 (Glaser & Strauss, 1967). First, the current digital teaching and learning state in Korean universities and colleges will be addressed. We shall describe the changes in HE that have been accelerated due to COVID-19, related HE policies as well as some specific cases studies. Second, we discuss the achievements and challenges of digital teaching and learning in Korean HE. While new ways of being 'learner-centered' have been much explored, other issues such as the competency gap of institutions and instructors, and the deepening digital divide among learners, are emerging that need attention.

The Backgrounds of Korean Higher Education

One of the distinctive characteristics of Korean HE is the control of the national government (Ministry of Education, 2023a). Most HEIs are subsidized by the Ministry of Education (ME), even though 85% of HE institutions are private (Ministry of Education, 2023b). A highly vertical stratification by reputation among the institutions drives the country-wide eagerness for university education, which is even acknowledged internationally (Nam, 2011). The tendency to prefer schools in metropolitan areas has also been an interesting feature of Korean HE. HEIs located in the regions other than metropolitan areas are the very ones that are the most affected by the upcoming elderly society where fertility hits 0.78, lowest in the Organization of Economic Cooperation and Development (OECD) countries (Kim, H. & Kim, S., 2023). The decreasing number of potential students increases anxiety within these institutions (S. Lee, 2022).

The increasing demand for lifelong education, however, has provided new opportunities for many of these HEIs, which call for some structural changes for these HEIs to serve adult learners as their new and alternative clientele. Therefore, the ME has supported HEIs to reach out to adult learners in the communities who look for upskilling and/or reskilling. The current ME policies have been enacted as a form of cooperation among the local government, HEIs, and local industry, which is located at the center of the local sustainability drive (Ministry of Education, 2022a).

This line of policies and practices in HE can roughly be categorized by three keywords – global excellence, localization, and lifelong learning. First, the development of globally competitive human resources is actively pursued. Korea's public investment in HE in 2020 is 0.7%. While this is lower than the OECD average (1.05%), it also is significantly lower than that in its primary and secondary education (OECD, 2021). Therefore, the current ME policy focuses on investing more in HE for research and education, lifting unnecessary regulations for institutions, and educating more people in wider life span, particularly in high-tech through industry-university cooperation (H. Lee, 2022).

Second, these policies encourage more HE graduates to settle locally rather than heading to the metropolitan area to seek jobs. ME policies, therefore, support students' increased participation in various learning opportunities at the local level, such as educational programs at local and regional universities and internships with local employers (Ministry of Education, 2022b). Naturally, HEIs are now asked to position themselves to be centered on human resource development (HRD) by functioning as a learning hub in the very regions they are located.

Third, changes in HEIs toward lifelong learning institutions are also actively pursued. The need for this change is obvious under disadvantageous circumstances such as the population decrease and local extinction crisis (Ministry of Education, 2017). The digital revolution also serves as one of the important reasons, particularly for baby boomers to go 'back to school' to learn for work opportunities in their later life, which is much longer than that of their parents (Choi et al., 2018). One of the main policy measures of the ME for this is the 'LiFE project' - 'LiFE' being an abbreviation of 'Lifelong education at universities for Future Education,' meaning the expansion of universities and colleges toward adult learners. With this active policy measure, more and more HEIs are now being transformed to include lifelong learners, i.e., non-traditional students (NILE, 2022a).

Changes in Digital Teaching and Learning in Korean Universities and Colleges Before and After COVID-19

According to earlier analysis of OECD on digitization in administrative services in many countries, education, particularly teaching and learning, was found but developed at a slow pace while "insight from distance, blended and collaborative learning were emerging" (OECD, 2016, p.24). The introduction of Learning Management Systems (LMS) and online course content in Korean HE gradually increased in the past decades, which brought not only instructional advancement but also increased diversity and openness in Korean HE overall. One of the most prominent changes in HE in this aspect was the emergence of remote HEIs named 'cyber universities.' This new type of HEI was approved and became popular in the early 2000s (Park, 2006). The Korea National Open University (KNOU), established in 1972, had been the only one of this kind until then.

The COVID-19 pandemic was key in introducing digitized instruction into the entire school system, from primary to post-secondary (Kalenzi, et al., 2020). The change in teaching and learning in HE has been carried forward in line with Korea's national strategy, 'digital transformation' of its industries, represented as DNA (Data, Network, AI) (Ministry of Education, 2021). Below is a summary of the digital teaching and learning conducted in general as well as in remote HEIs.

The Korea National Open University and Cyber Universities

For the last 50 years, the number of graduates of Korea National Open University (KNOU) has reached 800,000, expanding the access of HE to adult learners. All the courses of KNOU are delivered online through its LMS named U-KNOU Campus (https://ucampus.knou.ac.kr/). Some face-to-face instruction is given as an auxiliary measure on its 13 regional campuses. KNOU maintained its status as the only remote HEI until the Millennium when 'cyber universities' started to serve the learning needs of adults with increased online support features. Consequently, the number of students at KNOU has gradually decreased. For example, from 171,692 in 2017 to 123,110 in 2022(Statistics Korea, 2023).

In 2001, the legal foundation for 'cyber universities' was created, and 7 undergraduate schools and two professional undergraduate programs started operation in March 2001 (Park, 2006). With the revision of the Higher Education Act in 2008, these virtual universities were added as an official HEI category, with KNOU as the only public one and all the others as private. As of 2023, there are 21 cyber universities in Korea (Table 1) and the cumulative number of graduates is about 320,000 (CU info, 2023).

Table 1

The Statistics of Private Cyber Universities in Korea

Number of Private Cyber Universities	Number of Departments	Number of Students	Number of Enrolments in 2022	Number of Graduates in 2022
21	443	148,770	38,526	33,298

Source: Korean Statistical Information Service (2022).

For the earlier part of the pandemic, the offline part of instruction at KNOU was entirely replaced with real-time online video conferencing such as Zoom and final examinations were also replaced with tablet-based tests. KNOU also took the initiative to share its thousands of online courses with general HEIs, which had to find a way to deliver their previously offline courses online with no time to prepare (KNOU Weekly, 2020). Cyber universities have also grown exponentially at the same time, proving that online education can be a quality alternative to traditional offline teaching and learning (Chang, 2020).

Online Teaching and Learning in Traditional Universities and Colleges

The outbreak of COVID-19 has somehow blurred the boundaries between traditional and remote HEIs, and even between HEIs and large online learning platforms, all of which have intensified competition in HE among these players.

The changed practices of traditional HEIs in Korea are summarized in two ways. First, traditional universities and colleges had to go completely online during the pandemic. In 2021, the online learning platform installation rate in these institutions reached almost 100%. It was 98.2% for colleges and 96.3% for 4-year universities, as shown in Table 2 below. Digital teaching and learning were considered a standard auxiliary method before COVID-19 while it has become a common practice after the outbreak.

Table 2

E-Learning Rates at Korean Universities and Colleges

School Level	2017	2018	2019	2020	2021	Increase over the previous year
Colleges	75.2	75.6	78.5	90.7	98.2	7.5
Universities	84.0	84.2	85.3	92.4	96.3	3.9

Source: Korean Statistical Information Service (2022).

In the initial phase of COVID-19, online learning provision in many institutions was not much more than basic, for example, uploading instructor-created video clips to the platforms to be watched by the students asynchronously. However, evolution has been rapid. Even though most HEIs have now returned to face-to-face classes, many have newly introduced courses organized as blended and/or hybrid learning, or even more experimental ones with constantly evolving educational technology (so-called 'edu-tech') Some leading universities have concentrated on innovating their learning platforms based on developed IT infrastructures that support various types of learning, searching for better ways to help their students (Yoon, 2022). These newer teaching and learning trials have changed Korean HE classrooms to give students more choices for participation in learning, enhancement of their learning outcomes, and increase communication between and among instructors and learners in expanded online community spaces for cooperative learning and team learning (University Distance Education Center, 2022).

Second, joint networking of universities among themselves or with global online learning platforms has emerged since COVID-19. For example, Yonsei University and 16 other universities have established an online lecture network and jointly operated online lectures since 2022 (Yonsei University, 2022). The emergence of this network can be interpreted as a self-help action for Korean universities to overcome difficulties through sharing online course content. Some universities have cooperated with commercial learning platforms such as Coursera, edX, or Udacity. For example, Sungkyunkwan University agreed with Coursera to allow its instructors and students to take 3,000 courses for free and gain extracurricular credits. It has also created eight courses in Korean language education, Korean philosophy, big data, energy, and software and provided them through Coursera for thousands of learners around the globe (University News Network, 2021). While concerns and questions have arisen regarding the boundary between HEIs and these alternative HE suppliers, efforts of Korean HE to work with competitive players and utilize their platforms and resources for their students and more are considered meaningful as it can be considered as an effort to generate value through innovative practices (Shaughnessy, 2018).

National Platforms of Online Learning in HE

Government-supported online learning at the HE level has also increased. First, Korea Open Courseware (KOCW) is a system for the joint utilization of teaching and learning materials operated by Korea Education and Research Information Service (KERIS), an organization for projects and academic research affiliated with the ME. It provides free lecture video

clips and materials shared by Korean and foreign universities and institutions. It started as Korea's open educational resources (OER) movement in 2007. As an e-learning service at the HE level, it aims to spread a knowledge-sharing culture by expanding opportunities beyond HE (KERIS, 2020). According to KOCW's official website (www.kocw.net), it has three core goals: First, 'improving the quality of HE through joint utilization of e-learning contents'; second, 'securing excellence in educational contents and methods by the power of sharing'; and third, 'expanding lifelong learning opportunities by improving public accessibility to university-level lectures.'

KOCW currently operates a curation service categorized by these themes to meet various learning demands, such as English, liberal arts seminars, and job training with other topics. It serves every person's right to learn more and better, not only HE students but also adult learners who look for higher learning outside of HE. The numbers related to KOCW in 2022 are shown in Table 3 below. During the COVID-19 period, many HEIs have actively utilized KOCW contents, so the usage rate has increased rapidly.

Table 3

KOCW Contents

Category		Institutions	Lectures	Resources
Korea	University	188	16,824	282,795
	Others	33	3,939	7,173
	Total	220	20,763	289,968
International	HEIs	9	4,278	5,320
	Open Archive Initiative (OAI)	3	-	133,180
	Total	12	4,278	138,500
Total		232	25,041	428,468

Source: KOCW homepage http://www.kocw.net (2022).

K-MOOC (Korean Massive Open Online Course), started in 2015, is also referred to as one of the major remote lifelong education services operated by the National Institute of Lifelong Education (NILE), a headquarter organization of lifelong learning affiliated with the ME (Ministry of Education, 2023d). As of 2023, 1,870 courses have been provided, with 2.8 million people enrolled (NILE, 2023). While KOCW mainly provides online lecture clips, K-MOOC provides an interactive online course service with lectures and learning activities such as quizzes and assignments. After COVID-19 started, many HEIs have discovered K-MOOC as a quality alternative to their conventional course provisions (NILE, 2022a). Adult learners outside HEIs have also actively taken its courses and used their credits in the Credit Bank System to earn HE degrees. NILE has now provided opportunities for its subscribers to take courses in Coursera and Udemy. The number of K-MOOC lectures sorted by academic disciplines as of 2021 is shown in Table 4 below.

Table 4

Number of K-MOOC Lectures by Academic Disciplines

Discipline	Humanities	Social Science	Education	Engineering	Science	Medicine	Art	Total*
Number of Lectures (%)	360 (26.5)	340 (25.0)	51 (3.8)	297 (21.9)	131 (9.6)	88 (6.5)	91 (6.7)	1,358 (100)

Source: NILE (2022a).

K-MOOC represents the increased opening of Korean HE through digital teaching and learning in that it serves excellent quality HE to anyone for free. The maximum number of students granted per class is 800 for quality control. And the course registration is operated on a first-come, first-served basis (NILE, 2022a). K-MOOC has become increasingly popular during the COVID-19 period and has been developed further by introducing content customization by analyzing individual learning patterns and preferences based on artificial intelligence (AI) big data as well as mobile learning services (University News Network, 2020). In addition, there are increasing cases of universities operating their own MOOCs such as KAIST, POSTEC, Yonsei University and so on (Ministry of Education, 2023).

Other National Remote HE for Lifelong Education Services

More services at the national level for lifelong learning in HE by NILE need to be introduced related to the increasing role of digital teaching and learning (Kim, 2020). First, the Credit Bank System (CBS) was created with the vision to promote the development of an open lifelong learning society. It was implemented in 1998 as a system that enables adult learners to acquire bachelor's degrees by accumulating credits from various educational institutions certified by the ME. The purpose of this system is to guarantee the people's right to learn and therefore to provide opportunities to acquire HE degrees in an alternative way, particularly for the groups of adults who did not participate in HE (Ministry of Education, 2023c). By introducing online education, CBS has benefited more people who want to take courses and get HE credits regardless of time and space. In 2022, over 40 thousand people have obtained their bachelor's degrees through the CBS. There are 416 CBS operating institutions which include 94 online education institutions (NILE, 2022b).

Second, there is a Match-Up program which is another program of remote HE services at the national level for lifelong learners based on the demand for flexible job training programs (Ministry of Education, 2023c). This is a short-term vocational certification program that includes online training courses tailored to the needs of some hi-tech industries. The majority of participants are HE students, job seekers, and current employees who wish to improve their job skills particularly for the jobs in the Internet of Things (IoT), AI, or big data, smart logistics and so on. Those who complete these training courses in Match-up program gain up-to-date skills in the fields that are certifiable through following the designated evaluation process by representative companies as well as HEIs in each industry.

Achievements and Challenges in Digital Teaching and Learning in Korean Higher Education

Digital teaching and learning in Korean HE are now considered as an essential development that has accelerated since the time of COVID-19. This rapid change has exposed both positive and negative aspects. Achievements and challenges of the current development of digital teaching and learning in Korean HE are explored below.

Achievements Gained from Fast Digitalization in Korean Higher Education

Due to the unprecedented emergency in which face-to-face instruction was not possible at all, the lack of knowledge, methods, and experiences about digital teaching and learning became apparent. There was a lot of trial-and-error, particularly in the early days of COVID-19. Three years later since then, the progress is remarkable upon expedited efforts.

First, one of the biggest achievements of the fast and expanded digitization of teaching and learning is the increased knowledge and practice to make the teaching and learning in HE more effective for learners. New 'learner-centered' pedagogical models have actively been explored during the pandemic with the utilization of digital teaching and learning. On the one hand, a high level of excellence in increased efficiency of digitization has been pursued mainly by leading universities. Many instructors have tried to facilitate their own classrooms both online and offline and have come up with optimized solutions in which learners can better participate (University Distance Education Center, 2022). Both instructors and students also have had more chances to discover learning online not as an auxiliary, but as a meaningful way of learning in HE. On the other hand, virtual HEIs have an opportunity to prove the value of online learning in HE level. Overall, the pandemic was a principal factor of these rapid developments in learner-centered teaching and learning with the adoption of various technologies.

Second, there are now increased options for learners who want to pursue higher learning outside HE campuses. On the one hand, national online learning platforms and programs such as KOCW and K-MOOC have provided increased higher learning contents and methods, all of which enhance the possibilities for people outside HE to get an education they want. Therefore, KOCW and K-MOOC have increased the Korean people's rights to learn in HE level and widen the

opportunities of lifelong learning (Jun, 2023). The ME and NILE have played a key role in enabling such changes for these lifelong learners who need HE.

Challenges Experienced from Fast Digitization in Korean Higher Education

Problems arising from fast digitization of teaching and learning in Korean HE are as many as the number of achievements. Fast changes to move onto online teaching and learning have resulted in various unexpected issues and problems such as platform delays and errors, lack of online class contents, insufficient institutional fundamentals for online class operation and evaluation, lack of teaching competencies of instructors in online teaching, and more. Among them, the issues of 'gaps' seem bigger than others.

First, various problems of HEIs as well as faculty in provision of digital teaching and learning as suppliers have been pointed out. Server instability as well as instructors' capabilities to deal with online as well as hybrid classes were addressed as major issues particularly at the early transition to non-face-to-face classes (Lee & Shin, 2020; Kang, 2020; Lee, et al., 2022). According to a survey in 2021, four out of ten students prefer online class over face-to-face or hybrid (ET News, 2021) but their preference for online classes is not based on their awareness or experiences of online learning but on the convenience such as saving time on travelling to the classroom. Instructors also respond that it is still the most difficult to check students' understanding on the taught contents in online classes, which requires competency building in online and hybrid formats of teaching and learning (Chong & Woo, 2022). In addition, some HEIs may welcome digitization just to reduce costs in hiring instructions and securing classrooms, which would possibly make their students more vulnerable (Shin, 2022).

Second, there have been many issues from a learner's aspect as well. The digital divide among learners seems to be one of the most serious issues. For example, possession of appropriate digital devices, high-speed internet access, and personal spaces for learning have been among the major reasons behind inequality of educational opportunities of the learners in the digital era. Learners' varying level in digital competency intensifies the digital divide, too. Particularly, many learners in their mid-to-late adulthood show a low level of digital literacy. Thus, many adult students in the LiFE Project show low readiness for digital learning (Yang, 2020), which is considered a big problem in their higher learning. Therefore, supporting them to get accustomed to an online education environment as early as possible is a key to their fruitful learning in HE (Yoon & Lee, 2022). The same concern applies to competency in digital teaching and learning for lifelong learners outside of HEIs. While inequality is a long-standing issue in Korean education, income is now less determined by HE degree (Jung, 2021). Since online teaching and learning has been fully implemented, 'digital divide' would possibly exacerbate income advantages or disadvantages of the HE graduates.

Conclusion

In the 2000, Korean HE experienced changes regarding digitization such as the emergence of cyber universities, e-learning platforms and open coursewares. Before COVID-19, however, all of these could be discussed as incremental. On the one hand, searching for various instructional methods in both online and traditional face-to-face classrooms has become an implemented practice in traditional universities and colleges. Remote HEIs such as KNOU as well as cyber universities, on the other hand, have been quick responding to the changed situation and therefore become successful HEIs. Policies by the ME in support of a digital transformation of HEIs had the result of more adult learners in HE gaining credits, certificates, and academic degrees online.

There are still challenges following the rapid digitization in HE. Institutional competency to lead excellence in digital teaching and learning with technology vary, as does digital literacy of the learners. While the 'digital divide' is a major concern in Korean HE, more and diverse attempts are found in both policies and practices, in which future directions of Korean HE and its digital teaching and learning can be seen as bright.

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Digitalization of Higher Education in Vietnam

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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 article presents a review of the current state and the potential of digitalization of Vietnam's higher education and makes recommendations in support of the digitalization process. It is mainly based on public documents. The paper discusses the extent of institutional digital transformation, its challenges, and opportunities in two contexts: (1) before the outbreak of COVID-19 when the process of digitalization of most universities was just beginning and varied in level, and (2) after the outbreak of COVID-19, when digitalization occurred rapidly. The review addresses digitalization in line with the National Digital Transformation Program with a vision for 2030, which has three targets: (1) to develop the platform to support distance learning and teaching and thoroughly apply digital technologies to management, teaching, and learning; (2) the development of digitalized learning materials, and (3) the creation of a data warehouse for sharing teaching and learning resources.

Keywords: digitalization, digital transformation, government policies, higher education, Vietnam

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Tóm tắt

Bài viết trình bày tổng quan hiện trạng và tiềm năng số hóa giáo dục đại học Việt Nam và đưa ra các khuyến nghị hỗ trợ quá trình số hóa. Bài viết chủ yếu dựa vào các tài liệu đã công bố. Bài viết tập trung thảo luận về mức độ chuyển đổi số của các trường, với thách thức và cơ hội ở hai bối cảnh: (1) trước khi dịch Covid bùng phát khi quá trình số hóa của hầu hết các trường đại học mới bắt đầu và đa dạng về cấp độ, và (2) sau khi dịch Covid bùng phát, khi quá trình số hóa diễn ra nhanh chóng. Các phân tích tập trung vào các mục tiêu số hóa nêu tại Chương trình Chuyển đổi số quốc gia, định hướng đến năm 2030: (1) phát triển nền tảng hỗ trợ dạy và học từ xa và áp dụng triệt để công nghệ số trong công tác quản lý, giảng dạy và học tập; (2) số hóa tài liệu học tập và (3) xây dựng nền tảng chia sẻ tài nguyên dạy và học.

Từ khóa: số hóa, chuyển đổi số, giáo dục đại học, chính sách của Chính phủ, Việt Nam

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Introduction

This paper presents a snapshot of the current state and the potential of digitalization of Vietnamese higher education (HE) and proposes recommendations in support of the digitalization process in higher education institutions (HEI). Government policy has shaped and driven the digital transformation agenda. Before the COVID-19 outbreak, digitalization had been slow and varied among HEI. Some universities were actively engaged in the digital transformation of institutional processes and systems, while the majority had just embarked on digitalization. The COVID-19 pandemic has highlighted and accelerated digitalization in Vietnam, resulting in positive and rapid progress. The following section, an overview of higher education in Vietnam, addresses policy related to digitalization to better understand the previous and current performance. In conclusion, the paper presents some recommendations.

An Overview of Vietnamese Higher Education

The Vietnamese national education system (formal and non-formal) has four levels. Early childhood education, general education: primary education (5 years), lower-secondary education (4 years), upper-secondary education (3 years), vocational education, and higher education (HE). HE is the highest of the four levels and provides programs leading to Bachelor's, Master's, and Doctoral degrees (Government, 2016a). The Ministry of Education and Training (MOET) is responsible for the national education system, except for the three-year-program colleges and vocational training, which are under the responsibility of the Ministry of Labor, War Invalids and Social Affairs (National Assembly, 2019).

There are 237 universities (excluding those in the security and defense areas), with 172 public universities and 67 private universities (MOET, 2020a), including two national universities (Vietnam National University, Hanoi, and Vietnam National University, Ho Chi Minh City). However, only 119 HEIs are directly under the direct management of MOET, while the others belong to other governing agencies, including line ministries, local government, or foreign organizations (Japan International Cooperation Agency, 2022). The Prime Minister's Office directly manages the two National Universities which comprise several specialized universities. In general, these HEIs follow the guidelines and supervision of MOET for education-related activities, while their financial and general management are under the direct command of the respective governing agencies. Public HEIs are funded, maintained, and represented by the State, while private ones are financed and supported by domestic or foreign investors. HEIs are required to determine their development goals and operational orientation as research- or application-oriented.

Vietnamese HEI are relatively centralized, and regulation includes institutional management, curriculum design, enrolment, and program operation. The curricula designs follow the standards provided by MOET, which appear in several official documents such as Vietnam's National Qualification Framework (Government, 2016b), Education Law (National Assembly, 2019), and Higher Education Law (National Assembly, 2018). Standards and formulation, appraisal, and promulgation of HE programs appear in Ministry documents, including regulations concerning the admission and program operations of Bachelor, Master, and Doctoral levels (MOET, 2021a, d).

In 2018, a World Bank report on the educational innovations of East Asia and the Pacific (World Bank, 2018) ranked education in Vietnam in the Above-Average Performing Systems, with schools showing significant progress. This impressive record of success in education shows that quality schooling in resource-constrained contexts is possible. While Vietnam has made significant strides in advancing at all levels of education, particularly at the tertiary-level, issues such as digitalization remain. Before the COVID-19 outbreak, specific actions and strategies for the educational digitalization of most HEI were just the beginning (Nguyen, Pham & Nguyen, 2021). To date, digitalization has accelerated considerably.

Digitalization

Digitization is understood as using technologies and information to transform institutional operations (Iosad, 2020). Digitalization causes significant changes in how society operates. The widespread use of digital devices, increased connectivity, and the creation of large amounts of digital data are evidence of this change. Digitalization is profoundly influenced by public policy and institutional development strategies, both of which play a crucial role in shaping the digitalization landscape of higher education (Walker, Jenkins & Voce, 2016). HEIs apply digital technologies to optimize existing processes by allowing more efficient operation and coordination between the various operations. Digitalization also changes the ways of teaching and learning, and, more generally, of relations between academic staff and students. (Pagani

& Pardo, 2017). Hence, HEIs become more competitive with digitalization, which may enhance their stakeholders' experiences.

Digitalization is considered an inevitable trend in HE (Japan International Cooperation Agency, 2022). This trend forces HEIs to revolutionize their approach to operations in several ways, including digitalizing the management information system, creating a database system, and applying technology to manage, operate, forecast, and support educational decision-making more efficiently than in the past. Teaching, learning, and evaluating might involve digitized documents, digital libraries, and virtual laboratories, implementing online teaching and learning systems, and building virtual universities (Phung, 2021).

Current Digitalization Policy

Government policy has played a key role in accelerating HE digitalization. Vietnam policies promoting digital transformation in HE provide a solid foundation and focus for the pace and scope of digital transformation in universities. Before 2020, there were various initiatives, such as the "Scheme for developing Vietnamese digital knowledge system" (Government, 2017). Anyhow, the benchmarks for HE are the following (PricewaterhouseCoopers (PwC) Vietnam, 2021):

The National Digital Transformation Program by 2025, Vision to 2030

Vietnam adopted in 2020 the National Digital Transformation Program towards 2025, vision to 2030, referred to as the Program, (Government, 2020), setting dual goals: (1) holistically transform the nation on three pillars, digital government, digital economy, and digital society, and (2) establish digital technology companies that can be worldwide famous. The Program specifies education among the eight priority areas to promote social and digital transformation. HEIs are supposed to head to seven targets: (1) to provide human resources in information technology; (2) to supplement their programs with digital technologies such as artificial intelligence, data science, big data, cloud computing, Internet of Things, virtual reality/augmented reality, block chain, and 3D Printing; (3) to provide open mass online courses for all citizens to improve access to education through digital technology, training, retraining, and digital skills training; (4) to universalize online exams; (5) to recognize the value of online learning certificates; (6) to build the data warehouse for sharing teaching and learning resources, and (7) to develop technology serving individualized instruction and learning.

In detail, the first top priority in implementing the Program is to develop the platforms to support distance learning and teaching and thoroughly apply digital technologies to management, teaching, and learning. All HEIs are supposed to provide distance learning and teaching, in which piloting programs allow studying at least 20% of the program content online. Second, the materials need to be digitalized; third, the data warehouse for sharing teaching and learning resources, both face-to-face and online, needs to be constructed; and fourth, technology for education, towards individualized instruction and learning, requires to be developed.

Strengthening the Application of Information Technology and Digital Transformation in Education and Training in the Period of 2022-2025, Vision to 2030 Project

Further guiding the Government Program, known as the *Program* (Government, 2020) in the area of education, the Government presents the Strengthening of the application of information technology and digital transformation in education and training in the period between 2022 and 2025, vision to 2030 Project (Government, 2022). The overall aim is to encourage using technology to promote innovation in teaching and learning, to enhance the quality of and opportunities to access education, to strengthen education management efficiency, and to build an education system that is open and adaptable to digital platforms; all of which will contribute to the development of a digital government, digital economy, and digital society (Pitt, et al., 2022).

Towards 2025, the Project aims at two objectives with key performance indicators. The first is to drastically innovate the method of educational organization to make teaching and learning in the digital environment an essential and daily educational activity for every teacher and every learner. Specifically, regarding access to online education, 50% of students and teachers have the conditions (in terms of media, transmission lines, and software) to participate effectively in online teaching and learning activities. Regarding the online education environment, to establish online teaching and learning platforms that are domestic products used by over 50% of students. More than 50% of HEI offer online distance learning (degree) programs. Regarding the scale of online activities, the proportion of online classes accounts for 20%. As to students studying for a second university degree, at least 50% study online, with more than 50% of the time being online.

The second objective is to drastically innovate the method of management based on technology and databases, enhancing the management efficiency and service quality of the State and institutions. Regarding institutional management, all HEIs apply the digital platform for educational system management. The national database system of the education sector is established and operates efficiently. Vigorous application of online service provision should lead to paperless administrative procedures regarding student services.

The discussion of the digitalization of HE in Vietnam will be based mainly on the first three suggested targets mentioned in the Program, with which the Project objectives are in alignment. They are (1) the development of platforms to support distance learning and teaching and thoroughly apply digital technologies to management, teaching and learning; (2) the digitalization of materials and (3) the development of data warehouses for sharing teaching and learning resources both face to face and online. The fourth target, the development of educational technology for individualized instruction and learning, responds mainly to the second aim of the Program to build up international digital technology companies in the future, and as such, might not apply to the current context.

Digitalization of HE before the COVID-19 Outbreak

According to the British Council report (Pitt, et al., 2022) on the readiness of digital transformation in Vietnamese universities, Vietnam possesses favorable conditions for digitalization. The rapidly increasing scale of telecommunications services, computers, and ICT products in Vietnam shows the rapid development trend of the digital economy in the future. Vietnam's ability to connect to the Internet quickly and easily and willingness to switch from 3G to 4G is also an excellent advantage for the digital transformation with the highest mobile/fixed broadband subscribers in Southeast Asia. The transmission quality and the speed of mobile/fixed bandwidth in Vietnam are relatively uniform and higher than average in Southeast Asia, excluding Singapore (World Bank, 2019).

The Vietnam Digital Evolution Index in 2021 was 46.79, which was low in comparison with those of other Southeast Asian countries, such as Thailand (53.04), Malaysia (69.03), and Singapore (98.82) (Mruthyunjayappa, 2021). In terms of workforce digital skills, the nation dropped four spots to rank 96th in the 2020 Global Talent Competitiveness Index (PricewaterhousCoopers, 2021). According to a World Bank report on improving the performance of HE in Vietnam (World Bank, 2020), active engagement among HEIs is varied. A few universities were forging ahead and integrating digital technologies; the others, in general, lack the foundational infrastructure and ICT technology to take advantage of digital and/or disruptive technology to support innovative educational approaches in teaching and learning. The HE system in general is considered underfunded (Japanese International Cooperation Agency, 2022; World Bank, 2020). The digital infrastructure of private universities is often better funded and modern, such as Vinschool, FPT Education, and Phenikaa (Pitt, et al., 2022; Japanese International Cooperation Agency, 2022).

Another critical challenge for digitalization is that teachers and students lack digital skills (Le, Giang & Ho, 2021). In public HEIs, the older age group of staff generally adapts slowly to technological changes (World Bank, 2020). Also, there is fragmentation and inconsistency since HE is overseen not only by MOET alone but also by several other governing agencies (Heyden & Le-Nguyen, 2020). In addition, the inconsistency of multiple bylaws (World Bank, 2020) causes more complexity and fragmentation in the legal framework for managing public HEIs, all of which might impede fostering digitalization nationwide among all HEIs.

As to the first target, most HEIs developed a learning management system (LMS), which could be considered a popular solution to promote digital transformation. LMS is a web application with different functional modules to manage the teaching content and the learning process entirely online. Besides, the system also integrates services to support exchanging information between lecturers and students and among students, assigning tasks, and offline interaction (Tang & Nguyen, 2020). In addition, building an information management system with learners' educational records is also considered as a targeted benchmark of digital transformation. According to Phung's study of HEI top leaders (Phung, 2021), they knew that building such a data system could allow universities to use these tools to analyze the performance of faculty, students, and staff for effective HEI management. These implementations can support decision-making and improve teaching efficiency and student recruitment rate, creating competitive advantages (Phung, 2021). However, poor interaction occurs when students access LMS infrequently or inappropriately.

Establishing the platform to support distance learning and teaching was not quite popular among HEI. In Vietnam, distance or e-learning has appeared in universities since 2000, but not many HEIs had invested in it. Only the two Open Universities and those offering distance or e-learning degree programs explored online and blended learning and invested in infrastructure and data management systems (Le, Giang & Ho, 2021), while other HEIs were somewhat skeptical (Tang

& Nguyen, 2020). It was estimated that more than one-half of HEIs stayed away from distance teaching and learning (Pham & Ho, 2020). Though technology was thought of as meeting the growing demand for higher education at a reasonable cost, online learning is much more expensive and complex if it is to be done correctly. Lacking established pedagogic traditions and expertise in this area, online teaching cannot be developed cheaply and quickly without sacrificing quality (Rizvi, 2020). Until late 2021, there had been separate delivery modes, as required by MOET. Full-time or regular programs had to operate face to face, while distance education relied on online courses, largely asynchronous, using LMS. E-learning was still minimal for regular or full-time programs (Pham & Ho, 2020) and was used only as a form of support.

As to targets number 2 and number 3, HEIs' operations are limited. Due to the limited provision of e-learning, most universities could not sufficiently provide open learning resources to learners and lecturers. Few HEIs, such as Ha Noi and HCMC Open University, Ha Noi and HCMC University of Technology, Can Tho, Da Nang, and Thai Nguyen University, have been providing online materials and assignments in delivering their full-time programs (Le, Giang & Ho, 2021). Building a digital data warehouse (e-books, electronic libraries, multiple-choice question banks, essays, etc.), e-learning, e-learning software, and simulation application software were considered not a spontaneous development, as they need large budgets and a long-time, specific, and synchronous plan. That is why not all HEIs implement the plan (Phung, 2021).

Current Context and toward the Future

The COVID-19 pandemic has led to a massive increase in online teaching through various digital technologies and platforms (Felix, 2021) and a growing appreciation for the merit of e-learning and related technology-based educational modalities (Pham & Ho, 2021). Fully aware of the necessity of digitalization, together with the top-down policy, such as the Program (Government, 2020), and the Project (Government, 2022), MOET and HEIs have firmly embarked on the digitalization processes at the national and institutional levels. Consequently, digitalization in Vietnam is moving forward steadily.

Most of the HEIs are approaching the first target. HEIs have developed a platform to support distance learning and teaching and thoroughly applied digital technologies to management, teaching, and learning (ICTVietnam, 2020). However, the level of digitalization varies among HEIs. The following might count the potentiality of the speeding digitalization processes. In 2021, MOET amended the regulations that officially allow HEI to provide up to 30% online teaching and learning volume of the regular/full-time Bachelor programs (MOET, 2021a, d), 20% online volume of the joint Master and Ph.D. programs (MOET, 2020b), and online testing up to 50% of course assessment, which is a crucial step forward for all HEIs to apply e-learning widely in their programs. MOET has released guidance to promote digital transformation in regulations on management, operation, and use of the national database system, interconnection data standards, and others. In addition, public HEIs have invested in the LMS considerably as they received various kinds of support from government, donors, and technology enterprises during COVID-19 (Japan International Cooperation Agency, 2022). All these have pushed forward HEIs efforts in their digitalization.

E-learning has become popular with Vietnamese students. Blended teaching and learning, a combination of on-campus lectures and online learning, has become popular. Many have confirmed the transition of teaching materials and after-class discussions onto the digital platform to improve the learning experience for their students. Most HEI support LMS to help teachers collaborate with students, manage their learning progress, and share the lecture content (Japan International Cooperation Agency, 2022). LMS also helps provide paperless procedures to students. Students can enroll in the new courses, check their study records, pay tuition fees, or do other administrative procedures without coming to offices in the institution.

HEI management tasks, such as students' academic records, teachers' workload, and administration such as staff workload, infrastructure inventory, salary payment, etc, have also been gradually integrated into the digital system (Japan International Cooperation Agency, 2022). The fact that HEIs have applied various tools such as web portals or academic and research management platforms for some time and currently have added new ones might raise the concern of synchronous databases, such as duplication or harnessing data, during the digitalization process of HEIs in the future.

In addition, the national database systems of the education sector also operate nationwide, and MOET has asked all institutions to use the MOET portal, a statistical system for the purpose of national-wide information on HE, (MOET, 2020c). A recent unified higher education management information system (HEMIS) promotes evidence-based decisions from all stakeholders. A shared database for 63 Departments of Education and Training of Vietnam, 710 Departments of Education and Training, and about 53,000 educational institutions has data about 53,000 schools, 1.4 million students, including statistics, and reports on the whole education system. It has helped managers at all levels issue effective

management policies. This system can also support 63 Departments of Education and Training and more than 300 universities and colleges nationwide for entrance selection and enrolment (Pitt, et al., 2022).

The second target of having the library and reference material database has received more focus and substantial results. The more e-learning is provided, the more HEIs prepare themselves for the operation's requirements, including digitalized materials. The HEIs which have embarked on providing online courses are more advanced, such as Ha Noi National University, University of Foreign Trade, and University of Commerce (Nhat Hong, 2022), while the newly joined HEIs are accelerating even though they confront challenges such as allocating large budgets, time-consuming preparations, and copyrights for the materials. Moreover, digital learning materials (e-books, e-libraries, multiple choice question banks, e-lectures, e-learning software, and simulation application software) do not develop spontaneously, orderly, and systematically. It is therefore difficult to control their quality and content (ICTVietnam, 2020).

The third target of having a platform for sharing face-to-face and online teaching and learning resources has been developed at the HEI level. Most HEIs offer online learning as part of their full-time programs. Especially at the national level, national database systems have also been built up and are used nationwide, such as the E-learning warehouse, and the Vietnamese Knowledge Systems (MOET, 2020c).

Under the supervision of MOET, the digital data warehouse has contributed to the Vietnamese Knowledge System, which digitizes nearly 5,000 quality e-learning electronic lectures, a repository of doctoral theses with about 7,000 theses, a multiple-choice question bank with over 31,000 questions, 200 e-books, and more is added. In addition, there are massive data warehouses of private companies in use, such as those of Viettel (Viettelstudy), VNPT (vnEdu), MISA (Misa EMIS), Topica, FPT (VioEdu), VTC Intercom (IOE), as reported by the Ministry of Information and Communication (MIC, 2021).

Moreover, several HEIs are building MOOCs to build a data foundation and to disseminate knowledge in socio-economic fields and in science and technology to create conditions for the community to contribute, share and exploit, which will contribute to the lifelong learning. Also, HCMC Open University is co-operating with Hanoi Open University to develop further VMOOCs with more than 50 free courses in fields such as business administration, finance-banking, law, foreign languages, and others (Vietnamnews, 2021).

Recommendations

The digitalization in Vietnamese HEIs has been accelerated after COVID-19. The future of HEIs practice will be shaped by more integrated digital technologies. Students need to integrate e-learning to function well in the digital age (Pham & Ho, 2020). HEIs with more digital components are predicted to achieve a more competitive teaching quality and enrolment advantage. The following recommendations further support for digitalization of HE could be considered.

Support for Policy Dissemination

Government policy only provides a top-down driver for change. How individual institutions implement them will vary, as each institution has its own systems, processes, educators, and learners to consider. To enable HEIs to effectively undertake their digital transformation and provide practical support for policy implementation, MOET should provide clearly articulated guidance, criteria, and evaluation frameworks (Pitt, et al., 2022). MOET should coordinate and regularly promote national-level training, webinars, and other nationwide promotion activities to increase familiarity with policies and effectively disseminate policies and supporting resources related to digital transformation policy.

Government Support to HEIs

MOET and the governing ministries need to increase investment and support for universities. Recognition of the concerns and challenges for HEIs, such as the issue of cost, standardized systems, and infrastructure, are vital to ensure that HEIs feel fully supported in digitalization. The government should allocate special funding for digitalization projects in HEIs, especially in provinces, to support the implementation of new technologies and infrastructure, by establishing digital infrastructure such as high-speed Internet, hardware and software systems, and cybersecurity measures to ensure delivery of online courses. In addition, MOET should partner with private companies, research institutions, and international organizations to support digitalization initiatives in developing new technologies and innovative solutions for HEIs. MOET also should support and encourage research on good practices in HEI digitalization to disseminate nationwide.

Changing the mindset of HEIs leaders should also be considered a top priority. MOET should provide training to top-level institutional leaders to understand the benefits of digital transformation and the scope and requirements of digital

transformation to develop their digital literacy and knowledge of advanced digital technology applied in education. Those leaders afterward will confidently involve and support the digitalization process at their HEIs.

HEIs Support for Lecturers

HEIs should support the development of digital skills among HEI lecturers and students through training programs and capacity-building initiatives. Further training and support for lecturers are needed in the following five main areas:

(1) Intellectual property awareness: in particular, training should prioritize the new critical areas in digitalization, such as copyright, intellectual property, cyber security, and privacy, that lecturers might confront.

(2) Pedagogical practice: for the pedagogical practice, the training provides lecturers with the knowledge and skill for effective online teaching, classroom management, and student inclusion. How to apply digital tools such as discussion forums, virtual group projects, and online quizzes needs to be included to help lecturers foster student engagement, and collaboration with their peers.

(3) Digital skills: digital skill training empowers lecturers with their digital skills, such as how to prepare for their online teaching material, how to use tools to create digital lessons, to record and edit the recordings suitable for the class; to create engaging visual content; to use multimedia tools to create interactive, aesthetic and understandable presentations for learners, and to use tools to create online quizzes and contests (Do, 2021).

(4) Training on developing personalized learning models: students learning varies in their objectives, tempo, and styles. The training should specify how to apply technology to developing personalized learning models which better suit individual student needs and abilities (Nguyen, Pham & Nguyen, 2021).

(5) Digital mentorship to senior lecturers: senior lecturers' needs extensive training to acquire the digital skills, and the HEI should provide an essential support team Unit in the universities handy for senior lecturers to increase their confidence, digital technologies knowledge, and, ultimately, their digitalization involvement.

HEIs Support for Students

Further training and support for students are needed because thus far most HEIs have invested mainly in digital infrastructure, digital data platforms for HEI operation, and management, including teaching and learning. Investments should also focus on developing online services for students.

(1) Digital skill training: HEIs should provide comprehensive training for students, including web search skills, to ensure learners can maximize online learning opportunities. Students also need mastery to use digital tools for effective study engagement and study in collaboration with their lecturers and classmates.

(2) Paperless administration procedures: automatic consults and feedback might be given to students related to their administration requests and the potential students' enrolment requests. Students can register for all the thesis writing, submission processes, course enrolment, program and course change, tuition paid, tuition waived, or scholarship application online (Le, 2022).

Conclusion

In conclusion, the current teaching and learning context after COVID-19 has reinforced the comprehensive roadway to digitalization in Vietnamese HE. The Government and HEIs have responsively committed themselves to the digitalization processes at the national and institutional levels, even though the digitalization processes vary among HEIs. HEIs have constructed their own platform to support distance learning and teaching, and thoroughly apply digital technologies to management, teaching, and learning. An increasing number of HEIs have embarked on developing digitalized learning materials, and data warehouse for sharing teaching and learning resources.

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The Development of Open Online Courses in China

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Abstract

In 2023, China leads the world in the number of Open Online Courses (OOC, over 64500) and learners (over 1.88 billion). In this article, we provide a brief review of the development of OOCs in China and outline the current situation of Chinese OOC focusing on learning platforms, course size and structure, and micro-credential courses. We also summarize the development and application of OOC in China focusing on national policy guidance, the organizational structure of OOCs, different modes of OOC development, and the establishment of a standardized quality assurance system. We also discuss the OOC credit recognition, blended learning, and multi-school collaborative teaching. Finally, we consider the future development trend of OOCs in China from the perspective of improving digital teaching literacy of instructors and expanding international exchange and cooperation.

Keywords: China, higher education, open online courses; MOOCs; development stages; blended learning

Introduction

Since 2013, the number of online open courses (OOCs) in China has increased by tens of thousands, while the number of registered users has increased by millions. Over 64,500 OOCs were launched in China since the end of March 2023 (Ministry of Education (MoE), 2023), and the number of OOC learners in China has exceeded 1.88 billion (MoE), 2023), making China the world leader in both the number of OOC and learners. This paper focuses on the development and experience of OOCs in China.

The Chinese Higher Education System

Unlike some western countries, such as the United States and Canada, the Ministry of Education of China (MoE)

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is a national department with responsibility for higher education (HE) and the formulation of higher education policies for the whole countr. The 34 provincial education departments are responsible for implementing the policies of the Ministry of Education in their respective provinces. Therefore, we emphasize the role of the central government in guiding and supporting the development of OOCs.

There are six types of high education institutions (HEIs) in China: Academic HEIs, Research Institutes, Professional HEIs, Vocational HEIs, Adult HEIS (eg: National Open University), and Other Non-government HEIs. In terms of the organizational management, there are mainly two types of HEIs in China: One is funded and managed by Central Ministries, with a total of 433 HEIs; the other is funded and managed by Agencies or Local Authority, with a total of 2,630 HEIs (MoE, 2022a). The number of students in these HEIs exceeds 55 million (MoE, 2022b).

The large HE system has strongly influenced the development of China's OOCs. At present, the vast majority of OOCs in China are provided by HEIs, while a very small number of OOCs are provided by enterprises. In addition, statistics from multiple OOC platforms in China reveal that more than 70% of OOCs learners are current students (Yuan et al., 2019). Especially during the pandemic, all teaching activities have been changed to online teaching, in which OOCs have played a central role.

Four Growth Stages of OOC in China

The growth of OOCs in China can be divided into four stages. Stage 1 began in 2003 and ended in 2010, Stage 2 began in 2011 and ended in 2016, Stage 3 began in 2013 and is ongoing, while Stage 4 began in 2019 and is ongoing (see Table 1). These stages reflect the evolution of OOC development in China from centralized and small-scale to divergent and large-scale, along with the interactive impact of the growth of global online courses on OOC development in China. In Stage 1, the growth of OOC in China came at the same time as the rise of the international Open Educational Resources (OER) movement (Kanwar et al., 2010). In April 2001, MIT officially launched the OpenCourseWare (OCW) project, announcing that the university's courseware would be freely accessible through the Internet, heralding the start of the OER movement. The openness and sharing advocated by the OER movement also provided a reference for the development of OOCs in Chinese universities. At this stage, Chinese OOCs were characterized by the open sharing of static course resources. Course teams were only required to provide text-based resources such as syllabi, teaching plans, and course exercises. There was virtually no interactive activities in the teaching process. As such, in Stage 1, OOC primarily targeted teachers and students in HE rather than the general public. A key role of OOC development was to provide new teachers with the ability to quickly start courses in their schools while relying on existing resources, thereby reducing the workload of course preparation.

During Stage 2, the development of OOCs in China focused on attracting teachers and students in higher education along with the general public, while targeting improving the utilization of course resources. As such, Stage 2 OOCs covered basic and professional courses in higher education, along with popular science and other courses of interest to the general public. In terms of online learning activities design, OOCs adopted forums, homework assessment, and other teaching activities supporting teacher-student and student-student interaction, thus intensifying the involvement of learners. Adhering to the concept of fully open development, the Chinese government invested CNY 38 million into the development of a unified course sharing platform between 2011 and 2013 to drive the sharing of courses. The utilization of OOCs increased significantly during this period.

In 2012, internationally renowned institutions such as Stanford University started launching Massive Open Online Courses (MOOCs). With the establishment of major MOOC platforms such as Udacity, Coursera, and edX, a boom period for MOOC began (Pappano, 2012). In Stage 3, MOOCs became also the typical form of OOC in China. Many independent MOOC platforms emerged, such as iCourse163, XuetangX, and CNMOOC (Tian & Xia, 2017). As of the end of February 2022, the number of MOOCs launched in China exceeded 50,000, with nearly 800 million course-takers, and rapid growth showed no signs of slowing down.

In terms of course design, when compared with Stages 1 and 2, MOOCs emphasized the creation of a complete online self-learning experience. In addition to providing course materials such as videos and documents, course teams were also required to design teaching activities that conform to the characteristics of online learning (such as peer assessment and online discussion) to enhance the users' online learning experience and improve the utilization of course resources. At this stage, MOOC utilized the intelligent transformation potential of information technologies. Learning analytics technology allows for the provision of personalized services such as recommending personalized learning resources to learners by logging data such as learner habits and browsing trajectories.

In 2019, the growth of OOCs in China entered Stage 4. On the basis of continued focus on the development of MOOCs, this stage was mainly characterized by two major changes: (1) an emphasis on the development of blended learning courses based on existing high-quality MOOCs, integration of high-quality OOC resources in the classrooms of higher education institutions (HEIs); (2) the application of emerging innovative technologies such as virtual reality and augmented reality to transform offline experiment courses with high experiment material costs and experiment risks into virtual experiment courses, further driving the deep integration of technology, education, and teaching. In 2022, the MoE launched Chinaooc to centralize all OOC platforms across China allowing students to search for OOC offered by any and all providers through a single portal. This approach signifies a gradual shift towards providing a standardized path for the development, operation, and management of future OOCs, and reflects that China has gradually formed an OOC quality assurance system led by standards and regulations.

These stages reflect the development process of OOCs in China on the basis of the gradual maturity of teaching technologies. As seen in Table 1, the technical characteristics, openness, target, and resource types differ in each stage. In terms of technical characteristics, new technologies have been applied to learning platforms across different stages. In terms of openness and target, OOCs have shifted from a semi-open to a fully open model, and expanded from teachers and students in higher education to include the general public. In terms of resource types, OOCs have shifted from providing static course resources to the activities and materials needed for a complete learning process.

Table 1

Comparison of OOC growth stages in China

Stages years	Key Technologies	Openness	Target	Resource Type
Stage 1 2003-2010	Hyperlink technology	Semi-open	Teachers and students in HE	Syllabi, teaching plans, learning exercises, experiment guidance, references, etc.
Stage 2 2011-2016	Network technology	Fully open	Teachers and students in HE; The public	Comprehensive course materials
Stage 3 2013-now	Learning analytics	Fully open	Teachers and students in HE; The public	Online teaching activities and materials
Stage 4 2019-now	Virtual reality, etc.	Fully open	Teachers and students in HE; The public	Online teaching activities and materials

The Basic Situation of OOC in Chiina

The OOC Platforms in China

In Stage 1, China had yet to establish a unified OOC learning platform, and course resources were presented by static pages created by course teams. In Stage 2, the Chinese government established a unified OOC platform to provide courses in a centralized manner. In Stage 3, the number of platforms has increased and the types of platforms have become more diversified. At present, there are 37 OOC learning platforms in China, with the most influential being iCourse, XuetangX, and Treenity. These platforms cover all undergraduate disciplines and majors, similar to edX and Coursera. There are also OOC learning platforms that focus on particular disciplines. For example, the PMPHMOOC platform mainly provides medical courses. In Stage 4, the Chinese government launched the unified Chinaooc platform, which aims to gather and integrate existing courses across various platforms and provide learners with a unified online portal.

In terms of open international cooperation, in order to provide course resources to students and teachers affected by the COVID-19 pandemic around the world, iCourse and XuetangX both launched international platforms in April 2020.

The iCourse international platform currently offers 351 online courses covering a total of eight fields (including medical studies, engineering technology, ecology and agriculture, economics, electronics, and computer science). The platform has served learners from 156 different countries and regions. Xuetang Global offers 399 courses to other countries worldwide, and has served nearly 10,000 registered learners. The XuetangX platform has also attached great importance to partnering with world renowned universities and organizations, launching more than 100 international courses to enrich platform content and provide students with more choices. The launch of these international platforms reflects China's OOC development philosophy of openness and sharing.

Subject Distribution of OOC in China

In terms of the subjects, as seen in Table 2, the difference between OOCs in China and other countries is that while business enjoys the highest popularity in other countries, the subjects such as management and economics are relatively less popular in China. Social sciences also enjoy higher popularity in other countries compared to China.

Table 2

OOC distribution by subject in China and other countries

Ranking	China	Other Countries
1	Engineering	Business
2	Medicine	Technology
3	Science	Social Sciences
4	Management	Science
5	Economics	Humanities
6	Literature	Education & Teaching
7	Arts	Health & Medicine
8	Education	Engineering
9	Law	Art & Design
10	Agricultural Science	Mathematics

Source: Wang et al., 2022

Micro-credentials based on OOC

Micro-credentials refer to serialized courses on a certain subject provided by MOOC platforms to learners, and are typically made up of 3-10 MOOCs related to the subject. When learners have completed all courses and passed evaluation, they can obtain a micro-credential. The first MOOC micro-credential program in the world was the XSeries program launched by edX in September 2013, which began with Logistics Management and Fundamentals of Computer Science. Soon after, Coursera and Udacity also launched their own micro-credential courses. According to data from Class Central, by the end of 2021, Coursera, edX, and Udacity had launched around 1500 micro-credentials, with over 500 being launched in 2021 alone (Shah,2022).

At present, there are only 21 primary micro-credential courses on MOOCs in China, 3 on XuetangX, and 18 on Treenity. Judging from the design models of MOOC micro-credentials, their career- and skills-oriented features have become increasingly prominent. In terms of course selection, of the 18 micro-credential courses currently offered on Treenity, 5 are related to artificial intelligence and big data, while others focus on core knowledge and skills in a specific professional or field, such as with the Lawyer's Practice Skills course. We can see that the subject selection of micro-credentials has a larger focus on professional skills and modern career development trends. We can also see an emphasis on the introduction of industry partners to strengthen the cooperation between platforms, universities, and enterprises. For example, the "Innovation Project" jointly launched by university professors and industry experts provides well-performing students with internship opportunities to help realize the transfer of knowledge and skills from study to the workplace.

The MoE has placed many regulations and restrictions on the issuance of credentials, posing challenges to the development of micro-credentials. HEIs and society as a whole are also concerned about the quality of online courses, further slowing the adoption and development of such projects in China.

The Development of OOC In China

Government support has been key to the course of OOC development in China over the past 20 years. Academic institutions, provincial and municipal administrative departments, academic non-governmental organizations, and relevant enterprises have also played an important role. In accordance with the OOC development situation of different regions and HEIs in China, different OOC development models have emerged, and OOC quality assurance systems have gradually improved. In this section, we introduce OOC development experience in China from the aspects of guiding policies, organizational structures and their functions, diversified development models, and quality assurance systems.

Promotion and Guidance of OOC Development by National Policies

As shown in Table 3, since 2003, the MoE has issued a series of relevant policy documents that have played a key role in promoting and driving the development of OOC in China. The issuance of the first two policies corresponded to Stage 1 and 2 of OOCs development in China, while the issuance of the latter two policies corresponds to Stage 3 and 4.

Table 3

Relevant OOC policies in China

Effective Period	Document Name	Number of OOC
2003-2010	Notice on Starting the Development of High-Quality Online Courses for Teaching Quality and Reform in Higher Education Institutions (MOE, 2003)	Identified and launched 2744 high-quality OOCs.
2011-2016	Implementation Opinions on the Development of High-Quality Open Online Courses (MOE, 2011)	Identified and launched 3876 high-quality OOCs.
2015-2019	Opinions of the Ministry of Education on Strengthening the Development, Application, and Management of Open Online Courses in Higher Education (MOE, 2015)	Identified 2095 high-quality OOCs. As of the end of 2019, the number of OOCs in China was 12,500.
2019-Present	Implementation Opinions of the Ministry of Education on the Construction of National Excellent University Courses (MOE, 2019)	Identified 3469 high-quality OOCs. As of present, the number of OOCs in China is 61,900.

Source: MoE (2003), MoE (2011), MoE (2015), and MoE (2019).

It should be noted that the issuance of the policy in 2015 was a watershed moment. The previous two policies drove OOC development through top-down selection and approval by the government. Since 2015, the policy has guided the independent development of OOCs by schools, enterprises, and regional organizations, emphasizing the practical effects of OOC applications. The government uses selection and identification as a means to highlight application orientations.

Organizational Structures of OOC Development

Before 2015, OOC development in China was led by the government, with HEIs organizing teachers to carry out course development in accordance with the requirements of policies. During this period, the teaching management departments of HEIs were responsible for overall management, while audiovisual education centers or education technology centers provided technical support. Compared with the number of courses offered by HEIs, there were not many OOCs offered during this period.

In 2013, as Chinese HEIs began the development of MOOCs, most continued the original development model led by teaching management departments and supported by relevant education technology departments. With the maturity of MOOCs, new organizational structures have emerged. For example, Peking University established a MOOC working group

to collaborate across departments, and Tsinghua University established an online education research center to comprehensively drive the development of MOOCs with a new organizational structure. These organizational structures reflect different orientations and concepts of OOC development. Peking University has given full play to interdepartmental collaboration, further integrated OOC development with traditional teaching, and regards OOCs as a key component of its teaching system. Tsinghua University regards OOC development as a key component of its strategic development, and has created the XuetangX MOOC platform. A survey of Chinese MOOC development and its institutional environment found that Chinese HEIs were more concerned with the challenges and opportunities that MOOCs posed to the reform and development of higher education, rather than their possible economic benefits (Zhao, Zhu, & Wu, 2019).

An alliance-driven organizational structure has also emerged in Chinese OOC development. As shown in Table 4, academic alliances have played a key role in uniting universities to realize the joint development, reform, and innovation of online teaching.

Table 4

Types of OOC alliances in China

Alliance Type	Basic Information	Influence and Contributions
National Alliances	Generally, rely on national OOC platforms, such as the University Open Online Courses (UOOC) alliance	Driving the open and shared application of courses (China wide?)
Regional Alliances	Established with provincial and municipal education departments as the core, such as the Fujian Open Online Courses Education Alliance (FOOC)	Driving the open and shared application of courses in the region
Professional Alliances	Established with discipline-specific professional steering committees as the core, such as the CMOOC alliance	Driving the development of core courses for disciplines, and improving the quality of talent training

OOC Development Models

The first model is to develop new courses oriented around teachers. This is the mainstream model of OOC development in China. The general process of course development is: teachers submit a course development application to the school → the school organizes experts to determine which applications to approve, then provides financial and technical support → the course team completes course development within half a year → the course is launched on an open platform.

The second model is that student teaching assistants use existing course resources (generally those developed in Stage 1.0 and 2.0 of OOC development) for transformation and development. This has created a project-oriented approach for the transformation of course resources. It includes the formation of a student teaching assistant team which, on the basis of a full understanding of course content, organizes the segmentation of knowledge points, video editing, support exercises, support texts, and more for the final review of the lecturer. In 2017, Peking University completed the development of 13 OOCs through this model, proving the effectiveness of a project-oriented approach in improving work results and efficiency while lowering the workload of teachers.

Though the subjects of these OOC development models are different, teachers still need to play an important role. From a more micro point of view on the production of course resources, teachers in different schools have different levels of investment. The primary difference lies in whether teachers need to create their own course videos. This practice reflects the difference in understanding of OOC development across different schools. For example, Peking University guides the independent development of courses by teachers, especially with regard to learning video production technology. The primary consideration is that courses may need to be adjusted or optimized during the development process, which would be easier if the teachers would produce the video content themselves. As such, Peking University focuses on arranging the relevant training for teachers engaged in course development. The school trained a total of 500 teachers over a five-year period (2013-2018). Some schools also work with companies to help their teachers produce course videos, thereby reducing

the technical impediments for video production. This method requires relatively higher funding, and generates additional workload and cost whenever video resources need to be updated.

OOC Quality Assurance Systems

The formulation of OOC development standards is key to ensuring the quality of OOC development. The previously outlined national, regional, and professional alliances have issued corresponding course development guidelines, while HEIs are also constantly exploring suitable guidelines in practice. In 2020, the MoE issued the "Guidelines for Development and Application of MOOCs in HEIs (Trial)", which further outlined the concepts of MOOCs and blended learning courses, and specified requirements for the development of MOOCs, the development of blended learning courses, and the operation of MOOC platforms.

In terms of quality assurance, teacher training and process guidance are key in supporting the development of high-quality OOCs. The former primarily relies on corresponding teacher training activities organized by the teaching development center of HEIs, with a focus on guiding the voluntary development of OOCs by teachers. The latter focuses on providing practical guidance in the OOC development process. Since 2013, Peking University has provided its course team with course designers and teaching experts at the start of course development. Over the course development process, these course designers and experts provide assistance to teachers in areas such as teaching design, media expression, and project management.

The Application of OOC in HE in China

Driving the development of OOCs through strengthening the application of OOCs is the principle and clearest characteristic of the OOC development process in China. HEIs also use the development and application of OOCs as a key means of education reform and innovation in education and teaching systems, and to further drive the recognition of OOC credits and blended learning based on OOC.

OOC Credit Recognition

OOC credit recognition is a direct method of applying OOC to higher education. At the beginning of 2022, the MoE and four other departments issued the "Several Opinions on Strengthening the Teaching Management of OOCs in HEIs" (MoE et al., 2022), which outlined specific requirements for the teaching management of OOCs used by HEIs to identify credits, including the primary management responsibilities of HEIs, the responsibility of teachers initiating courses, online learning standards and exam discipline, platform supervision and management, and other mechanisms. The policy serves as a systematic summary of the exploration and identification of OOC credits since the launch of MOOCs in 2013. It reflects the top-level design of the government to further drive and ensure the healthy development of online teaching. As of April 2022, the number of Chinese students who have obtained MOOC credits was 330 million, representing 41.2% of all online learners (800 million) (MoE, 2022c).

Both HEIs and OOC platform service providers are actively exploring mechanisms and practical methods of OOC-based credit recognition. At present, a relatively mature mechanism has been gradually formed. Learning platforms are responsible for launching courses, organizing teaching and evaluation, and providing schools with student learning data, while HEIs are responsible for formulating corresponding workflows and specifications. CNMOOC was one of the earliest platforms in China to develop a cross-university credit system. Each calendar year is divided into spring, summer, and autumn semesters, during which work is carried out in the aspects of school OOC selections, student course selections, online learning, online evaluation, and credit transfer. In the early days, courses that participated in credit recognition were mainly OOCs offered by teachers, and were generally complemented by offline exams. With the gradual increase in the number of OOCs, HEIs have gradually begun to allow students to study recognized OOCs and transfer credits during the semester.

Courses that support OOC credit recognition tend to adopt fully independent learning or blended learning. Under the fully independent learning model, students learn online independently, complete all course steps, apply for credits after getting online exam results, then obtain the corresponding credits according to the university's rules. Under the blended learning model, student learning is composed of online asynchronous learning, phased online/offline synchronous learning, and a final assessment. In this model, the course lecturer and teaching assistants will guide student learning throughout the process. Some schools may also hire their own teachers to provide offline guidance during the synchronous learning and final assessment steps.

Blended Learning

After years of online teaching development and large-scale practice in online teaching during the COVID-19 pandemic, blended learning has gradually become the new normal method of teaching and learning in Chinese universities. Blended learning is primarily based on OOCs developed by the teachers themselves or OOCs developed by other teachers.

The most natural and direct method of blended learning is based on OOCs developed by the teachers themselves. At present, most teachers who offer OOCs provide blended learning on this basis. The basic model is that students learn through OOCs before class, then engage in interactive seminars, research reports, and other activities in offline classrooms during class hours. In practice, blended learning has gradually become a key area of concern in HEI teaching. In recent years, China has also launched national teaching competitions such as the Blended Learning Design Innovation Competition and the National Teaching Innovation Competition (Tsinghua University Center for Faculty Development, 2022). These large-scale competitions have played an important role in furthering blended learning in HEIs.

Carrying out blended learning based on the OOCs developed by other teachers is an important means of driving resource sharing and educational fairness. The basic model is that teachers make use of the course resources provided by other teachers. Students are expected to learn with these resources before class. In offline classes, students are organized to carry out relevant activities to understand and apply the knowledge they have learned online, and are given supplementary explanations of relevant content in accordance with their learning conditions. As such, the MoE has launched the "MOOC Western Tour" plan to help improve the teaching quality of HEIs in Western China through thousands of MOOCs, blended learning based on MOOCs, and "synchronized classrooms". By 2022, a total of 725 HEIs in Western China have used MOOCs to carry out online or blended learning, accounting for 97.3% HEIs in the region. The plan has provided 172,900 MOOCs and customized course services to HEIs in Western China, helped carry out 3,272,400 blended learning course instances, and reached a total of 376 million students.

Joint Development and Sharing of Online Collaborative Teaching

Over the past few years, China has gradually formed a multi-school and multi-teacher collaboration mechanism for the development of high-quality OOCs in practice, and developed a MOOC-based "1+M+N" multi-school collaborative teaching model. The model uses high-quality MOOCs to lead joint blended learning, drive the joint development and sharing of high-quality resources, bridge the "digital gap" between inter-regional and inter-school education, and effectively improve educational equity.

In the "1+M+N" multi-school collaborative teaching model, the "1" refers to a benchmark and exemplary OOC. These high-quality OOCs are developed by leading teachers from renowned schools, with innovative and quality content. The "M" refers to M small private online courses (SPOCs) launched by different higher education institutions based on "1" MOOC. HEIs introduce high-quality resources and support for both teaching and learning. During this process, institutions will establish a course team to carry out the characteristic and differentiated transformation of MOOC, add localized content, or adjust relevant learning requirements and rules. The "N" refers to N physical classes or N groups of students, and reflects that even when classes use SPOCs with the same content, the corresponding teaching methods can be adjusted in accordance with individual student learning needs and abilities to realize differentiated learning.

The "1+M+N" multi-school collaborative teaching model provides regions and schools with lesser education and teaching resources with the opportunity to develop progressive teaching reforms. In the application of high-quality OOCs, a three-level transition from simple copying to partial transformation to innovative thinking and transformation has been realized, and "1+M+N" has gradually become an OOC application model with Chinese characteristics in practice.

Implications for Future Practice

Over the past 20 years, the acceptance of online learning in Chinese higher education has continued to increase, changing the ways HEIs and students experience education. Looking ahead, it will be necessary to further improve the digital teaching literacy of teachers and the open sharing mechanism of OOCs to drive sustainable development.

Improving Digital Teaching Literacy

No educational reform would be possible without competent teachers. Therefore, many countries are providing teachers with digital technology training programs. For example, several countries launched national digital literacy projects, and established digital literacy portals that provide digital literacy training courses, such digitalliteracy.gov in US and SWGfL Digital Literacy in UK. Another example is the Institute of Educational Technologies and Teacher Training in

Spain, which provides teachers with various forms of online training and learning experience.As emerging artificial intelligence technologies such as ChatGPT begin to affect higher education, how teachers recognize and understand the relationship between technology and teaching, focus on improving their digital literacy, and adapt their education and teaching methods are keys to the sustainable development of higher education.

Improving the Open Sharing Mechanism of OOCs

With their high degree of openness and accessibility, OOCs have a strong role in driving the circulation of high-quality educational resources. To keep quality standards and supply high, it is necessary to protect the rights and interests of course resource providers by outlining sharing conditions in OOC agreements according to the wishes and needs of different course teams, clearly defining the OOC reference specifications, and other methods. This facilitates the development of an online education ecosystem in which everyone is willing to share and be open.

OOCs are a starting point for driving educational equity across the world. In 2022, China provided hundreds of OOCs in both Mandarin and other languages to all parts of the world. In addition to opening and sharing Chinese educational resources, these efforts have especially improved educational resources in underdeveloped countries. In the future, such sharing of OOCs would expand international exchange and cooperation, bridge the digital education gap, and contribute to global educational equity.

Conclusions

OOC has been widely used in China and has played an important role in higher education reform. The government, schools, enterprises, and social institutions have all contributed to the development of OOC, and it still remains to be seen how OOC will further promote educational reform in China and the world in the future.

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Empirical Article

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Digitalization of German Higher Education and the Role of Europe

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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

Although it is a highly developed industrial country and generally known as technologically savvy, Germany lags internationally in digital transformation. Moreover, Germany's progress in Higher Education (HE) is uneven since 16 federal states have responsibility for education, including Higher Education. The pandemic has reinforced the importance as much as accelerated the transition to digitalization in HE. Although HE leaders see digitalization as important for research, service, and management, they emphasize that digital transformation has meaning for teaching and learning. The new digitally-based formats of teaching and learning—for example "blended learning" and so-called "inverted classroom" formats—benefit students most as they motivate and engage them more than does traditional classroom-based education. As Germany is a member of the European Union (EU) and a signatory of the Bologna Process, European policies, programs, guidelines, and agreements also affect Germany's digital transformation.

Keywords: Bologna process, digitalization, European Union, Germany, higher education

Introduction

The transition from the analog to the digital age has proceeded gradually, with a noteworthy acceleration during and after the coronavirus pandemic (2020–2021). Digitization of analog data into digital formats for processing by computers and integration into larger ecosystems claims ever increasing attention in German schools and Higher Education Institutions (HEI) (Bils, Brand, & Pellert, 2019).

As part of the general shut down of public life, universities, colleges, schools, vocational training centers, and libraries were forced during the pandemic to move from face-to-face programs and on-site activities and adopt online formats of delivery. Although this closure negatively affected children in particular, pupils and trainees in early childhood institutions, schools, and vocational programs, the effect on students in HEI was somewhat less dramatic. Many universities and specialized non-university institutions had some prior experience with on-line teaching and learning and therefore Information-and-Communication-Technologies (ICT) as well as Learning Management Systems (LMS).

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The complete shutdown of all campus and classroom-based activities in early 2020 was nonetheless a major disruption.

This essay is based on the analysis of policy documents by the two levels of German government, federal and states, as well as by the European Union (EU). I refer also to the analyses and recommendations by various non-government organizations including think tanks and research networks, both German and international (the Bologna Process group of countries). This is relevant for providing an overview of the developments and the present situation regarding digitalization in German HE. I also refer to several research studies that are based on surveys of HE managers, academic staff, and students.

Digital Transformation in Germany

Germany, separated into two parts after World War II and reunited in 1990, has in 2023 a population of 84.5 million, a net increase in recent years despite falling birth rates. The increase is a result of the influx over the last 10 years of between three and four million refugees, mainly from wars in Syria, Afghanistan, and recently Ukraine. Further, immigrants from other countries have come for work and in search of a better life. By mid-2023, more than a quarter of the population were immigrants or had an immigration background, with definite benefits for the labor market. However, this immigration also posed certain challenges for the education system (Slowey & Schuetze, 2023).

As in most industrialized countries, digitalization in Germany began slowly and only in a few sectors in the early 1990s. It has accelerated since 2000, affecting most sectors of society, HE included. All types of human interaction between administrative agencies and citizens, workplaces and workers, suppliers and customers, associations and their members, cultural institutions, and the public display, have been involved. Among the sectors affected by the digital wave, education at all levels was marked by it. Teaching, learning, and research (the central missions of universities) that previously took place in person, laboratories, and often in teams, now had to adopt a "virtual mode."

Compared to some other European jurisdictions, especially the Scandinavian and Baltic countries, Germany had been relatively slow in embracing digitalization as a policy priority. The digital infrastructure and modes and speed of digitalization were mostly left to industry and private organizations. This was to change at the end of 2021 when a new federal administration made digitalization a priority. There is now a comprehensive federal digital strategy with a federal minister responsible for enhancing, coordinating, and implementing the strategy's elements: (1) move as quickly as possible towards a networked and digitally competent society; (2) use digitalization to increase innovation through science, research, and development; and (3) create digital access to all public services (Bundesregierung, 2021). The strategy is supported by substantial investment by the federal government.

An example in public services is the Online Access Act (Online-Zugangs-Gesetz—OZG), which aims to enhance digital access to and digital availability of various public services. Although not specifically targeted at HE, one cluster identifies several services linked to "study life situations." Among the eight service sectors under this heading are student financial support, university admission, recognition of educational qualifications, and library and archival services (Ruschmeier et al. 2020).

The federal government finances the OZG with 3 billion Euros (US$ 3.3 bn) of which about half goes to the Länder and one fifth to improving the digital infrastructure, especially broadband connections, and high-capacity networks. Due to a late start, Germany is now holding a middle ground on three main indicators in comparison with the other EU member countries. The EU's Digital Economy and Society Index (DESI) (European Commission, 2022a) measures annually (1) a number of human capital indicators, such as basic digital skills, enterprises providing ICT training, the numbers of ICT specialists, and ICT graduates; (2) the integration of digital technology in business activities, among them information sharing, online sales, big data, the use of social media by small and medium enterprises and by large businesses; (3) digital public services for citizens and businesses, and Open Data. Only regarding the fourth main indicator— "connectivity" which measures the availability and uptake of fixed and mobile broadband, 5G coverage, and high-capacity networks—has Germany caught up with most other European countries.

Yet, according to a survey of business leaders, conducted by the European Center for Digital Competitiveness, a part of the ESCP Business School in Berlin, 96 percent of respondents find that Germany lags behind comparable countries. While responsibility for that lag is attributed to both the government and industry alike, respondents see little sign so far that the government, despite announcing to make digitalization a policy priority, has significantly implemented policies towards digitalization (European Center, 2023).

Even if Germany's degree of connectivity is now comparatively high, access to and actual use of digital services are inequitable. The digital divide between urban and rural areas remains, notwithstanding infrastructure programs to narrow it. Households possessing digital devices such as desktop computers, tablets, or smartphones, necessary to access digital public services or private online offerings, are similarly divided from others without such technology. The latter divide became apparent when schools and tertiary institutions closed during the pandemic and students were forced to follow school programs online.

Another problem is the divide between citizens with and those without necessary digital competencies (Distel, 2022). Although the lack of digital skills is not a peculiarly German problem, it is significant that less than half of the German population possesses even the basic digital skills needed to access and avail themselves of digital services. This is partly due to a deficit of relevant courses and programs in schools, an absence of connectivity, and the lack of necessary equipment.

A similar deficit afflicts the adult education and training system. For example, less than a quarter of enterprises provide ICT training for their workers (European Commission, 2022a). Another divide exists between citizens with low levels of education, who use e-learning opportunities less frequently than citizens with higher levels of education. This confirms the fact that people with little education participate less in their later lives in organized learning activities than those with higher levels of education.

Germany's Higher Education System

The Institutional Fabric

Germany has over 400 HEIs, of which some 120 research universities ("Universitäten") are authorized by law to confer doctoral degrees. The 240 so-called "universities of applied sciences" ("Fachhochschulen" or "Hochschulen für Angewandte Wissenschaften") are either technical or otherwise specialized colleges and institutes that confer diploma, bachelor, and master's degrees. A third type is Colleges of either Arts and Music or of Religious Studies. The great majority of HEIs are public although the number of private, mostly smaller, specialized institutions has grown over the last 20 years. Approximately 20 universities of technology ("Technische Universitäten"; TUs) and almost 40 technical universities of applied sciences ("Technische Hochschulen"; THs) focus on engineering disciplines, the spectrum ranging from architecture to industrial engineering.

Germany has just a single public distance university ("Fernuniversität"; FU), established in 1975 following the model of the British Open University. Although recognized as a full-fledged research university, the FU is primarily focused on distance teaching. Its only campus and administrative center are in Hagen, a small town in North Rhine-Westphalia, Germany's largest federal state. In addition, the FU maintains more than 50 study and research centers all over Germany and even in a few neighboring countries. These centers are important elements of the university's concept of "blended" or "hybrid" learning. At these regional study centers, some of them located at other HEIs, students attend the few mandatory classroom-based seminars and preparatory classes and sit for examinations.

The German higher education system was traditionally characterized by a close link between teaching and research. This principle was originally conceptualized by Wilhelm von Humboldt, the founder of the University of Berlin at the beginning of the 19th century. This research-learning nexus has become the model for the modern "research university" concept that spread worldwide after it had been first adopted by Johns Hopkins University, Harvard, and some other US universities (Levine, 2021). With the development in Germany—and most other countries—from an "elite" to a "mass" system of HE (Trow, 1973), this close research-teaching nexus is no longer the rule for all universities and programs but has rather become the hallmark of small elite institutions and of doctoral studies. More important, but beyond the scope of this article, is the question in which ways new models and methods, especially Open Science, are changing scientific research and knowledge production (see Franzen, 2018), including the nexus of research and graduate education.

Besides the universities and universities of applied sciences, Germany has a network of 100 or more public research institutions that are independent of the HE sector. However, these institutions do provide graduate, research-based education, and award Master and especially PhD degrees, the latter in conjunction with public universities. The two largest of these research institutions are the Max Planck-Society and the Fraunhofer-Society. The former goes back to the beginning of the 20th century and conducts primarily basic research. It includes 86 research institutes throughout Germany which work in the fields of natural sciences, life sciences, and social sciences and the humanities. The Society employs some 24,000 people (researchers, doctoral students, graduates, scholarship holders, visiting researchers, and staff). The Society also sponsors Max Planck Schools, joint graduate programs currently run by 24 research universities and the Max Planck Society.

The Fraunhofer-Society specializes in applied research with an emphasis on key future-relevant technologies and commercializing research. The Society currently operates 76 institutes and research units. Over 30,000 employees, predominantly scientists and engineers, work with an annual research budget of 2.9 billion Euros ($US 3.2 bn), of which almost 80% come from contract research. Some of the institutes of both Societies also perform services for university research, providing equipment and facilities such as large-scale equipment, specialized libraries, and documentary resources.

The great majority of HE students are enrolled in public institutions, although the percentage of first-year students in private, state-recognized HEI has increased from less than 2% in 2000 to almost 14% in 2020. Total HE enrolment is 2.9 million students, 11% are foreigners while the majority are from other European (EU) countries). The proportion of German first-year HE students at high school graduation age is 55.8%, an increase during recent years in a country that has a flourishing dual apprenticeship system in which than 50% of the age cohort previously enrolled. Most public institutions have adopted a system of "blended learning", that is, a combination of in-person and online teaching and learning whereas many of the private HEI teach—and assess students' learning—exclusively at a distance namely, online.

The Constitutional Setup

Germany is a federal country with 16 federal states (Länder). As in many other federal countries, such as the US or Canada, the responsibility for education including HE lies with the states. Only a few HE matters are a federal or a joint federal government-Länder responsibility; examples include student aid, research, and financing of major research infrastructure (Füssel & Wolter, 2013). As there are no tuition fees (with a few exceptions) and therefore HE is almost free in Germany (HEIs charge only small administrative fees), public HEIs have no income from tuition so that the bulk of their funding comes from the Länder and the federal government.

Four collective organizations provide a certain degree of national coherence and coordination. The Standing Conference of Ministers of Education and Cultural Affairs ("Kultusministerkonferenz" (KMK)) brings together the Länder ministers responsible for education including for HE as well as the Federal Minister of Education and Research (who has responsibility for training, international collaboration and research, most non-university research societies and institutions, student aid, and research promotion). It is through the KMK that the Länder agree—among themselves, or with the federal minister of science when federal responsibilities are concerned—on common policies regarding structures and processes of education. Once a consensus has been reached at the KMK, it is up to the Länder legislatures or ministers to ratify and implement the KMK agreements. Besides policy advice and recommendations to the federal and Länder governments, the KMK also addresses the HEIs by specifying the objectives of digitalization and conditions under which they must be implemented to be successful (for example, KMK, 2017, 2019).

The Science and Humanities Council ("Wissenschaftsrat" (WR), 2018) is another body at the national level providing expert advice to ministries and other entities responsible for scientific research and HE level study. In 2022, the Council issued Recommendations for the Digitalization of Teaching and Learning (WR, 2022), stressing the importance of cooperation among all members of HEIs, especially academic staff and students, and of additional investment and strong support structures.

More specifically concerned with HEIs, the German Rectors' Conference ("Hochschul-Rektorenkonferenz" (HRK)). The HRK is a voluntary association of public and state-recognized universities and other higher education institutions in Germany. It currently has some 260 member institutions at which more than 96% of all students in Germany are registered. In 2021, it made an appeal to the federal government and the states detailing the financial and other help needed for putting into place the various infrastructures and personnel for an efficient digitalization of HEIs (HRK, 2021).

With the objective of sponsoring research on and providing a platform for researchers and HEIs to discuss issues of digitalization, the German Forum for Higher Education in the Digital Age ("Hochschulforum Digitalsierung" (HFD)), was set up in 2014 by the German Rectors' Conference. This Forum is jointly financed by the federal government and an employer-sponsored foundation. Like the other organizations mentioned above, the HDF has no regulatory power but serves as a consultative and advocacy body. The HFD has conducted several research studies and surveys of HEI managers about the state of digitalization in German HEIs (for example, HFD 2016, 2017, 2021).

The Digital Transformation of German Higher Education

A study of German HEIs, conducted at the end of 2018, surveying their leaders, focused on the importance, strategies, and objectives of digitalization, the embedding of digitalization in information technology (IT) governance, the

status and framework conditions of digitalization, and the digital infrastructure (Gilch et al, 2020). The survey showed that digitalization had already affected most of the functions of HEIs sometime before the pandemic. However, while the great majority of institutional leaders (83%) saw the importance of digitalization as high, its actual status was judged to be still relatively low (at 20%).

More than 50% of universities had formal strategies or concepts in place for the institution. Seventy percent had an explicit strategy specifically for teaching and learning, almost all of those stressing the importance of digitalization for improving the quality of teaching (for an example, see University Duisburg-Essen, 2017). Sixty percent of the respondents emphasized the efficiency and quality of various administrative services to be improved by digitalization of the administration.

There were significant differences between the various areas of HE operations regarding the use of Information and Communication Technology (ICT). With respect to teaching and learning, more than 85%of universities had student information systems (SIS) and learning management systems (LMS) in place. For the support of research, 30%of universities had full or partially functioning research information systems (RIS) while 18% had data management systems (DMS).

Administrative functions and services have profited from digitalization to a far larger extent than research and teaching. All student data are stored and administered with the help of SISs, already mentioned. Thus, all student application, enrolment and completion data are processed within this system. Financial data are handled by resource management systems (RMS), and data concerning grounds, buildings, and facilities by computer-aided facility management systems (CAFM) (Gilch et al, 2020).

Before the pandemic, HEIs had been slowly developing institution-wide digitalization strategies and ICT governance structures. Whereas numerous ICT systems and applications were in use across the institution and for different functions, they were not, or only partially, coordinated, or integrated. The question of who was in charge at the university level for digitalization overall was not clearly determined. Many substructures such as faculties, departments, institutes or research centers, and central services such as the library or university hospitals, had their own ICT structures and responsibilities, uncoordinated with the others. Yet in three quarters of HEIs, the responsibility lay with one person or a single committee. Larger HEIs had a central information officer (CIO) or a central information committee. Leading actors were most often the directors of computer centers or vice presidents who were also involved in the development of the institution's overall digitalization strategy. During the pandemic, there was:

> a great deal of pressure in the direction of digital teaching leading to a steep learning curve for many faculty members, which pushes forward competence development processes. Massive investments are being made in the technical infrastructure, teachers are acquiring media technology knowledge and taking advantage of the services provided by educational consultants and instructional designers. Examinations and tests are carried out with the help of computers (e-assessment) and some university presidents and vice-presidents probably have become painfully aware of the value of their Center for Teaching and Learning. What will remain of it after the pandemic is completely unclear. (Zawacki-Richter, 2020, p. 219)

After the pandemic, more than 50% of HEIs have an institutional digital strategy, however, formulated in many cases without the participation of teachers and learners. Overall, the study showed that digitalization was particularly advanced in HEIs with informatics, engineering, science, and mathematics faculties (STEM subjects). Overall, however, it is probably fair to summarize the development at German HEIs as follows: "No managerial strategies, no teacher training, no debates on technological design nor politics, no arguments about the pros and cons—we just do it" (Kerres, 2020, p.i).

Such overall strategy and management plans for digitalization require significant efforts and resources by several actors, not to mention collaboration and coordination between them on various commercial products and providers of hard- and software. For the HEIs it becomes even more difficult when public authorities are involved as rule-makers and funders. The main instrument of the state governments to influence HEIs to digitalize further are regular performance agreements ("Leistungsvereinbarungen"). In these contracts several specific targets are defined that a particular institution must reach by a certain date. In the same agreements, special funding for realizing the various targets is included.

A study on digital teaching and learning, based on a survey of presidents of German HEIs at the height of the pandemic in September 2021, showed that more than 50% of institutions had an overall digital strategy, although in many cases established without the broader participation of academic teachers and learners (Lübcke et al., 2022). Respondents

predicted that in the future 40% of teaching would be entirely online while much of the remaining 60% would be partly traditional classroom-based and partly "hybrid learning"; i.e., a combination of traditional and online learning.

This view coincides with the views of the other important stakeholder group—students. While students value the possibility of learning at a distance, saving them commuting time and expenses, and appreciate learning both at the time they choose and at their own individual pace, they are aware that learning in virtual settings deprives them of some important advantages and attractions of campus-based education. Examples for such advantages are the possibility of socializing with fellow-students not just in classroom or laboratory settings, but also in campus-wide activities such as Orientation Days, sporting events, club fairs where they can find and bond with other students with similar interests. Meeting and communicating at campus-based restaurants and cafés are another way for students socializing by sharing information and opinions both on study-related and general topics.

HE from the student perspective is about more than academic learning. It is also a place and a time to develop social and civic skills, as well as confidence in personality and identity. These social functions of HE are vitally important in equipping citizens for their future lives—and they cannot be fulfilled adequately online (European Commission, 2020b).

The European Dimension of Digital Transformation

The Role of the EU

Germany is one of the 27 members of the EU. Therefore, some of the European rules and regulations are binding law in Germany, namely those which are based on the EU's original legislative competencies—which aim primarily at strengthening the economies of the member countries and a common market. Since digitalization is an important factor for the innovation, performance, and competitiveness of the national economies, the EU has issued numerous policies, recommendations, and guidelines serving these objectives.

To monitor the state of the art and progress made in member countries regarding digitalization, the EU has an index system (DESI) in place since 2014. Progress in four categories in the EU's 27 countries is annually measured and results compared and ranked. DESI is a valuable tool for individual countries to identify deficits and areas for priority action. The EU also uses DESI to assess the state of the art in the member countries, specifically the EU's objectives and targets in Europe's Digital Decade (European Commission, 2019). Its overall aim is "to empower businesses and people in a human-centered, sustainable, and more prosperous digital future."

One of the EU policies aims at a Single Digital Gateway (European Parliament, 2018). This regulation requires member countries to make public services faster, more efficient, and user-friendly by implementing digital accessibility to and availability of public services by 2024. The German OZG is a result of this EU regulation. The EU does not merely issue regulations and guidelines, but also invests substantial sums of money in its Digital Europe Program. Thus, in March 2023, the EU allocated 1.28 billion Euro (US$ 1.32 bn) for the years 2023–2024. Almost the same amount is available for, among other purposes, the programs enhancing advanced digital skills, artificial intelligence, and cybersecurity. Some of these funds go to HEIs (Academic Cooperation Association, 2023). Regarding education, the EU has only limited competences. There are just two clauses in the treaty concerning *The Competencies of the European Union in Education:*

Article 165

1. The Union shall contribute to the development of quality education by encouraging cooperation between Member States and, if necessary, by supporting and supplementing their action, while fully respecting the responsibility of the Member States for the content of teaching and the organization of education systems and their cultural and linguistic diversity.

2. Union action shall be aimed at:

- developing the European dimension in education, particularly through the teaching and dissemination of the languages of the Member States,

- encouraging mobility of students and teachers, by encouraging inter alia, the academic recognition of diplomas and periods of study,

- promoting cooperation between educational establishments,

- developing exchanges of information and experience on issues common to the education systems of the Member States,

- encouraging the development of youth exchanges and of exchanges of socio-educational instructors, and encouraging the participation of young people in democratic life in Europe,

- encouraging the development of distance education,
3. – 4. Article 166
1. The Union shall implement a vocational training policy which shall support and supplement the action of the Member States, while fully respecting the responsibility of the Member States for the content and organisation of vocational training.
2. Union action shall aim to:
- facilitate adaptation to industrial changes, through vocational training and retraining,
- improve initial and continuing vocational training to facilitate vocational integration and reintegration into the labour market,
- facilitate access to vocational training and encourage mobility of instructors and trainees and particularly young people,
- stimulate cooperation on training between educational or training establishments and firms,
- develop exchanges of information and experience on issues common to the training systems of the Member States.
*(*European Union, Treaty on the Functioning of the European Union, 2007)

The European Commission has focused relatively early on the topic of education in the digital age:

> Digital transformation is changing the job market and requires new skill sets. Digital technologies will offer new ways of learning provided there is adequate access to these technologies. To reap the benefits of these developments, education and training systems must respond better to these changing forces. (European Commission, 2016)

In 2018, the EU launched the Digital Education Action Plan, setting out three priorities: making better use of digital technology for teaching and learning; developing relevant digital competences and skills for the digital transformation; and improving education through better data analysis and foresight. This Action Plan was later concretized and complemented by several other policies, particularly the European Skills Agenda (European Commission, 2020a). Part of the Skills Agenda is the European approach to micro-credentials for lifelong learning and employability (European Council, 2022).

Although the EU has only a few original powers in the regulation of education, the Commission finances several programs that benefit HEIs and students. An example is the longstanding Erasmus+ (European Commission, 2017) which helps in financing the exchange of students and academic teachers within EU countries. More recently the EU funds projects supporting the setup and delivery of HE courses in advanced digital technologies and reinforcing skills. For this activity, the EU will invest some €910 million over two years (Academic Cooperation Association, 2023).

Most EU regulations and recommendations aim at enhancing and strengthening connectivity, the widespread use of digital data, and the promotion of digital skills and competencies. One other important feature is the regulation of ethical use and the protection of personal data. Thus, as part of the Europe's Digital Decade policy, the EU has issued a declaration on digital rights and principles (European Commission, 2022c) which defines in a broad way the rights of citizens and the principles of the use of digital information. It is however just declamatory in nature.

The enforceable law in all member countries is the General Data Protection Regulation (GDPR) (European Commission, 2018). Its basic principle is that personal data must be "processed lawfully, fairly and in a transparent manner in relation to the data subject." This insistence on "lawfulness, fairness and transparency" of the collection and use of data aims at protecting the right of EU citizens to their personal data.

While this regulation is primarily intended to keep big technological companies such as Meta (Facebook and WhatsApp), Twitter, and Apple from commercially using and selling data without the consent of the individual owner of the data, the regulation is also of major importance for digital HE. The regulation applies to the three major fields of HE activities: (1) the collection and processing of various student data as part of digital administrative services, (2) data collected for teaching and learning platforms and analytics, and (3) academic research using big data. To enforce the GDPR, many HEIs have installed specific offices controlling the protection of students' and other individuals' data for research (see Lundie in this Special Issue).

The Bologna Process

The Bologna Process is an intergovernmental agreement on HE reform by means of voluntary convergence of member countries' HE systems. It currently has 50 European member countries; several European HE associations and

organizations are affiliated, and several non-European countries. The EU is not a formal member but closely connected. The Bologna Process' initial main purpose was to harmonize and enhance the international recognition of European academic study and degree structures, improve the quality of European HE and encourage the exchange of students and collaboration within Europe, as well as internationally.

The Bologna Declaration was launched in 1999, named after the University of Bologna, the oldest European university, and where the Declaration was signed by 29 countries. The Bologna Declaration established goals for reform in the participating countries, such as the three-cycle degree structure (bachelor, master's, doctorate) and shared instruments, such as the European Credits Transfer and Accumulation System (ECTS) and the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). Over the years, the Bologna Process has grown into a Europe-wide policy platform for coordinated higher education reform. There are regular Ministerial Meetings every two or three years. A Follow-Up Group with a Board and a Secretariat monitor compliance with ministerial decisions and prepares for later meetings (European Commission/EACEA/Eurydice, 2018).

Germany, one of the original signatories, has since changed its traditional two-cycle study organization to the three-cycle degree structure (bachelor, master's, doctorate) that is dominant in countries with a British tradition (the UK, most former British colonies, and North America), and has modularized most studies. German HEIs have also signed up to the ECTS and the ESG systems.

Digitalization, which had not been an issue or objective in 1999 has since made it on the Ministers' agenda. Thus, following their meeting in 2015, the Ministers declared:

> Enhancing the quality and relevance of learning and teaching is the main mission of the EHEA. We will encourage and support higher education institutions and staff in promoting pedagogical innovation in student-centered learning environments and in fully exploiting the potential benefits of digital technologies for learning and teaching. (Yerevan Communiqué, 2015, cited in HFD 2020, p.5)

Three years later, at their meeting in Paris, Ministers confirmed that:

> Digitalization plays a role in all areas of society, and we recognize its potential to transform how higher education is delivered and how people learn at different stages of their lives. We call on our higher education institutions to prepare their students and support their teachers to act creatively in a digitalized environment. We will enable our education systems to make better use of digital and blended education, with appropriate quality assurance, in order to enhance lifelong and flexible learning, foster digital skills and competences, improve data analysis, educational research and foresight, and remove regulatory obstacles to the provision of open and digital education. (Paris Communiqué, 2018, cited in HFD 2020, p.6)

Although ministerial communiqués are not binding for the countries affiliated with the Bologna Process, they suggest compliance and follow-up. HE statements on digitalization of HE may be relatively general and therefore not particularly relevant for EU member countries with advanced digital HE systems. Yet they are important for less advanced countries as well as for collaboration among all Bologna Process affiliated countries.

Summary

The transition to digital HE is multifaceted, dependent on general factors such as level of income, online connectivity, industrial development, and digital skill levels of the population. The transition is particularly complex in Germany although the country has a thriving economy, a well-developed technical infrastructure, and overall, a performant education system. The reasons for its complexity lie in Germany's constitutional setup—16 federal states have responsibility for HE whereas the federal government has just regulatory competence for a few fields regarding HE; namely, student aid, research, and international relations. However, because of its overall responsibility for the economy, the federal government has also the general competence and the responsibility for implementing digitalization in Germany.

Because Germany is a member of the EU, it is dependent on and subject to EU laws and policies many of which target digitalization as a major source of innovation and competitiveness. Although the EU has little direct authority to regulate education, digitalization of education plays an increasingly important role. In addition, Germany is affiliated with

the Bologna Process, an agreement on voluntary convergence and coordinated reform of the member countries' HE systems. Digitalization is also part of the attempt to create a performant, high quality, coherent European ESG.

Germany's HE sector is predominantly public, consequently decisions about the creation and use of data on teaching and learning, research, and management and services are made by state legislatures and education ministers. Both the federal and state governments are supported by advisory bodies, most importantly the Standing Conference of Ministers of Education and Cultural Affairs and the Science Council, which provide research-based information and advice for coordinated policies and reforms on a national scale.

By contrast with other, especially smaller, and less industrialized countries, Germany's lack of connectivity, infrastructure and funding are not the biggest problem in the transition to digital HE. Rather, the difficulty is due to a lack of coordination at the institutional and sector levels to create compatible digital systems, as well as of institutional strategic planning processes that involve digital experts but also users, especially faculty and students.

More generally, and not limited to Germany or EU countries, it is becoming obvious that parts of the digitalization of HE, especially online or blended learning, are changing the nature of higher education and learning. Consequently, higher education institutions are also changing. No longer will campuses be the main model for the organization and delivery of HE and many of the facilities found on a traditional campus such as libraries, lecture halls, student accommodation, sports facilities etc. will disappear or rather be limited to campus based HEIs. The (near) future will show what that means for teaching and mentoring, social learning, student life and student support, for service and engagement for the community and other elements associated with traditional HE.

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The Ethics of Research and Teaching in an Age of Big Data

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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

Big Data offers opportunities and challenges in all aspects of human life. In relation to research ethics, Big Data represents a normative difference in degree rather than a difference in kind. Data are more messy, rapid, difficult to predict, and difficult to identify owners; but the principles of informed consent, confidentiality, and prevention of harm apply equally to digital data. Recognition that technologies are not inherently value neutral, and that data collection, aggregation, and their use in decision making can both create and intensify inequities and harms is central to applying these principles. Data justice extends concern with voice and authenticity into the digital domain. Universities act as gatekeepers to professional accreditation in fields including software engineering. The relation between academic freedom of enquiry, state and corporate interests in the Big Data age raises important questions about power and control in the academy, which have governance implications.

Keywords: assessment, big data, governance, large language models, research ethics

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Introduction

Recent years have seen the exponential growth of Big Data analytics in many fields of human endeavor. Big Data has been defined as "high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision-making, and process automation" (Gartner, 2015). Following this definition, not all large datasets will qualify as Big Data. Large standardized datasets (such as those produced by international Program for International Student Assessment's educational assessments which produce static analyses) would not be included in this definition (Hartong, 2016). The uses of Big Data are very often removed from the kinds of processes commonly understood as data processing, such as conventional social research or educational assessment. Big Data can include data generated by such diverse areas as haptics (information on movement and non-conscious body activity such as heart rate and galvanic skin response), natural language, and environmental sensors in the

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Internet of Things (McEwen & Cassimally, 2013). These high-variety datasets require complex algorithms to analyze, the process of "automated reasoning" required is often quite distinct from the processes of abstraction, and hypothesis testing employed by human researchers (Reid, 2016). Further, data and information are not synonymous— information is well-formed data that are meaningful under some level of analysis (Floridi, 2004). The level of analysis can be as large as an entire city (Carta, 2019) or as intimate as the self (Sumartojo et al., 2016).

This essay seeks to understand the ethical challenges of Big Data for teaching, research and governance in global higher education. In this essay, I employ an ethical framework of rights, harms, and circumstances to understand the ways in which Big Data analytics in general, and large language models in particular, are operative in the academy. Highlighting challenges of clarity, transparency, and property rights in the datafied university, I argue that, although conventional ethical models can and should provide a guide to continued practice, these can become unduly complex and can obfuscate harms if attention is not paid to the structures and interests underpinning Big Data practices.

Digital Ethics

In an influential law paper in the early days of the commercially available Internet, United States appeals court judge Frank H. Easterbrook compared "digital law" to the "law of the horse." His point, principally, is that there are some cases in which the interaction of law intersect with some other fields, such as economics or international relations, which illuminates aspects of jurisprudence more broadly, but that computers, like horses, are not such a case (Easterbrook, 1996). While horses may at times appear in property law in relation to their ownership, or in relation to torts relating to damage done to property by horses, and at other times appear in the law as a mode of transport, regulated by the rules of the road, and still other times in relation to animal welfare law, a lawyer with any general knowledge of the law as a whole will be able to apply some common sense to understand which of these frames of reference apply to the given case. There is no need for a distinctive "law of the horse." Applying this general approach to digital law, Easterbrook argues for clear rules, transparent bargaining institutions, and clear property rights, enabling a liberal framework to operate in the digital field as it does in other fields of civil life.

Applying this approach to ethics today involves recognizing that the same ethical principles which operate in other spheres of life can be applied in the context of Big Data. In relation to the object of ethical action, persons continue to be imbued with intrinsic value, and the principle of avoiding deliberate harm and respecting individual autonomy continues to be relevant. These principles are agnostic to major debates in moral philosophy, such as between deontological and utilitarian ethics, and are similar to the broad consensus conditions of causal connection, knowledge of consequences and autonomy summarized by Noorman (2012). Morally salient circumstances can often be inferred from analogy to the physical world in relation to such matters as public and private, where gatekeeping structures operate in online spaces. In relation to the professional ethics of the academy, these public/private distinctions are usually quite well-defined: just as a teacher has a right to know what her students say about course content during a seminar but not in their dorm rooms after, so they have a right to access discussions in a university virtual learning environment, but not a private text chat; just as a researcher can treat letters to a newspaper editor as public documents but needs to gain ethical approval to survey members of a private club, so things posted on open web forums can be treated as public, but forums that require subjects to register or receive gatekeeper approval cannot. Thus far, there is no need for an "ethics of the horse."

In relation to transparency, clarity, and property rights, however, developments since Easterbrook's 1996 paper raise significant questions. The high velocity and variety of Big Data requires complex algorithms for analysis, and the use of heuristic machine learning algorithms often means that the complex multi-factor correlations they identify are not easily comprehensible to the human agents providing the data. Consider, for example, a hypothetical correlation between timing of cardiovascular activity and voter intent: it would not occur to a polling company to search for this correlation, nor would it occur to an individual purchasing a wearable heart monitor watch that their data might be used by polling companies for political advertising; nonetheless, Big Data often exploits such unexpected confluences in the data. This has clear implications for transparency and informed consent, as it points to the limits of our ability to conceptualize the uses to which our data may be put. In practice, many people pursue what Daniel Solove terms "security through obscurity"—believing their data is secure online because it would not be of interest to anyone (Hartzog & Stutzman, 2013). The ability to transparently understand the uses to which their data may be put is not merely a matter of reading the privacy statement, though one study put the opportunity cost of every user reading the privacy policy of every website they use at least once a

year at 54 billion hours in the United States alone (this compares with 3.4 billion hours spent by every American taxpayer completing their income tax returns around the time of the study) (McDonald & Cranor, 2008). Rather, even if individuals were to consent to the uses to which their personal data were put by one website or another, it is in the sale and aggregation of this data and its potential secondary uses that transparency becomes near impossible.

Turning to clarity, a further use of Big Data by Large Language Models (LLM) is to construct artificial agents who can mimic natural language which is indistinguishable from a human language user. This has clear implications for the ways we understand the ethical harm principle. One of the earliest theoretical tests of Artificial Intelligence (AI), proposed by mathematician Alan Turing, was to posit that a machine is intelligent if its language use is indistinguishable from that of a human by a human interrogator (Turing, 1950). Subsequent critiques of this model have sought to highlight the difference between Turing's "parlor game" style test and a more expansive test of general intelligence, the need to attend to the subcognitive unconscious associative structures essential to human language use, and the link between cognitive and sensory information in human communication (French, 2000). As Artificial General Intelligence models relying on LLM approach Turing Test viability, a further significant question relates to the difference between "the strong results of reproductive, engineering AI, [relative to] the weak results of productive, cognitive AI" (Floridi, 2011). Reproductive AIs in this decade, such as ChatGPT, match patterns in existing human-created data—essentially constructing language through a complex version of "if the first N words of a sentence are this, human authors are most likely to place word x at N+1." These models are difficult to distinguish from human agents, but are incapable of producing any new thinking.

The implications of LLM reproductive AIs for our ethical principles of harm and intent are twofold. Firstly, as it becomes more difficult to distinguish human from artificial agents, there is a risk that we learn to ontologize ourselves heteronomously, in relation to non-human rather than human agents (Floridi, 2014). Interacting with one set of agents to whom we can do as we please because they are means to ends and incapable of suffering harm leaves us ill-prepared for interacting with other sets of agents who have intrinsic value and to whom we can relate, help, and hurt. Secondly, although artificial agents are not persons, the language datasets they draw upon reflect a totality of human experience. Large datasets which include biased human inputs can amplify that bias, as has been seen in predictive policing algorithms (Fountain, 2022; O'Donnell, 2019). The interaction between these two threats—interacting with ontologically "empty" agents and those agents reflecting and reproducing unethical human data, opens the possibility of a cumulative harm—human agents imitating the biases of the machines they have interacted with, and machines learning from and imitating the human data generated by those interactions.

Regarding the third of Easterbrook's criteria, in relation to property rights, data has become at once more and less a form of private property. As the forms of data and media of collection become more granular and varied, European legal discussions increasingly frame digital privacy as a matter of human dignity (Floridi, 2016), implying a primary, inviolable, human right rather than a secondary, instrumental property-type right to our data. At the same time, the commercial model developed by Big Data corporations, most notably by social media, treats the user not as customer but as product, selling increasingly fine-grained data for advertising purposes and manipulating affect to encourage engagement (Ghosh, 2020). This makes judging the private/public circumstances of any interaction more complex than the examples cited earlier in the paper. The interaction between the generation of student assessment data, its collection, aggregation and comparison by plagiarism detection software, and the asset generation model of the plagiarism detection software company, for example, is rarely explored. Further, the opportunity cost for not engaging in that data-for-service transaction is extremely high—a lack of credibility on the part of the academic institution, or the refusal of academic credit on the part of the individual student—raising important ethical questions in relation to informed consent.

In light of these significant complexities, then, is there a need for "ethics of the digital?" Is the field no longer analogous to Easterbrook's "law of the horse?" Returning to Easterbrook's criteria, this may be best understood as a transitional question. If the interaction of ethics with another field illuminates the ethical, then it is worthy of distinct study—such as in relation to politics, war, environment, inter alia. In relation to the digital, there are clear challenges which face society as a whole, yet there is not yet a clear understanding of the aims, ends, and purposes of these challenges. To take one field that has sought to conceptualize these challenges and threats, the Copenhagen School of security theory takes a multi-sectoral approach to understanding securitization. Each sector has its own internal motivating logic—the political sector is concerned with the institutions of politics and the binding idea of the state; the societal sector with the preservation of "we identities" and the economic sector with the profit motive and fiduciary responsibility, for example (Buzan et al., 1997). While recent iterations of security theory have attempted to conceptualize an informational sector, and enumerated information security threats, the definitions offered for informational security tend to focus on practices, such as communications and influence, digitization, methods and techniques of data transmission in networks (Ivancik, 2021), rather

than identifying any sectoral logic to the informational sphere. Where motivations are attributed to information security actors, these either revert to the logic of the economic sector, or to actors aiming to secure or subvert political stability. Even turning to the technology ethics sector itself, a review of the leading Institute of Electrical and Electronics Engineers (IEEE) journal dealing with privacy ethics questions shows a disconnect between those papers engaging ethical questions and those papers reporting the engineering of technical solutions (Tse et al., 2015). In relation to digitalization, issues of law, security and ethics seem to be in agreement that there are aspects that illuminate the totality of the field, but also that we do not yet fully understand what aspects those are, what the implications are, and to what end. What of the educational field?

Digital Ethics in The Academy

Learning and Teaching

Given how deeply embedded Big Data is within our information management processes, it should not come as a surprise that learning and teaching practices are impacted. There is insufficient space here to address in full the intersection of epistemic virtue and data ethics, but a few specific examples can highlight the dangers of interpreting higher learning as though it were merely a process of information transfer (Lundie, 2016). In the European Higher Education Area, for example, the recipient of an undergraduate degree is expected to demonstrate knowledge and understanding in a field of study that is informed by knowledge of the forefront of the field, apply that knowledge through sustained argument, problem solving and critical analysis, and demonstrate the skills necessary to undertake further autonomous study (Bologna Follow-Up Group, 2005). These principles of autonomy, argument, and applied knowledge lend themselves to forms of assessment designed to measure originality and critical synthesis, not merely the transfer of information. Further, these principles draw on a long history of humanistic study in the European university—higher education is about the cultivation of educated persons, not simply knowledge acquisition, social reproduction, or technical competence.

In their present form, however, many of the forms of assessment employed by universities are dependent on LLMs and Big Data for their practical operation. This, in turn, leads to ongoing negotiation of questions of fairness and cheating. Most recently, the availability of open-access AI writing algorithms has raised concerns about students passing off algorithmically generated essays as their own work. Recalling that such LLM AIs are reproductive, matching patterns in existing human-created data, it is possible to see that the difference between software such as ChatGPT and a word-processor's built-in spelling and grammar checker are differences in degree, rather than differences in kind. Both operate by identifying the most likely sequences of words to appear in a positively received text. Yet in many cases, automated grammar checkers are encouraged, while AI writing apps are forbidden. Already, Turnitin (which relies upon an LLM which is constantly updated from essays submitted to its subscribers) has introduced features designed to detect AI-generated writing (Staton, 2023).

The potential harm to learner autonomy, and to knowledge itself, from these intersecting LLM systems, is rarely considered in relation to the architecture of the systems themselves. Reproductive AI relies on large language datasets, comprising all of the hitherto human-produced language content in a field. Detection systems rely on the scraping of AI-produced language in addition to human-produced language, as will future reproductive AIs. The result of this may be an increasingly narrow scope for human language to express originality, as our exposure to language becomes increasingly dependent on structures and patterns derived from the past. Merely trying harder to differentiate between human and artificial agents, as the cat-and-mouse generation/detection of informational content continues to consume one another's data, is not a viable solution.

More concerning than this particular development, however, are the ways in which attempts to exclude Big Data methods from our pedagogies and assessment practices have reshaped learning in unhelpful ways. Providing access to Turnitin scores in order to help students to self-diagnose poor scholarly practice, for example, can result in both an anxiety about the numerical score produced by the software, and a genuine confusion as to the relationship between language structure and originality. From experience, I have known students accused of misconduct incriminate themselves inadvertently by saying that they believed they had changed an idea enough to not be counted as plagiarism, believing this to be good practice. The availability of vast searchable academic databases such as Google Scholar can lend themselves to similar processes, whereby students first state an unsupported opinion, then find a scholarly source to back it up. These inadvertent, emergent biases in practice do not represent any devious intent on the part of the student, but rather reflect the confusion between reproductive, machine definitions of learning as information transfer, reverse-engineered from existing language data, and an authentically human definition of knowledge.

Possible solutions to these problems include a recognition that Big Data provides opportunities across the range of knowledge-intensive professions for which higher education provides a preparation. As in many other areas in which

personal data is increasingly viewed as an aspect of the person, rather than as a property relation, this may involve more personal, enacted, less alienated forms of assessment, as well as raising student awareness of the threats and challenges of data-driven disinformation, including the passing off of AI-generated responses for those areas in which evidence of human autonomy is sought.

Research

With regard to research ethics, it is possible to follow the same principle of adhering to Easterbrook's "law of the horse" application of real-world principles to the digital up to the point that harms and rights attributions become too complex to disentangle clearly and transparently. This was the approach taken by the British Educational Research Association (BERA) in the reauthoring of its guidelines for ethical research in 2018. In relation to informed consent, for example, the guidelines advise researchers as follows:

> Where research draws on social media and online communities, it is important to remember that digital information is generated by individuals. Researchers should not assume that the name given and/or identity presented by participants in online fora or media is a "real" name: it might be an avatar. This avatar could represent a human or a bot, but behind either will be one or more human creators responsible for it, who could therefore be regarded as participants; whether and how these potential participants might be traceable should be considered. Where an organization shares its data with researchers, those researchers have a responsibility to account for how and with what consent that data was gathered; they must also consider the authorship of that data and, consequently, whether it is necessary to independently approach the relevant individuals for consent concerning its use. Researchers should keep up to date with changes in data use regulations and advice. (BERA, 2019, p. 7)

To highlight two key points in this paragraph: firstly, in relation to given identities, the guidelines highlight the importance of considering the human individuals behind the creation of digital personae. While a digital avatar may constitute a form of performance (Papacharissi, 2012), sometimes curated by a number of individuals on behalf of a high-profile individual, the new problem posed by LLMs is that the individual human creators who provided the language reconstructed by the algorithms are so far removed from the responses that it becomes impossible to attribute ownership rights over the text. Even if such attribution were possible, the number of creators involved would make any attempt to independently approach them for consent prohibitive.

Secondly, the guidance considers cases where organizational ownership is asserted over data. In almost every sphere of social life, organizations hold data on service users for a range of purposes. Within education, this can include some of the measures and metrics identified in the foregoing section. The level of consent given to the collecting organization is often tacit, implied, or given under some measure of duress—universities have always collected and collated data on student assessment performance, and Big Data does not introduce any novel data collection harms, but it does potentially change the data processing and aggregation climate in important ways. There are challenges of informed consent in organizational contexts that involves recognizing so that data may be shared up long and complex hierarchies. This includes sharing from individuals to academics grading their work, from those academics to university administrators seeking to understand patterns in departmental performance, from universities to Big Data corporations, perhaps contracted by national governments to carry out evaluations of the higher education sector as a whole, but who nonetheless reinscribe that data in line with their own collection processes, as highlighted earlier. Depending upon which level researchers seek to engage, the organizational data they collect may have undergone multiple mutations of consent.

The legal scholar Daniel Solove suggests a taxonomy of 16 distinct privacy harms, relating to four domains of information collection, processing, dissemination, and invasion (Mulligan, et al., 2016; Solove, 2008). This taxonomy suggests that privacy needs to be understood not as a single thing but a collection of related concepts with a family resemblance between them. We can use these four domains to understand the research process. With regard to invasion, the rules of informed consent as operative in real-world empirical research are relatively clear-cut—a researcher seeking direct access to a participant's private life needs to seek consent. In relation to the other three domains, however, research with Big Data is more complex. To return to the assessment data example, information collection may not have changed significantly from the time of pen-and-paper examinations, but the processing of this data for a multitude of purposes other than the assigning of a grade, and its dissemination to other mediating organizations, has changed significantly. While the values-in-design literature contains a number of practical suggestions for embedding privacy-protection strategies in the design of data systems (Flanagan et al., 2009; Wicker & Schrader, 2010), researchers are rarely in the position of designing

Big Data systems for the collection and processing of data, but rather of being secondary users of that data. The BERA guidelines continue:

> Anonymity is much harder to guarantee in digital contexts. The policies of some social media sites which require identification at signup may exacerbate this. Researchers need to be aware that participants' understandings of their level of privacy in a particular online space may be inaccurate. Ambiguity about privacy within some online communities in which sensitive or illegal topics are being discussed, or material shared, raise(s)further ethical concerns. Relatedly, researchers should consider the question of what online content, in what circumstances, they would be obligated to report to relevant authorities and/or online service providers, bearing in mind any agreements entered into regarding confidentiality and anonymity… Researchers using data gathered in such contexts should inform the community concerned about how the data will be used. (BERA, 2019, p. 23)

A further point, not recognized in the BERA guidelines, is that researchers engaging in data collection on social media need to be aware that they are inside the algorithm ecosystem they seek to research. Two solutions present themselves to this problem. The first involves a further recourse to Big Data algorithms to analyze the large language datasets generated by Application Programming Interfaces (APIs), such as Twitter's real-time streaming API, or even Twitter's "firehose," which provides access to all 400m daily tweets on the platform. Such analytics require a unique skillset for social researchers. The other solution is for researchers to recognize their own digital positionality. A normal Twitter keyword search, for example, will not return all of the items which include a particular keyword, but a curated sample filtered by the algorithm, filtered based on past engagement patterns of the user searching for them. The creation of avatars accounts to understand an alternate positionality—for example, exploring what a social media platform presents about the reliability of health journalism to a user who follows and likes US Republican media content, and how that varies from the search items displayed to a user who follows and likes Canadian Liberal political content—presents further ethical questions around misrepresentation. Such an approach may technically constitute a deception study; however, it is unclear who, if anyone, is being deceived. Failing to recognize this positionality undermines the rigor and reliability of much small-scale qualitative social media research.

In practice, these changes lend themselves to two changes in the ways social researchers do their work. The first relates to the proliferation of publicly available and proprietary datasets which can provide whole-population data on a range of themes. In practice, the levels of statistical understanding and the computing power necessary to carry out complex multivariate work with these datasets has tended to make these the preserve of specialist units, such as the University of Glasgow's Urban Big Data Centre. This kind of large-scale, government funded approach to urban analytics has potential to greatly improve wellbeing, but also raises significant questions, not only regarding the consent of participants involved in the datasets, but also regarding the scale of governance. Such services are expensive, and tend to be at the service of governments or multinational corporations. The Urban Big Data Centre has been pioneering ethical approaches to participatory coproduction research with the end users of such services. One example is the Waterproofing Data project (Pitidis et al., 2022) which sought to involve young people affected by climate change in the Global South in developing solutions to the problem and understanding and negotiating the data processing challenges posed by those solutions.

The second change relates to the blurring of the boundary between secondary and primary data. As the publication costs of publicly available sources tend toward zero (Weinberger, 2011), many of the private opinions, professional judgments, management decisions, and mid-level policy recontextualizations which would previously have remained private, circulated as memos within an office building, or only available through oral interactions, have become accessible from without. As noted above, however, this is not the same as this data becoming "publicly available" in the sense that is ethically pertinent. This can mean that it is unclear when social research leaves the "literature" phase and becomes empirical. At the University of Glasgow, for example, empirical research usually requires the completion of an ethical approval form, together with participant information letters and consent forms. This is reviewed by a College Ethics Committee, under conditions set out in the UK Concordat to support research integrity (UKRIO, 2019). Research involving social media, Big Data, or other sources in this blurred middle, however, requires a different ethical approval form for research with "non-standard data." Although this is considered by the same committee process, it does suggest that the considerations for an ethics of the digital are at least procedurally distinct from those of common research ethics. This process tends to foreground the complexity and indeterminacy of big data research, providing participants with a reading list of potentially pertinent journal articles, professional guidelines, and methodological guides (University of Glasgow, 2023).

Governance and Administration

Through their research and teaching function, universities play an important role as gatekeepers to professional employment. For this reason, concerns that the technology sector is cannibalizing the governance of higher education (Lundie et al., 2022) ought to be taken seriously. The corporatization of higher education, particularly in the digital sector, entails that the burden of responsibility for preparing talent for the challenges of work appears to be fundamentally shifting; research and teaching are "outsourced" to the university, but metrics of quality increasingly are set and adjudicated by graduate employment in high status corporations. New data technologies have been identified as both an effect of these international corporatization processes and a driving force in their governance (Hartong, 2016).

When heads of government and chief executives of Big Data corporations met to discuss the future of education in the world economic forum in Davos in January 2020, they agreed that the education sector is due for an overhaul to make schools and universities fit for the fourth industrial revolution. This "Education 4.0" model would have to align skills to fit the needs of the corporate sector (World Economic Forum, 2020).

While the history of universities predates state involvement in education, and always conferred measures of academic freedom over and against the authority of the state, since the industrial and democratic revolutions of the 19th century, education governance has been seen as a prerogative of state sovereignty. The principle of academic freedom comprises freedom of inquiry in research and the freedom to teach or communicate ideas and facts. Against the backdrop of technical and corporate takeover, some of the reactionary exercises of state authority to limit, for example, the interpretation of history and politics (Miller et al., 2023; Woolcock & Zeffman, 2017) can be understood as a rearguard action in a climate in which other forms of interference in curriculum, through quasi-markets of educational goods reinscribed as currency according to corporate metrics (Lundie, 2022), have become normalized. The differences between universities and the research labs of the tech sector begin to blur, with new research ideas that inform the tech industry coming equally from publicly funded grants to university research labs and the private labs of industry, and researchers moving seamlessly between university and corporate roles.

To marshal these competing state and industry imperatives, international organizations increasingly play a role in reifying and standardizing measures of educational effectiveness, which in turn drive governance policies of leading universities. Given the impact universities can have on the economic attractiveness and investment potential of nations, these governance demands in turn drive education policies across the world. The incursion of technological algorithms, themselves the proprietary secrets of private providers, in this process is an ethical blind spot in current thinking. From international rankings (e.g., Quacquarelli-Symonds; Academic Ranking of World Universities; and Times Higher Education World Rankings) to the role of large educational conglomerates such as College Board and Pearson Educational, such institutions play important gate-keeping roles in selecting which universities' research is funded and achieves impact, and selecting which students can access university qualifications that prepare them for high status professions. An example of the influence of these ranking systems on the prerogatives of state sovereignty is provided by the UK High Potential Individual visa scheme. This visa scheme offers the opportunity to live and work in the UK to graduates of the global top 50 universities, defined as an institution that has appeared in two of the three global ranking systems listed above (Nietzel, 2022), essentially ceding control of its borders to proprietary corporate algorithms.

Implications and Conclusion

From Easterbrook's concern with clear rules, transparent bargaining, and clear property rights in the digital sphere, it has been possible to theorize three constellations of normative Big Data questions operative in higher education today. Firstly, in relation to transparency, the risks of harm in relation to learners ontologizing themselves and their knowledge in relation to artificial agents has been explored in relation to large language model reproductive AI. Secondly, in relation to transparent bargaining, the challenges to recognizing and respecting the intrinsic value and autonomy of human research subjects when datasets become infinitely reproducible, subject to portability and recombination across domains, and the unexpected results that can arise from the automated reasoning processes involved in Big Data analysis pose difficult questions for informed consent in research. Finally, in relation to property rights, attention needs to be drawn toward the impact of corporate interests on freedom and consent in higher education governance processes. In all three cases, awareness of the threats and opportunities posed by Big Data, and the structures and algorithms which generate these, are necessary to enable students, researchers, and university administrators to contextualize and navigate these ethical dilemmas, maintain clarity on their value for the human actors within the system, maximize benefits, and minimize harms.

Ethical theory at present stands at a transitional point, not yet having arrived at a distinctive *telos* and institutional logic of the technological sector that would illuminate a distinctive "ethics of the digital," and yet finding it increasingly difficult to proceed without one. As harm and intent become more remote from the human causal agent, traditional utilitarian

and deontic ethical calculations become more difficult to apply. These issues concern technologies whose influence is felt globally, requiring nuanced and rapid response, yet the resources to address them remain concentrated in the Global North, potentially exacerbating inequalities for universities in the Global South. As data becomes more than merely a piece of personal property, indeed, in much current research the most fundamental properties of the human person such as genetic structure and neural activity become datafied, approaches to data management that are grounded in property relations become insufficient, not only in research ethics but in the wider world. Infinite reproducibility of data and language holds out a challenge and also a promise to educators, offering the potential to upskill graduates in literate domains in ways analogous to the impact the introduction of spreadsheets and calculators had on mathematical domains—freed from the labor-intensiveness of calculating complex statistical significance tests manually, it becomes possible to advance more quickly to higher level analytical skills, for example. The same challenge calls us to a more profound ethical engagement with the infinite reproducibility of data generated in the course of research and evaluation, its appropriation by corporate technological interests, and infinite manipulability by hitherto uninvented large language machine learning models, and the consequences of this for a still more accelerated and undifferentiated world.

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Digitalisation, Neoliberalism and Globalisation of Higher Education in the Australian Context

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Abstract

This article explores the rise of digitalisation in Australian higher education and its impact on learning and teaching, administration, and regulatory obligations. This digitalisation can be epitomised by the prevalence of learning management systems (LMS) which have reshaped the conduct and configuration of education. As universities have embraced the LMS, as forced by the pandemic, the confluence of disruptive digitalisation combined with globalisation, regulatory reforms, and shifts in government funding models have seen the Australian higher education sector in constant evolution. This article contextualises the impacts of digitalisation using the lens of neoliberalism and globalisation, with past, current, and future state considerations in the sector. It includes a case study from a large metropolitan Australian university with a signature pedagogy of industry-partnered and flexible learning to consider how Higher Education Institutions (HEIs) in Australia must continue to evolve in identity and provision of learning to serve social interests for the future in digitalised contexts.

Keywords: Australia, digitalisation, globalisation, higher education, identity, LMS, neoliberalism

Introduction

The dominance of neoliberalism and globalisation in higher education has had significant impacts on the role of digitalisation in Australia. This has been evidenced in discussions and dissections of current and future perspectives on higher education, such as: Dede & Richard (2020) who discuss the "synergistic digital economy" which forces adaptation and change at a rapid pace, shifting labour market requirements, and informing the place for lifelong learning (2020). Similarly, Zajda outlines the commodification of higher education as a result of neo-liberal education policy that reduces education to an investment in human capital and resource development (2020, p. 156); and Popenici discusses the "...process of industrialisation, commercialisation, and trivialisation of higher education" (2022, p. 135) and a potential future of "...ongoing decline in quality, the vocationalisation, and oversimplification of higher education" (2022, p. 183). The disruptions of the global COVID pandemic have also seen a sharpened focus on the role of digitalisation, in particular raising questions about the physical and digital priorities for learning and teaching practice when defining the virtual university (Wheaton & Young, 2023). It is in this wider setting that tensions continue to exist between academics and administrators, contributing to ongoing concerns around institutional values and identity in the sector. This is characterised as "technologised governance, "often positioned as being in direct

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support of a marketized institutional model, and thus an opposition to the aesthetic and intellectual values of higher education (Popenici, 2022). Nevertheless, there are opportunities emerging to successfully consider and utilise digitalisation within a neoliberal context. This is evidenced by Australian HEIs and sectorial discussions for implementing strategies that reassert institutional identity and serve not only economic but also broader social challenges.

Understanding the Australian Context

Australia has 43 HEIs in metropolitan and regional locations, with at least one university main campus based in each state capital city (Study Australia, 2023). Research is a legal requirement for achieving accredited university status. Nearly all these institutions have multiple campus locations, either within Australia or internationally. Both the 2023 QS world rankings and the Times Higher Education show seven Australian universities in their respective top 100 ranking (QS World Rankings, 2023; Times Higher Education, 2023). Like most countries, there are hierarchical divisions and categories within these universities, notably the larger prestigious 'sandstone' Group of Eight (Go8) and the Australian Technical Network (ATN) institutions. The former reflects eight leading research-intensive institutions while the latter reflects six focused on enterprise, impact, economic and social solutions. In addition to these two groupings of larger public institutions, there are six private institutions amongst the remaining 31 HEIs.

Admissions for study, except for several private universities, are based on the Australian Tertiary Admission Rank (ATAR) scores given to secondary school students. Other features of the sector include specialist metropolitan, regional, or remote universities that tailor to specific cohorts (e.g. lower socioeconomic status, first-in-family, remote) or distance education providers. There are also private online-only offshoots, such as Swinburne Online and Royal Melbourne Institute of Technology Online (RMITO). These entities have operated separately from their parent institutions of Swinburne and RMIT, benefitting from the intellectual property of their academics or industry connections, and are geared to the full-fee professional mid-career cohort seeking to upskill or transition. The privately funded Online Education Services (OES), a joint venture by SEEK (Australian HR company and online employment marketplace) and Swinburne University, offers online delivery partnerships with HEIs and is illustrative of the pivotal establishment of fully online programs and their platforms for the private and commercialised provision of education. Such examples indicate the increasing commercial influence of developing and delivering higher education to targeted cohorts and customers.

Governance and regulation of HEIs

Various government bodies and legislation operate as governance and regulation in Australian higher education. The Australian Qualifications Framework (AQF) functions as a national policy underpinning the design of all regulated qualifications and outlining pathways, awards and credit transfer guidelines (Australian Qualifications Framework, 2023). In 2019, an AQF Review provided recommendations for several new qualification models for the framework based on research, analysis and consultation conducted by the panel (Department of Education, 2019). These qualifications are indicative of expected future learning needs of the Australian population and pose disruptions to the sector including microcredentials and their use in credit towards formal qualifications, and a national credit point system to support universal entry (Department of Education, 2019). The Review states that the ongoing effect of new technology, such as artificial intelligence, and the transformation of workplaces mean that "...employers have strong and growing expectations that graduates will be work ready and productive" and that "...innovation…across industries, underpinned by workforce capability, will be essential to improved productivity and competitiveness" (Department of Education, 2019, p. 7). The features of the new qualification models cater specifically to workforce and social needs with the aim to increase participation in higher education. The qualification models also are responses to new technologies disrupting traditional authority sources for information, skills, and experience attainment (Department of Education, 2019). This points to the significance of digitalisation and rise of commodification in the sector.

Other significant governance bodies include the Tertiary Education Quality Standards Authority (TEQSA) and Australian Skills Quality Authority (ASQA) which serve as national regulators for higher and vocational education sectors respectively. These bodies undertake regular audits of institutions that self-accredit and provide qualifications across tertiary and vocational levels of the AQF. Several HEIs are dual-sector, thus offering enhanced pathways and opportunities for students. In terms of legislation, the Higher Education Standards Framework (HESF) threshold standards provide the minimum acceptable requirements for Australian higher education providers and form the basis of audits conducted by TEQSA. These standards make explicit mention of anticipated forms of digitalisation for the learning environment and teaching delivery, calling out the provision of virtual or blended learning environments and the use of electronic learning management systems (Australian Government, 2021).

Government drivers, funding and policy

Key government drivers and public policies have had indirect influence for how universities have been digitally shaped in the period since 2000. Most notable is the 2003 Higher Education Support Act (HESA) that introduced a new government funding model whereby student caps on individual institutions were lifted (Davis, 2021). This resulted in an increase of offerings of full fee degrees and opened opportunities for HEIs to explore international and non-traditional markets, alongside government supported domestic student places, resulting in increased participation. Over time, government funding and subsidies have steadily decreased and policy statements increasingly focused on the economic benefits and intent of education for employment, pushing for higher participation through an equity lens (Davis, 2021).

In 2020, the pandemic occurred alongside the introduction of the higher education legislation package: Job-Ready Graduates (JRG) (Department of Education, Skills and Employment, 2020). The government introduced priorities and frameworks for fee setting that had an aim to elevate Science, Technology, Engineering and Mathematics (STEM) disciplines that supported a flourishing economy. At the same time, there were hiked fees for humanities and arts degrees as these disciplines were considered less essential for supporting the economy and thus received less public subsidy (Davis, 2021). This reform shifted government funding to align with disciplinary areas of national priority, promoting an explicit intention of higher education to address economic interests by aligning graduates to market needs. This activity reflects neoliberal globalization as expressed by Marginson (2022), the outcome of which is "...the rapid and stable expansion of international higher education and global science but on the basis of a singular language and a dominant institutional template and mix of disciplines. Potentials for the creative diversity of knowledge and approaches to higher education have been lost" (p. 25-26). The Federal Government has since committed to a higher education review in 2022-3, namely the Australian Universities Accord (Department of Education, 2023). The Accord aims to determine a visionary plan for the sector, devising recommendations and performance targets to improve quality, accessibility and affordability for the next three decades.

The Universities Accord is specifically concerned with the negative impacts of the JRG for students, especially those from female, equity and First Nations groups, as this cohort is largely represented in fields of study where the highest increase in student contributions have occurred (Department of Education, 2023). While the Federal Government provides financial help to students through the Higher Education Loan Program (HELP), compulsory student contributions are still required. The National Priorities and Industry Linkage Fund (NPILF) is another funding framework that explicitly provides block grants to universities based on their engagement with industry to produce appropriately 'job-ready' graduates (Department of Education, 2022). Conversely, Universities Australia, the university peak body, provides an independent sector voice that advocates for the value of HEIs beyond that of dominant government policy, along with the Indigenous Strategy 2022-25 that also represents a whole of sector approach to improving social justice and fairness for Aboriginal and Torres Strait Islander people as staff and students in HEIs (Universities Australia, 2022). Therefore, the Accord and independent voices of the sector represent a critical awareness to shift the current political and policy landscape to align with more appropriate cultural and social needs.

Scale, the Australian Location and Digitalisation Infrastructure

Finally, geography and infrastructure directly impact the size, operation and digitalisation of Australian HEIs. The five largest Go8 universities educate an average of 64K students each with the ATN university RMIT showing 91K enrolments in 2021. These figures are significantly larger than equivalent universities in the UK and US where average enrolments are 18K and 39K respectively (Davis, 2022). Australia is also home to Perth, one of the most remote cities in comparable size in the world and setting to five HEIs. In addition, Australia has a unique placement to Asia and the Pacific, with HEIs considering their role as "in and of Asia" in servicing student, social and policy-based interests. Simultaneously the historical influence of colonialist origins from Europe shapes the identity of the nation historically and currently with 1.2 million United Kingdom migrants living in Australia as of June 2021 making it the largest migrant community (Department of Home Affairs, 2023). When it comes to infrastructure to support digitalisation, Australia lags in internet quality, being 65th in ranking, and dropping over the last decade (Purtill, 2022). The quality of infrastructure has implications for the ability to innovate and explore digital affordances without risking equity and inclusion for students and educators.

Pedagogical Impacts of Learning and Teaching

Like most HEIs across the developed world, the take-up for digitalisation in Australia for learning and teaching has been epitomised through the adoption of the LMS to varying degrees of sophistication since 1997 with the release of WebCT (Zawacki-Richter & Latchem, 2018). Despite the diversity of technologies now in use, the LMS is an inherent mechanism of any HEI, positioned in a young academic discipline of instructional and educational technology (Wheaton

& Young, 2023). One factor often overlooked is the potential for the 'Americanisation' of pedagogy from the extensive employment of US-based educational technologies (such as Canvas) in Australia HEIs. This 'Americanisation' is driven in some respects by technological determinism, whereby 'edtech' products like Canvas are dominant in the Australian sector, but their functionality developed based on their American origin. The customisation to the Australian-based context only occurs based on consumer advocacy by HEIs in the region facilitated by the product "Canvas Community" (Instructure, 2023). The development of educational technologies within American political and cultural ideologies of business models and institutional practices, translating to affordances offered by these systems that implicitly shape the way the Australian sector evolves in terms of standardisation, language, and collective development. The LMS as a widely foundational digitised tool is indicative of a business model templated hegemony, with its focus on managerialism, analytics, integrations to other dominant systems, and a standardised manner for packaging and sharing learning. While the LMS has been adopted at institutional levels for both informational infrastructure and pedagogical change, this has not necessarily translated to deep engagement for learning and teaching practice with academic staff (Wheaton & Young, 2023). New university processes and changes frequently fail to be broadly accepted and assimilated into the experience of learning and teaching in HEIs, and the pedagogical adoption of the LMS as a cornerstone of HEI digitalisation is a key example.

There are varied conceptions and approaches within Australian HEIs to digitalisation in learning and teaching and adoption of the social integration affordances of digital technologies. In 2013, universities were being forced to respond to the continued reduction of federal government support, declining student satisfaction with reduced staff to student ratios, along with intensifying global competition to rethink approaches and inherent identities as institutions for learning. This raised some debate and questions about delivery modes and the role of digitalisation, in particular the lecture, perceived as the traditional pinnacle for delivering university learning to large classes. Some universities publicly rebranded themselves by committing to smaller class sizes with 'flipped' digital resources as a more effective mode for supporting student learning (Bebbington, 2013). These shifts saw experimentation with alternative pedagogies prompted by questions about passivity and lack of collaborative learning opportunities for students in lecture settings. This experimentation sought to encourage higher learner engagement and activeness, consequently activating more fulsome implementation of LMS that supported independent and flexible engagement with digital resources and activities that was consolidated in face-to-face time on campus with teaching staff.

Charting digitalisation of HEIs in Australia using the LMS as a key lens to assess ideological discussions can be dissected into pre and post COVID framings. Pre-COVID framing saw educational technology (or edtech) continually positioned as the transformer of education to a student-centred practice. However, concerns existed around whether pedagogy was driving technology or technology was driving pedagogy (Sankey et al, 2020). Zawacki-Richter and Latchem (2018) determined several trends in educational technology developments that show a shift "…from a focus on computers and technology for computer-based instruction to a view of computers as tools for collaborative learning and the adoption of student-centred approaches to instructional design and learning" (p. 140).

In addition to considering the role of technology in education, there has also been a focus on frameworks for assessing the impact of technology on pedagogy and the degree of digitalisation achieved in institutions (see Graham, 2005; Porter, Graham, Bodily & Sandberg, 2016; Mestan, 2019; Han, Wang & Jiang, 2019). In Australia this rise in digital models of instruction and delivery has led to the establishment of independent organisations such as the Australasian Council on Open, Distance and e-Learning (ACODE), Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) and Technology Enhanced Learning Accreditation Standards (TELAS). These bodies represent the emerging quality standards and governance associated with the digitalisation of learning and teaching, and a pedagogical focus on educational technology to improve student outcomes. In this context, concerns have been prompted around data and surveillance, methods of implementation, criticisms of standardised tools, and changes to practice that are perceived to constrain educational freedoms and neglect human value (Huang, Matthews & Lodge, 2021).

Prior to 2020, Australian universities were in varied states of developing their digitalisation identities and processes. In responding to the pandemic and ensuing lockdowns and border closures, HEIs were compelled to abruptly exploit the full potential of digitalised learning and teaching. These scenarios were universal and have also been clearly recounted by Bekele (2021) for the African higher education context. There was a clear economic imperative to respond urgently, given the extent to which Australian institutions relied on international students with education being the fourth most valuable export in 2019-20 (Department of Education, 2023). This reliance on international cohorts can be traced back to the early 1990s, resulting from a significant reduction in government funding, introduction of student fees and increased domestic enrolments (Davis, 2021). In 2003, the HESA funding model for higher education was introduced, primarily based on open market modelling with Commonwealth Supported Position (CSP) allocations for defined numbers of undergraduate and professional-oriented postgraduate programs, along with demand-driven openings for

any number of full-fee paying students (Watts, 2017). Government expectations set for higher education as a significant export contributor opened the competitive gates for the international student cohort as a lucrative consumer group (Davis, 2022; Watts, 2017). This shift in ideology served the Australian higher education industry most satisfactorily until it began to unravel though border closures in 2020, at which point the Victorian state government initiated the International Education Resilience Fund (IERF) to boost abilities of institutions in that jurisdiction to retain their international student cohorts (Victoria State Government, 2021).

The COVID response necessitated the recasting of HEIs as predominantly online providers, dispelling ideological positions on the nature of edtech to provide a durable mechanism for educators to remain working and connected to their students. TEQSA provided explicit guidance that was linked to existing threshold standards to define the 'pivot to online teaching' conditions (Australian Government, 2020a). These guidelines took full consideration of a broad range of conditions needed for managing the learning and teaching ecosystem including supporting students and staff, maintaining quality learning, and outlining requirements for governance and oversight of transition and changes from 'normal' to 'pivot' state. This guidance by TEQSA and necessary adjustments for online-only delivery necessitated by lockdowns and border closures, situated the COVID pivot as an external change agent. As Bekele (2021) describes for the African response to the pandemic, there was a similar dramatic increase in the engagement of Australian HEIs with digitalisation and its related online instruction modality, instigating responses of 'panic-agogy' or emergency remote teaching (Hodges et al, 2021). At the end of 2020, a TEQSA thematic analysis report on the COVID student experience (Australian Government, 2020b) captured insights across the Australian HEI sector that define opportunities for more purposeful design of digitalisation that builds on the wealth of personal and professional experiences across the sector.

Leaning into Bekele's (2021) learning from the African context, the importance of Internet infrastructure and connectivity has been crucial, along with committed institutional leadership to resource and support the successful integration of technology in learning and teaching that factors in human, pedagogical and curriculum perspectives. This is increasingly evident as global markets and travel have revived conversations about the "new normal" and discussion on when the "physical" returns to learning. Defined as a post-COVID world, physical learning environments are being re-evaluated as a seamless space of digital and physical learning with a focus on collaboration, specialist space designs and shifted considerations of how space and place intersect to embody learning and connection.

A Case Study of Royal Melbourne Institute of Technology (RMIT)

Anchoring the impacts of digitalisation in Australian HEIs, inclusive of COVID disruption, it is useful to focus on a specific case study. RMIT is a metropolitan, multi-campus international university founded in 1887 with a combined staff and student number of approximately 100,000. RMIT has four Colleges, namely Business & Law, Design & Social Context, STEM, and Vocational Education. These Colleges are of considerable size with most being larger than UK HEIs, e.g. Business & Law had 26.4K enrolments in 2021. RMIT's urban campus in the Melbourne CBD and international presence in Vietnam, Singapore and Europe when combined with its dual-sector offerings create an ecosystem of geographies, social and industry engagement. The case study is split into pre and post COVID responses, with the pandemic offering a reflective point for the values and limitations of digitalisation for the institution.

RMIT's journey of digital transformation has encompassed the initial transition, implementation, and ongoing quality assurance process for Canvas, the new LMS selected in 2015, as well as its reliance and use during the COVID pivot. This transformation has been documented in various conference presentations and publications (Wheaton & Mastro, 2018; Wheaton & Young, 2019; Wheaton & Young, 2023) and articulated in the vendor-published case study of Canvas LMS implementation (Instructure, n.d.). The implementation of Canvas represented a desire to provide greater support services and integrated resources to students, using learning dashboards to streamline assessment submission, library access, communications, important policies and procedures, and other tools such as portfolios. A significant institutional commitment, both financially and culturally, was made to this process of digitalisation. Advocacy and a clear rationale for this investment was clearly articulated with strategic and collective leadership from the Vice-Chancellor (VC) and Deputy Vice Chancellor Education (DVCE), and leadership at operational and tactical levels. To support the rollout, change champions and existing staff across RMIT also served to drive capability and engagement outcomes. A microcredentials strategy was established, originating as a pilot project prior to integration into the LMS ecosystem and a longer-term intention to embed into program curriculum. Such digital investments do not receive specific Federal Government plans, funds or directives to support digitalisation transformation as it is up to institutions to determine funding allocations for their own efforts in alignment with operation and strategic priorities. For RMIT the investment in digitalisation was anchored in the benefits of sustainability, scalability and consistency, alongside pedagogically improved learning and teaching practice intended to deliver improvements in the student experience.

The impact of COVID operated as a significant pause, reflect, and continue mechanism for various initiatives across the institution. To capitalise on the digitalisation efforts and to utilise long-term opportunities for creating responsive and relevant curriculum for programs, RMIT undertook a redesign of its curriculum architecture. This involved the structural design of formal qualifications and non-formal learning to enhance pathways and the interfaces between qualifications and disciplines. This work was initiated in response to the previously mentioned AQF Review, an emerging National Microcredentials Framework (Department of Education, Skills and Employment, 2022) and insights gained from the experiences of the pandemic. In addition to the fundamental reshaping of curriculum, digital transformation continues with the implementation of a curriculum mapping and management tool that will provide essential administrative, governance and learning and teaching functionality in tandem with the LMS.

Core concepts included in the new curriculum architecture are stackability, unbundling, and disaggregation of curriculum to form new types of learning as referred to in various international commentaries for meeting new learner markets (see Craig & Williams, 2015; Dede & Richards, 2020). Thus, not only has digitalisation led to segmented configuration strategies for curricula, but the dominance of neoliberalism in the socioeconomic status quo has influenced the emergence of these formations of learning for upskilling. However, RMIT, in looking beyond the market to the broader social and cultural importance of HEIs, has defined new graduate capabilities, replacing existing generic learning outcomes otherwise known as graduate attributes, to inform the design, delivery and content of our curriculum. The capabilities reflect the University's strategy of "Knowledge in Action", that focuses on learning through life and work, research and innovation, and serving our communities (RMIT, 2022, p. 8). In the context of digitisation, the capability of "Digitally Adept", emphasizes the ability to create and utilise a blend of digital and human skills, tools and emerging technologies to solve problems, innovate, communicate and bring about change. Similarly, the capability of "Critically Engaged" places contextual focus on employing intellectual independence and judgement to engage critically with information, make sound evidence-based decisions, actively challenge assumptions and undertake research. The set of six capabilities anchor the value and unique identity of the institution, leveraging our research expertise, our academic and institutional capital, in informing not only training for job readiness but also of the individual graduate to be an active agent of social, environmental and political change.

Neoliberalism, Digitalisation and Commodification of Higher Education

As we consider the broader Australian context and RMIT as an HEI case study, we have an opportunity to contemplate the influences of commodification on higher education that neoliberalism has imposed at macro and micro scales. There are specific national contexts as well as institutional-specific contexts that inform how a commodified value of HEIs is assessed, which is intimately tied to the journey of digitalisation. This influence of neoliberalism and globalisation on the higher education sector is not a uniquely Australian phenomenon, but it should be understood in the context of our nation-specific elements (Turner, 2020, p. 142).

When stating that higher education is increasingly commodified, this can be understood as the abstraction of the intrinsic value of learning, identified through qualifications that indicate the human capital of graduates in terms of their ability to be producing economic agents. In this context, qualifications operate as indexical substitutes for the outcome of learning, pointing not only to the graduate but the institution which operates in a market economy in which value is determined by metrics and ranking systems. The value of a HEI award can therefore, increase or decrease, thus qualifying these operations as functioning in a 'quasi-market' (Watts, 2017). Additionally, this abstraction has shifted the intrinsic value of education from being a process of experience to that of 'exchange value' offered for employment. Thus, when placed in the broader context where there exists competitiveness for value and status of product and key operations of economic transaction and profit, these are subtle signs of educational capitalism present in HEIs (Watts, 2017).

Linking this concept of commodification to the digitalisation of higher education, Selwyn and Facer (2014) identified that: "…we can therefore say with some confidence that sociological research is now ably showing that digital technologies in education are not neutral but political; that they are carriers for assumptions and ideas about the future of society; that their design, promotion and use are all sites in which struggles over power are conducted (p. 491)."

This is exemplified in HEIs in our global context of market-driven societies. The rise of the LMS and broader technologies has been perceived to shift power from academics into the hands of administration and governance (Popenici, 2022). Considering that digitalisation was epitomised as online-only delivery for international students caught offshore during the COVID crisis in Australia, the power struggle can be felt not only within institutional ideologies around pedagogy, but also nationally and internationally within the Australian government and China that banned recognition of online degrees post-COVID (D'Agostino, 2023). Further instances of power imbalance shaped by neoliberalism include the growth of casual academic staff in line with increasing international students in Australia (Department of Education, 2023). Funding allocations in service of international markets (e.g. IERF), abrupt strategic

and operational shifts from online delivery to refocus on campus presence and delivery, and foreign dictations of quality influencing agency of institutions (D'Agostino, 2023).

Microcredentials similarly represent another shift in neoliberal commodification. This educational technology demonstrates the shared potential for designing learning and unbundling HEI products in closer synergy with industry, using digitalisation as the enabler for securing a new market group in lifelong learning (Lang, 2023). The MOOC was previously considered the unbundler of education, when conceptualised as providing flexibly delivered equitable and personalised learning opportunities, but has increasingly moved into commercialised domains (Lambert, 2021). It is clear that microcredentials are the future investment for providing modularised learning in the uncredentialed space of workforce upskilling and lifelong learning. The Australian government has already sought to establish a National Microcredentials Framework (Department of Education, Skills and Employment, 2022) that aligns with needs outlined in the AQF Review (Department of Education, 2019). The framework certifies industry defined competencies that generate specific short-term return and benefits for human capital in a competitive marketplace. However, as Lang (2023) proposes, HEI products can be developed through a co-design process with industry and similarly quantified and unbundled in a marketplace, but with the mindset shift of market to educational construct, to explicitly serve industry demand.

There are also factors that contribute to the influence of neoliberalism and digitalisation within individual HEIs, most notably the unique context of institutions and potentially competing ideologies held by their staff. We are living through the fourth industrial revolution (4IR) where digital technologies have disrupted life and our organisations, challenging HEIs to be more innovative, competitive and relevant in offering services and processes (Subic, 2021). Universities have not been immune to this disruption, but there are considerations about the speed and nature of response. As complex and large organisations, HEIs are typically seen as slow in adaptation to change (Davis, 2021) which can be influenced by not only the adoption of technology but the need to understand its implications (Veletsianos, Kimmons & Bondah, 2023). Thus the implications of rapid technological advancement in digitalisation of higher education collectively puts HEIs at a frequent disadvantage, challenged by our institutional scale and logics, funding mechanisms, and imperative to deliver skilled workforce responses while simultaneously offering a critical lens to maintain the public good. Considering these contexts collectively, Turner's (2020) caution on relying simply on neoliberalism and globalisation to understand higher education is valid. To this, we must consider national and local considerations unique to HEIs as well as the influence of digitalisation.

Outlooks for Digitalisation in Australia

It may appear to be a bleak perspective for the current trajectory of digitalisation in the HEIs of Australia given the evidence put forth in this article. Charting digitalisation within Australia using the LMS as a key asset and considering the inevitable disruption and after-effects of the pandemic, as well as considering a unique case study of RMIT, we can see the complexities of value, optimism, and criticism shaping the sectorial debate. There is increased awareness of the value of digitalisation, but also an awareness of what is lost when HEIs are required to transition to be entirely online providers. Despite criticisms and cautionary warnings as shared by Popenici (2022) on the potentially "...dangerous path when we simplify all to fit the function of computing algorithms" (p. 97), we must be mindful of path dependence as articulated by Turner (2020) and reflect on our Australian perspective, disruptors, national systems, and individual HEI identities and strategy. The Australian context presents a range of influencing factors and if we consider technology alone, the case of academic integrity gives cause for optimism. Australian universities and academic researchers in the discipline of assessment are committed to an educative approach for engendering academic integrity (Australian Government, 2022), rather than only informed by surveillance using digital technologies. This stands in stark contrast to the view posed by Popenici whereby integrity is a focus on punishments and institutional consequences (2022, p. 173). In this context, ChatGPT is yet another digital disruptor, but Australian perspectives have seen a call for engagement rather than avoidance, advocating for renewed discussion on the need to improve assessment practices and revisit the value of learning as a process. Here, graduate capabilities that drive curiosity and expand understanding, function to facilitate meaningful engagement with disruptive technology to reflect and evolve our methods of learning. Technology also continues to provide legitimate opportunities for equity and inclusion, through online offerings, recordings and access to materials and technologies for improving accessibility.

The JRG evidences the influence of neoliberalism in strategy, policy, and funding frameworks that shape how HEIs operate. There is no doubt that neoliberalism presents a critical view of education and relies on digitalisation, but we see that with attitudes around international students there is a human centred concern emerging amongst financial and geopolitical interests surfacing in the Universities Accord. As we mobilise the potential that is emerging to visibly shift from an export to knowledge economy, we are also reaffirming a unique social good for Australian society and beyond. University graduate capabilities provide a tangible mechanism to create curriculum aligned to this need as they

reinvigorate the opportunity for generalist humanities programs addressing the broader social issues and worldviews of society (Coleborne, 2023). The Universities Accord also captures the visions and views of the sector, indicating that we are collectively aware of our precarious position to either enter a period of growth or lose our identity (Department of Education, 2023).

In summary, Australian HEIs are embracing digitalisation in keeping with the socioeconomic factors of globalised neoliberalist markets while also navigating the unique contexts of the individual institution. Despite these various pressures, HEIs are also reasserting their role to wield digitalisation as a tool to improve education beyond the realm of jobs – asserting the individual virtues of lifelong learning, social good, and semi-permeable barriers between the University and society, both online and in-place within our urban and rural environments.

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Progress and Challenges in Digital Teaching and Learning in the Canadian HE System

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Abstract

Canada has a long history of digital and online learning. The article gives a brief overview of the development of digitalization of teaching and learning in Canadian HE, and the current status in terms of online and blended enrolments across the country, including the impact of Covid-19. The main reasons for this shift in teaching and learning are discussed, as well as the main challenges and opportunities Canadian HE institutions face as a result of the digitalization of teaching and learning. The article ends with conclusions about the extent and type of digitalization, its objectives, and the attitudes and policies of the main stakeholders towards digitalization of teaching and learning in Canadian HE institutions.

Keywords: Canada, digitalization, higher education, online/blended learning, teaching/learning

Introduction

Canada is the second largest country in the world by total area, yet its population is only 39 million. Even though nearly 80 per cent of the Canadian population live near the southern border with the USA, and in its larger cities, Canada is still in general a sparsely populated country, with long distances between major cities, and between urban centres and their vast hinterland. This has historically influenced the organization and delivery of higher education and in particular has provided a foundation and rationale for online learning and distance education.

At the same time, Canada's closeness to and strong connections with the USA, its economically advanced cities, and a well-educated work force, have resulted in ideal conditions for the development of advanced digital applications such as online learning.

The Canadian Higher Education System

Education is constitutionally the responsibility of the ten provinces and the three territories. Thus, there is no national higher education system in Canada. There is no Federal Ministry or Department with responsibility for post-secondary education, although the federal government does provide student aid and tax breaks for students and their parents, and funding for research and innovation. The federal government is largely responsible for funding higher education opportunities for indigenous learners, although those who go on to post-secondary education usually attend a provincially funded institution. There are four types of public post-secondary institution in Canada:

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- universities,
- polytechnics/institutes of technology,
- one- and two-year professional and vocational colleges,
- CEGEPs (general and vocational colleges) in Québec.

Almost all universities are provincially funded and there are few private, for-profit online universities in Canada, and their programs are small. There are numerous private, for-profit vocational colleges, but still a majority of two-year college students attend provincially funded institutions.

Most Canadian students receive financial support of some kind, ranging from endowment-funded scholarships to low interest student loans to tax breaks. In most provinces, grants and tax-breaks combined usually cover at least the tuition costs. As a result, Canada has the second highest rate of access to higher education in economically advanced countries, according to the OECD (2022). Almost two-thirds of those aged between 25-35 in Canada have some form of tertiary education qualification (Schuetze, 2019). For more details on the Canadian higher education system, see Usher, 2022.

Online Students

Pre-Covid

Because there is no federal agency responsible for higher education, there are no official national statistics on the number of students taking online or distance courses. However, since 2017, the Canadian Digital Learning Research Association has been conducting annual surveys of all publicly funded universities and colleges in Canada regarding their digital learning activities.

There are still difficulties in collecting accurate and reliable data, because there is not consistency between institutions on how to count online or distance enrolments. Nevertheless, the CDLRA recorded that in 2017, roughly 17 per cent of all students taking courses for credit were taking at least one online course, and that eight per cent of all credit course enrolments were in fully online courses (see Table 1 for a breakdown by type of tertiary institution. Credit courses are those leading to an official degree or diploma, so these data do NOT include continuing education enrolments).

Bates (2019) reported that in 2018:

- the average online course load for students was three to four courses a year (the overall course loads ranged from 7-8 course a year in universities to around 10 courses a year in colleges.)
- the 1.36 million online course registrations in 2016-2017 were the equivalent of 4 universities of 27,000 students each, 4 colleges of 12,000 students each, and 1 CEGEP of 3,500 students.

Table 1

Number and percentage of online course registrations for all Canadian postsecondary institutions by type of institution, 2017:

Type of institution	Online course registrations	All credit course registrations	% online
Universities	839,673	10,261,104	8%
Colleges outside Québec	476,232	5,661,687	8%
CEGEPS (Québec)	34,364	1,798,790	2%
Private, provincially supported Québec colleges	6,956	232,018	3%
Total	*1,357,225*	*17,953,599*	*8%*

Source: Donovan et al., 2018

Perhaps more important than the actual numbers though is the trend. CDLRA also collects from the institutions estimates of future online course enrolments. Most institutions expect their fully online courses enrolments to increase in the future. The surveyed institutions reported that their online enrolments had been slowly but steadily increasing for the

last 15 to 20 years up to 2019. The rate of increase was reported at around 10% per annum, while on-campus enrolment numbers had been mainly static.

Some provincial governments, such as British Columbia, Alberta and Ontario, had in the past encouraged the growth of online learning by special funding for the development of new online courses in addition to the annual government operating grants for universities and colleges. However, in recent years this growth is now driven without specially earmarked funding. Johnson (2019) reported:

The vast majority of Canadian post-secondary institutions offer online courses for credit, with almost all universities and colleges across Canada delivering courses online. Online offerings have remained consistent and, in 2019, there were no institutions that moved away from delivering courses online.

This is a major difference between Canada and the USA. Online learning in Canada is spread widely across all institutions, whereas, although still quite pervasive in the USA, and the overall numbers are much higher, online learning is concentrated in a relatively small number of universities and colleges with very large numbers of online enrolments, such as the University of Maryland University College, University of Southern New Hampshire, Arizona State University, Western Governors' University, the University of Phoenix, and Ivy Tech Community College (Seaman, Allen, & Seaman, 2018).

The Impact of Covid-19

As a result of Covid-19, all universities and colleges in Canada, as elsewhere, almost immediately switched to emergency remote learning, a form of online learning based mainly on delivering lectures synchronously online via video-conferencing.

However, prior to Covid-19, the majority of online courses in Canadian HE institutions had been largely asynchronous, using learning management systems such as D2L's Brightspace, Moodle, Canvas or Blackboard Learn. Nevertheless, even before Covid, almost two-thirds of all HE institutions were also using video-conferencing for online learning in conjunction with an LMS (Johnson, 2019).

At the time of writing, it is still too early to predict the consequences of Covid-19 for online learning. The necessary haste in moving to emergency remote learning meant that many of the lessons about what was required for good quality online learning were ignored. As a result, responses from students and instructors were mixed, with many students and instructors strongly disliking emergency remote learning, while others found it worked quite well.

What is clear is that even before Covid-19, fully online learning in Canada was increasing at a steady rate. So, also, according to data from the CDLRA, was blended or hybrid learning, the mix of on-campus and online learning. Blended learning can take many forms and is very difficult to track, but in 2021 Johnson (2021) reported: While more than half of institutions (53%) agreed that faculty were more interested in teaching fullyonline courses, there was a stronger interest among faculty in teaching hybrid (partially online) courses. Three-quarters (75%) of institutions agreed that faculty were more interested in teaching courses where instruction is partially in-person and partially online.

Johnson concluded: The findings from the 2021 National Survey of Online and Digital Learning show that, even with a return to on-campus learning, hybrid and online learning options are desired. Further, the data indicates a shift in preferences among faculty and students toward using more digital learning resources and educational technologies in their classes. Most institutions do not expect to return to a pre-pandemic state of teaching and learning, and online learning and digital resources will likely play a much greater role at Canadian post-secondary institutions going forward.

Similar results have been found in the USA. For instance, Seaman and Seaman (2023), conducted a series of seven surveys of community colleges (two-year institutions that grant associates degrees) between April 2020 and September 2022. They found (pp.10-11) that:

> Most community college students reported being more optimistic about online learning (56%) and blended learning (50%) than before the pandemic. In addition, fifty-two percent of faculty reported being more optimistic about online learning than pre-pandemic; only 17% said they were now more pessimistic…. The substantial changes in attitudes and future teaching desires indicate that a return to the pre-pandemic "normal" is not likely. Faculty report that, for the most part, their teaching practices have changed, and that these changes will continue without a wholesale return to the pre-pandemic approaches.

One of the challenges of this expansion of digital learning is the definition of terms. This is important, because students need to know the requirements of a course. Do they have to attend campus on a regular basis? How much of the

course is online? If it's online, do they have to log in a particular time (synchronously)? The CDLRA has been working with organisations in the USA such as WCET and the Online Learning Consortium to agree a common terminology. Based on a survey of nearly 1,000 faculty and just over 1,000 administrators, the researchers found a very high degree of agreement on most of the terms used to signify digital learning, as follows:

Table 2

Definitions of Digital Learning

TERM	DEFINITION
Online learning	All instruction and interaction is fully online (synchronous or asynchronous).
Hybrid learning	A blend of online and in-person instruction (online instruction is synchronous or asynchronous).
Hyflex learning	Students can move between online and in-person instruction as they see fit (also referred to as multi-access or co-modal learning).
In-person learning	All instruction takes place in an in-person setting.
Synchronous learning	Instruction takes place in real-time and requires student presence (in-person or virtual) at a set time.
Asynchronous learning	Instruction is available for students to access at a time that works best for them.

Source: Johnson, Seaman and Poulin, 2022

Provincial Government Strategies

Higher education policy is the responsibility of the provinces in Canada. Provincial governments began to support the use of online courses in the mid-1990s. Their approach to digital learning is an extension and development of their policies towards online learning.

Meta-Organisations

Several provinces established meta-level organizations to help co-ordinate or encourage online learning, although these organizations do not offer online courses or programs themselves.

BCcampus has in the past managed a fund from the British Columbia provincial government to support the development of new online courses and open educational resources, and more recently has managed funds for developing open textbooks. It has also established an open educational resources repository available worldwide.

Contact North | Contact Nord in Ontario, established in 1986, offers five core services in English and French. The five services include:

- 112 local online learning centres serving 600 small, remote, rural, aboriginal, and francophone communities;
- a portal of online courses and programs from Ontario institutions for students and prospective students;
- a portal for faculty and instructors, focusing on online learning;
- a portal for students needing literacy and basic skills training;
- a Student Information Hotline providing support to students and prospective students.

eCampus Manitoba also provides an online portal for students where all the courses offered by most of the universities and colleges within the province are listed.

These organizations often support faculty development initiatives for online learning, through webinars and local conferences and workshops. They also facilitate professional communities of practice. In British Columbia, for instance, the Educational Technology Users Group (ETUG) is supported by BCcampus.

Provincial Government Digital Learning Strategies

More recently the governments of both Ontario and British Columbia have developed specific strategies for digital learning in higher education.

In 2020, Ontario created a virtual learning strategy for higher education, consisting of four elements:

- positioning Ontario as a global leader and testbed for digital innovation in educational technology.
- establishing Ontario as a global leader in virtual learning by creating opportunities for international students who want to study from their home, while accessing Ontario's world-class, digital content.
- encouraging lifelong learning by supporting virtual micro-credential programs to help people learn new skills at their own pace, when and where they need their education most.
- investing over $50 million between 2020-2022 for the development of digital courses and resources, to be allocated to Ontario colleges and universities; the allocation of funding is managed by eCampus Ontario.

In 2022, British Columbia published a draft Digital Learning Strategy based on extensive consultations with various stakeholders. The strategy has three priorities:

- Policies and processes: institutions will be required to update existing policies or develop new policies to address the impact of digital technology on all facets of post-secondary operations and to foster innovation and excellence
- System collaboration: system-level coordination and collaboration is required across BC's post-secondary system to reduce the escalating costs related to digital technologies, and to improve the sustainability of BC's post-secondary institutions in response to increasing demands for digital infrastructure including hardware, software, and human resources.
- Enhancing digital equity: mitigating or eliminating digital inequities by developing BC's digital capabilities within the post-secondary institutions, across the post-secondary system, inclusive of adult higher education entities, and within BC more broadly.

The strategy document also included a set of guidelines to assist post-secondary institutions in navigating the expanding use of digital technologies supporting teaching and learning.

There are significant differences in the approach of the two provinces. Ontario's is more focused on funding to support digital learning; British Columbia's approach is more on ensuring equity and system collaboration. Both require institutions to develop specific strategies for digital learning.

Institutional Strategies

Open Universities

There are two public universities in Canada that offer programs only at a distance:

- Athabasca University, established in 1970, and funded by the Alberta government, is an open, fully distance university that draws up to 40 per cent of its 40,000 students from outside the province of Alberta. It offers both undergraduate and graduate degrees fully at a distance.
- TÉLUQ in Québec, established in 1972, is a francophone, fully distance university offering full degree programs to just under 20,000 students a year. It is a fully autonomous university within the Québec higher education system and awards the degrees and diplomas.

However, both these institutions are facing existential challenges as more and more conventional universities offer fully online courses and programs.

Thompson Rivers University, a campus-based, provincially funded institution in British Columbia, also offers distance courses and programs through its Open Learning Division (TRU-OL). TRU-OL partners with three other BC universities to ladder their distance education courses towards a TRU degree.

Royal Roads University (RRU), on Vancouver Island in British Columbia, offers a mix of online and on-campus programs, focusing on graduate level career development. RRU offers three formats:

- on-site with 100 per cent face to face learning;
- blended, with part of the program taught in a face to face residency and the balance on line; and
- fully on-line.

RRU's residency-based programs are usually short, ranging from one to three weeks, usually in the summer. The majority of its programs are fully online.

Dual-mode Institutions

As already noted, most campus-based universities and two-year colleges in Canada also offer fully online courses. Some of the universities have a long history of distance education provision. Queen's University (Ontario) offered its first correspondence courses in 1889 and overcame geographical challenges in regions without access to the postal service by employing the North West Mounted Police (now the Royal Canadian Mounted Police) to deliver material for these courses (CADE, 1999).

There are basically four types of fully online courses commonly offered:

1. individual fully online courses, serving several purposes:
    - enabling students who have dropped courses, or need only one or two more courses, to complete their undergraduate degrees without having to come back full-time for another year;
    - providing more flexibility in scheduling for students throughout their academic studies;
    - offering increased access for working adults/students with young families;
2. courses towards a full undergraduate degree available entirely online;
3. post-graduate masters' programs, mainly aimed at working professionals;
4. non-credit courses or programs leading to certificates or diplomas.

Many of these dual mode universities offer parallel on-campus and distance courses and do not indicate the mode of delivery on degree transcripts. Indeed, in most cases on-campus and fully online students take the same examination, usually under supervision at a proctored exam site or more recently through online proctoring.

Although the majority of students in Canada are taking just one or two online courses as part of their on-campus program, more recently some conventional universities have also started offering complete undergraduate degree programs fully online. For instance, students can start a B.Tech program in computing at Mohawk College then transfer to McMaster University to complete the last two years fully online. Similarly, Queen's University is offering a fully online B.Tech in mining engineering aimed at working miners across Ontario. Entirely fully online undergraduate programs though are still quite rare in Canada, the main providers still being Athabasca University, TRU-OL and TÉLUQ.

Université Laval is a francophone institution in Québec which has been rapidly expanding its online enrolments and is probably in 2022 the largest provider of tertiary online learning in Canada, as Athabasca University's enrolments have been static since 2019.

The Commonwealth of Learning, charged with promoting open distance education throughout the 53 countries of the Commonwealth, is located in Vancouver, British Columbia.

Thus, in Canada there is a wide variety of higher education institutions engaged in online and digital learning, from fully online distance teaching universities to small campus-based institutions nevertheless offering at least some online courses.

Digital Technologies

Canada has been a leader in the development and use of digital technology for teaching and learning.

Early Developments

The first fully online course for university credit was offered in 1986 at the Ontario Institute of Studies in Education, a graduate school of the University of Toronto.

The first web-based learning management system, WebCT, was developed at the University of British Columbia in 1996 by Murray Goldberg, and later acquired in 2006 by Blackboard, Inc. WebCT was being used by 10 million students in 80 countries at that time. In 2000, the University of Guelph partnered with Desire2Learn, a Canadian company based in Kitchener, Ontario, to develop another major learning management system, now called Brightspace.

The University of British Columbia began offering fully online courses for credit in 1995, and also offered its first fully online programs in 2003.

Dave Cormier, an instructor at the University of Prince Edward Island, was the first to coin the term MOOC (Massive Open Online Course). The first MOOC, Connectivism and Connective Knowledge (CK08), was offered in 1998 by the Extension Division of the University of Manitoba, by George Siemens, Stephen Downes and Dave Cormier. However, a majority of MOOCs follow a different design, using mainly video-recorded lectures, based on a model developed in 2011 at Stanford University and MIT in the USA.

Current Technologies

In 2022, though, there are basically two kinds of technology being used for digital learning in Canadian tertiary education:

Institution-wide technologies

These technologies have become more or less standard, and are available across the whole institution, both for on-campus and off-campus digital learning:

- learning management systems
- video conferencing systems
- lecture capture and streaming

Many universities now have Learning Centres, with publicly accessible online educational resources, wi-fi and Internet access, and open spaces for research and innovation, where students can go to work individually or in self-managed groups. These types of facility will become increasingly important as blended and hybrid learning expand.

Nearly all universities and colleges in Canada use these resources extensively. The role of Centres for Teaching, Learning and Technology is critical in helping instructors exploit such technologies.

Specific applications

These are applications, such as simulation and games, virtual and augmented reality, and artificial intelligence applications, that are used for specific purposes within a particular program, but are not universally used throughout the institution.

Another important development is the design of interactive classrooms that integrate technology into digital learning on-campus. Queen's University has developed a range of interactive classrooms of different sizes and designs. The instructor has a central 'pod', students are grouped around tables with access to power and the Internet, and each group of students has their own screen on the classroom walls. Students can bring in work done outside the classroom and demonstrate it, and there are quiet cubicles where they can go and do individual work.

Some institutions, such as the University of British Columbia and Emily Carr University of Art and Design, have created emerging media laboratories where instructors and educational technology specialists can experiment with and explore the application of new technologies. Thus, there are many 'pockets of innovation' in digital learning in Canada, many of which have been reported by Contact North.

Why the Move to Digital Learning?

There are several reasons for the move to digital learning in Canadian tertiary education.

Flexible Delivery

This is probably the main driver currently. Many Canadian students are working part-time (even if classified as full-time students) to help keep down student debt and to pay their way through college, or have a long commute to the institution from where they live. Most fully online students are not really 'distant' students. They usually live within an hour or so travel time to the institution, but their time is valuable and digital learning gives them more flexibility in managing their time. Covid-19 reinforced the flexibility of digital learning. Instructors also liked the idea of working mainly from home. Digital learning is really just another aspect of the digital age, where employers, workers, students and instructors all want more flexibility and control over their lives.

Accessible and Convenient Technology

Although there are still significant gaps in Internet access, especially in remote rural areas, most Canadian tertiary students have convenient and easy access to the Internet. Most have computers, tablets and mobile phones, and are comfortable using them for study purposes. Similarly, instructors have access to relatively easy-to-use technology for delivery, such as learning management systems and video-conferencing.

Support from Centres for Teaching and Learning

The move to digital learning is not a huge step technically for instructors, although some training on how to use the technology is beneficial. This is now though easily available through the Centres for Teaching and Learning that most Canadian universities and colleges have established. The value of these support centres was given a tremendous boost by

Covid-19. Previously, fewer than 10 per cent of faculty had made use of the expertise of the staff of these centres. During Covid-19, more than half of all instructors received at least some help from such centres (Naffi, 2020). Perhaps the greatest value of these centres though is not technical support, but getting instructors to reconsider the design of their courses to increase active learning and to better manage student workload.

The Lifelong Learning Market

This is a more strategic development driven by demographics and a changing economy. The number of students coming out of Canadian high schools each year is either declining or static due to demographic reasons. Canada's fertility rate was 1.4 per woman in 2020.

The main growth in recent years in student enrolments has come from international students. There were over 800,000 international study permit holders in Canada in 2022, a 30% increase over the previous year. In some of the smaller Canadian higher education institutions, international students make up more than 60% of the institution's student population. Canada has set a target of roughly 500,000 new immigrants a year. Acceptance as an international student can ease the path to immigration.

International students have been a financial lifeline to Canadian colleges particularly. Government direct funding to post-secondary institutions varies from province to province but over the last 10 years it has been static or declining per student. This reduction in funding has been more than compensated for by the higher fees charged to international students. However, it is a fickle market and is easily interrupted by global politics. There are also signs that this market is reaching capacity in Canada.

There are severe labour shortages in many sectors of the Canadian economy due to the 'baby boomers' reaching retirement age, particularly in areas such as health and other sectors requiring a post-secondary education. The Federal government strategy is to meet this challenge through increased immigration. However, there are still barriers from professional associations and provincial governments to accepting foreign qualifications (or even qualifications from another province). This is leading to a demand for courses or programs that enable students to up-date or transfer their existing qualifications.

Lastly, the economy is changing. While manufacturing, agriculture and mining, three major Canadian industries, are still in high deman, the skills required are changing. In particular there is increasing growth from new employment sectors. For instance, more people are employed in the movie and video games sector in British Columbia than in mining, forestry and agriculture combined.

Consequently, many adults in Canada are looking either to update their existing qualifications or skills, or need to move into new areas of study because their jobs are changing. This is leading to a rapid growth in micro-credentials but also growing demand for professional masters' programs. These adults have families and may still be working, and need the flexibility that digital learning can provide.

The Needs of a Digital Economy

Although probably the least influential of the reasons driving institutions towards more digital learning, it is probably the most important in the long run for the Canadian economy. Recent reports (e.g. the Royal Bank of Canada's 'Human's Wanted', 2018) make it clear that automation, artificial intelligence, remote working, remote shopping, and other factors associated with the digital age require knowledge and skills that are different from the ones needed in an industrial age. Digital learning enables learners better to develop such knowledge and skills. It helps increase general digital literacy, but it is also more appropriate for teaching the high level soft or intellectual skills that people will need not only to work but to live in a digital age (see Bates, 2022).

Digital learning can be used to enable students to find, evaluate, and apply knowledge: to become knowledge 'managers.' This though requires not only the use of digital technologies, but also the re-design of teaching to encourage such learning. Fortunately, we shall see that the resources are now there to enable this to happen.

Open Educational Resources

Open educational resources (OER) are a critical aspect of digital learning. OER are teaching, learning, and research resources that, through permissions granted by their creator, allow others to use, distribute, keep, or make changes to them.

British Columbia became the first jurisdiction in North America to implement open textbooks in 2012. By 2022, the collection has grown to include close to 400 open textbooks, open educational resource publishing guides, and other open resources. The books, adapted or created by BC faculty, cover all 'core' subjects at university and college level. All these books are available for free downloading under a Creative Commons license, and are offered in various e-book formats free of charge, or as print on demand books available at the cost of printing. In 2022, the project passed a milestone of $30 million in student savings on textbook costs over the ten years (Lalonde, 2022). The movement has now spread to most provinces and territories across Canada.

More importantly, increasing amounts of academic knowledge, including research and data, are now open access, available at a click of button. All knowledge will soon be open, easily available, and free. There is now less and less need for instructors to deliver information; it is increasingly freely available. However, it would be wrong to give the impression that this is now happening on a wide scale in Canada. In 2019, only 54% of institutions reported using open textbooks, and 67% reported that they use other OER. Few institutions (9%) reported having a formal policy or strategy for OER and/or open pedagogy (Johnson, 2019). Several Canadian institutions (Athabasca, TRU-OL, Kwantlen Polytechnic, Portage College, BCcampus, eCampus Alberta and Contact North) are members of OERuniversitas (OERu), which offers free online courses so that learners can gain formal credentials from the partner institutions. OERu is a consortium of 36 organizations across five continents, and is dedicated to widening access and reducing the cost of post-secondary education by providing open pathways to formal, quality credentials.

Main Challenges and Future Opportunities

In general, digital learning is increasingly accepted and continues to expand in most Canadian post-secondary institutions, but nevertheless there are a number of challenges that need to be addressed.

Institutional Strategies for Digital Learning

There are three major challenges with the increasing move to digital learning. The first is pedagogical: the pandemic clearly indicated that just moving lectures online is unsatisfactory and leads to student disenchantment and poorer learning. Prior to the pandemic, online courses were mainly asynchronous, built around the use of a learning management system, and incorporated best practices developed over almost 20 years of online learning. These lessons need to be incorporated and developed by instructors moving into digital learning. The second challenge is infrastructure, in particular on-campus wireless and technology capacity, and appropriate learning spaces when students are studying both in-person and online. The third challenge is to make sure that all students have full access to digital learning, in terms of equipment and Internet access.

As more and more on-campus faculty start to use online components in their classroom teaching, so the demand grows for more technical support, such as instructional and web designers. When online learning was about 10 per cent of all enrolments, and growing at a rate around 10 per cent per annum, this was manageable. However, Covid-19 indicated clearly what is needed when everyone goes online. An increase in blended/hybrid learning in particular will require a re-think of how best to prepare and support instructors for digital learning. It is not possible to scale up support on a one faculty member: one instructional designer basis.

Decisions on the type and extent of digital learning are probably best made at the departmental and program level, and will depend as much on the nature of the target group as on the demands of the subject area. However, we have already seen that there are implications for campus planning, car parking (more online, less commuting), and on-campus IT infrastructure as well as for academic support.

Thus, a certain amount of central planning and management of digital learning is required. How fast and to what extent should an institution move into digital learning? The CDLRA found in 2019 that 57 per cent of colleges and 41 per cent of universities reported that they had a strategic plan for e-learning, hybrid learning, and/or online learning that was being implemented to some extent, and a further 29 per cent were in the process of developing such a plan.

Increased Faculty Development

Rapid developments in learning technologies, the need for teaching methods that help students develop the knowledge and skills needed in a digital society, the increased diversity of the student body, and the increasing integration of online and face-to-face teaching require instructors to have a much higher level of teaching skills, and in particular an understanding of pedagogy and alternative course design models. Most faculty and instructors in Canada are totally

unprepared for such developments. Their training is primarily in research and as subject experts. To date, faculty and instructors have been dependent on substantial help from instructional designers in particular, but adding more support staff as the use of online learning grows takes funding away from academic departments and impacts therefore on instructor: student ratios. The current system of faculty development in Canada is primarily voluntary. More systematic pre-service as well as in-service programs for faculty development are essential, if the quality of digital learning is to be maintained as it expands into the mainstream. Lastly, Covid-19 demonstrated the critical importance of the Centres for Teaching, Learning and Technology that most Canadian tertiary institutions have established to support faculty/instructors in moving to digital learning (Naffi, 2020). These Centres have a mix of instructional designers, web designers, and video specialists who help instructors with the transition to digital learning.

New Larner-centred Pedagogical Models

Perhaps the most interesting development though in Canadian digital learning is in the design of courses that require students to develop the skills of knowledge management (Bates, 2022). Instead of an instructor choosing, organizing and delivering academic content, courses are designed so that students collaboratively use the Internet to find, analyse, evaluate and apply knowledge to solve real world problems. E-portfolios are used to demonstrate the knowledge they have acquired. Thus, instructors become facilitators and guides rather than deliverers of information. This approach better prepares students for the volatile, uncertain, complex, ambiguous and constantly changing world that they will face on graduating. Digital learning is already leading instructors in Canada to experiment with new teaching methods; this is likely to increase over time (for a collection of over 200 examples, see Contact North's Pockets of Innovation.).

Student Assessment

Digital learning is both a challenge and an opportunity for student assessment. Many instructors ran into major problems with online assessment during Covid-19. Many institutions resorted to intrusive proctoring technology to ensure students did not cheat during exams. Students rightly felt this invaded their privacy when studying at home, and many instructors believed that students were still cheating. The main cause of the problem was a failure to adapt in-person assessment to online learning. Not only does the teaching method need to change; so does the assessment method. How much do students need to memorise when they can just look it up? We need to encourage students to go online for information to find out something, not discourage them.

Online learning facilitates continuous assessment, as it can leave a record of student learning on the learning management system. Students can record their activities and compile an e-portfolio of their work. In other words, digital learning can allow for more authentic assessment, tied to the 21st century skills needed in a digital age. This is not a particularly Canadian challenge but it is one that needs to be met in the transition to digital learning.

Privacy and Security

It is not only in assessment that privacy and security are issues in digital learning. In Canada, student privacy is mainly protected through password-protected learning management systems, but increasingly instructors are going outside these institutionally supported tools to use mobile learning apps and other technologies that do not have the same level of protection. British Columbia was, until recently, almost unique in North American in preventing public organizations from storing personal data anywhere outside Canada. Nevertheless, even students in BC have expressed concerns that their learning management system collects too much personal data (Vescera, 2019). Indeed, during Covid-19, it was discovered that some educational software companies were selling school children's data to advertising companies (Human Rights Watch, 2022). As in other countries, Canada is struggling at a national level to control the use of digital data by the large Internet companies. However, education is also big business for private ed tech companies. Canada certainly needs a more modern set of national laws that provide better protection for student data, without it unduly restricting the development of new ways to teach with technology.

Artificial Intelligence and the big Tech Companies

Canada is considered a leader in the general development of artificial intelligence. Canada was the first country in the world to implement a national AI strategy. However, there is little evidence at the moment (see for instance Zawacki-Richter et al., 2019; Bates et al., 2020) of a major breakthrough in the application of 'modern' AI specifically to teaching and learning in higher education, either in Canada or elsewhere, with the exception of perhaps large language models such

as ChatGPT and learning analytics. However, it must be recognised that, although AI has not to date been largely adopted in teaching and learning in tertiary education, AI still has the potential to disrupt the system. In particular, the big tech companies are more likely in the future to focus on using AI to replace or by-pass existing HE institutions in order to commercialise tertiary learning and teaching. AI is a sleeping giant and educators ignore it at their peril. Nevertheless, there is still a long way to go before it becomes embedded in teaching and learning in Canadian tertiary education.

Conclusions

Digital learning has reached a level of acceptance in Canada to the point that it is now being mainstreamed into campus teaching as well as distance education. Digital learning developments are breaking down the previously sharp distinction between face-to-face teaching and distance education. Above all, digital learning offers students in Canada an increasingly wide variety of ways to access post-secondary education. Digital learning though is going beyond increased access and flexibility for learners. It is beginning to impact on teaching methods, with a shift away from formal presentation to a focus more on knowledge management and intellectual and motor skills development.

However, there is still a long way to go before the whole of Canadian tertiary teaching and learning is fully digitalized. Although valid data collection methods are not yet in place to measure fully the extent of the digitalization in teaching and learning, probably less than a third of instructors in 2022 have moved away from the traditional, classroom-based teaching methods based mainly on lectures and labs supported by student reading, to a more learner-focused and digitally-based learning environment. However, the trend is moving in this direction and has been accelerated by Covid-19 emergency teaching.

Most Canadian tertiary education institutions have an extensive infrastructure to support digital education. Increasingly student services too are being digitalized and made available online and on-demand, particularly as a result of Covid-19. Most Canadian tertiary students have good Internet access, computers and mobile phones. Nevertheless, there are pockets or gaps in access, particularly in rural or more remote areas of Canada, and for students from low-income families, where the cost of data or lack of equipment can be a problem.

Most university and college administrations are supportive of the move to digital learning. Instructor resistance to online learning in particular is still significant, but decreasing year by year. Again, emergency remote learning further reduced resistance to online learning. Students generally are welcoming digitalization as it gives them more flexibility. There is still some resistance among some professional accreditation bodies to fully distance qualifications, but even that is slowly changing as these professions themselves become increasingly digitalized.

Government support for digitalization varies from province to province, but most provincial governments have earmarked funds or established agencies to support the move to digital learning. The main focus of these supporting agencies is professional development, collaboration between institutions (for example in developing and sharing OER), and special initiatives, such as BCcampus' Open Textbook program and Contact North's remote learning centres.

However, universities in particular are still highly autonomous. There are few mandatory requirements from government. Although governments in Canada and senior administrators in tertiary education have nudged and encouraged the move to digital learning, most of the adoption has come through the initiatives of individual instructors or academic departments to meet what they perceive to be the needs of their students. Canada is moving in the right direction. Whether it is quick or effective enough still remains to be seen.

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A Study of Digitalization of Higher Education Institutions in the Caribbean

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Abstract

As technology integration advances, higher education institutions (HEIs) are experiencing varying degrees of digitalization of their systems, processes and services. This qualitative study explores the status of technology integration and the digital infrastructure of five higher education institutions within the Caribbean. It seeks to answer three questions: i) what is the level of digitization in the institutions' systems? ii) what is the status of technology integration in the teaching-learning processes in the institutions? iii) what types of digital infrastructures are in place to support the institutional functions? The analysis of the data reveals advances in the digitalization of a number of areas including communication processes, administrative processes, the student life cycle processes and in teaching and learning. This study provides important insights into the evolving landscape of digitalization of higher education within the Caribbean, and should serve to inform policy and practice in this important area.

Keywords: Caribbean higher education, digitization in higher education

Introduction

Digitalization is changing every aspect of human life including education. Consequently, institutions of higher education must be flexible and adaptive if they are to maintain their relevance in contemporary societies and maintain their role in shaping the future of societies. Therefore, the digitalization of higher education institutions, which in this paper refers to the integration of technology and various digital tools in the teaching and learning, administrative and support processes

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of education, is crucial. Higher education institutions must respond to this context by ensuring that their systems and processes for teaching and learning and administration are digitalized to ensure their graduates are prepared to function effectively within their context. Against this backdrop digitalization in higher education is gaining more and more prominence and it is seen as a means of making higher education not only more accessible, but also flexible and personalized.

Further, digitalization has taken on greater importance as a way of survival for higher education institutions. The notion of digitalization as a goal resting in a strategic plan or an option to be further discussed for consideration, is for any institution a suicidal approach to survival. Additionally, the Covid-19 Global pandemic helped to advance efforts in the education sphere because of the almost two-years isolation that many countries experienced. This resulted in increased levels of digitalization to initially provide emergency remote teaching and learning experiences for learners who were unable to meet for traditional face-to-face experiences. As the world slowly returns to normalcy and as new strains of the virus continue to be detected more and more institutions are advancing digitalization efforts. The Caribbean is no exception.

Moreover, there is growing consensus that digital tools serve to enhance the teaching learning process making the learning experience more easily accessible, engaging, interactive, collaborative, and participatory. These are all approaches that are valued in the 21st Century classroom as we prepare students for the world of work and to contribute to their society.

While we are aware of the many benefits of digitalized education, we are also aware that the pace of digitalization varies across geographic regions and among high-income, upper middle income, lower middle income and low-income countries. Against this background the purpose of this paper is to explore the status of digitalization among five higher education institutions within five Caribbean Countries: Jamaica, Trinidad and Tobago, The Bahamas, Barbados and Turks and Caicos Island.

The Caribbean (both English- and non-English-speaking countries), comprises approximately 42 million people scattered across 30 territories. Many of the nations emerged from positions of massive foreign political domination to independence and self-governance (Alfred et al., 2011). Within this context higher education is viewed as an important sector for economic growth and development, as it helps to produce skilled professionals who can contribute to their respective countries' workforce and overall development. However, the countries share a distinctiveness of low growth and vulnerable economies that consistently operate within very tight fiscal spaces with high public debt. The resulting increase in debt service payments crowd out the productive expenditure needed for the sustainable provision of public services one of which is quality education of the citizens. Making quality higher education accessible to all of its citizens is therefore a challenge. However, a recent study by Brown and Shen (2017) found that increased access in higher education has risen tremendously due to accessibility of technology among other factors.

Higher education in the Caribbean varies among countries, but generally follows a similar structure as in other parts of the world. The Caribbean has a mix of over 50 public and private institutions, (Beckles & Richards-Kennedy, 2021) including universities, and colleges offering a variety of programmes ranging from, certificates to diplomas, associate degrees, undergraduate and graduate degree programmes in a range of fields. In addition, there are also several community colleges and vocational schools throughout the Caribbean that provide technical and vocational education and training (TVET) programmes. Despite the increased access in higher education highlighted by Brown and Shen (2017) Caribbean's tertiary enrolment rate is less than 25% compared with the North American average of near 60% and the Latin America average of 52% (The World Bank, 2020).

Literature Review

As technology integration advances, higher education institutions (HEIs) are experiencing and or aiming for varying degrees of digitalization for teaching and learning, administrative and technical related activities and services. This literature review examines the concept of digitalization within HEIs generally and specifically within the Caribbean to include: the level of digitalization in institution systems, a review of HEI infrastructure, digitalization of the teaching and learning process, of administrative systems, and institutional services, and of resources for digitalization, including professional development.

Digitalization of higher education in the Caribbean was explored as part of the paper *Accelerating the Future into the Present: Re-imagining Higher Education in the Caribbean* (Beckles & Richards-Kennedy, 2021). The authors posited that:

> The immediate future will see Caribbean universities upgrading their offering with new digital technologies, robust and integrated business enterprise systems, expanded online and blended teaching, complemented by targeted experiential learning. Universities will also invest in new pedagogical material and approaches that allow for smooth transitions to virtual delivery and online business continuity when necessary. (p. 367)

The authors further argued that:

> This new university model will thus take into account the new possibilities generated by artificial intelligence, blockchain technology and other evolutions of digital technologies, the rapidly changing world of work which requires more knowledge-intense skills than before and also the need to bridge the digital divide so that we leave no one behind. (p. 367)

It is important therefore to understand the concept of digitalization. Matveeva, et al. (2020) defined digitalization as a concept "associated with the large-scale penetration of information and communication technologies into the everyday life of modern society" (p. 78). According to these authors, digitalization must be seen as modernization, reformation and transformation of education to include problem-solving and decision-making with the assistance of digital technologies. The aim is to increase efficiency, agility and accessibility.

Digitalization of Higher Education

Digitalization of higher education has been explored from several perspectives: students (Brink et al., 2020; Thoring et al., 2017; Ugur 2020); students assessment (Frolova & Rogash, 2021); instructors, (Ugur, 2020); professional development of instructors (Matveeva et al., 2020); impact of digitization in HE (Shrivastava & Shrivastava, 2022); digital resources and transformation in HE (Benavides et al., 2020; Frolova & Rogash, 2021;); and tertiary institution operations (Telukdarie & Munsamy, 2019).

Within the Caribbean context Bleeker and Crowder (2022) in their study on *Selected online learning experiences in the Caribbean during COVID-19* focused on the responses of 16 Caribbean countries during the Covid-19 Pandemic. Using a combination of interviews and document analysis the researcher conducted case studies on the availability of ICT for online learning and the supporting connectivity across the countries/islands. Attention was placed on the 2020 Sustainable Development Report of which Transformation 6: "develop and use online education tools" (p. 11) was one area of focus. Additionally, the report highlighted online educational tools as critically important to facilitate the expansion of access to quality education. The report also emphasized further investment in digital skills. These are very important in an increasingly digitalized world.

The study found that internet connectivity varies across the Caribbean and that there were many areas where the population has limited access. The researchers in their recommendations highlighted the importance of ensuring internet connectivity through expansion and strengthening of infrastructure as important elements for online learning success. The study also called for an expansion of online learning devices. To advance teaching and learning in a digital age the researchers also recommended centralized learning management systems or "content page with list of approved content for educators" and students (Bleeker & Crowder, 2022. p. 56). This of course would be dependent on the size of the institution. Content pages would only be used where there is no established learning management system. Another recommendation coming from the study is that of consideration for mixed modalities to ensure that the learning of students who experience challenges with connectivity and other issues is not compromised. To this end there is a need to include low and non-technology online learning solutions to supplement in class learning in order to ensure inclusivity across all contexts. As digitalization increases, the call for the engagement of mixed modalities is significant given access limitations across many Caribbean countries. In relation to this study, Bleeker and Crowder (2022) further called for the 'development and revision of ICT policies' (p. 63) having noted that only a few countries have a national digital education strategy that capitalizes on the use of information communication technologies.

Digitalization and the Teaching-Learning Process

Digital learning technologies include learning management systems, multimedia applications, synchronous technologies, collaborative applications (which can either be web or cloud based and allow for interaction between students

and faculty and also student and their peers), cloud-based technologies (which can support storage of resources) and emerging technologies such as artificial intelligence (AI), extended reality (XR), augmented reality (AR), virtual reality (VR), analytics (Martin & Xie, 2022).

Shrivastava and Shrivastava (2022) in their analysis of digital learning environments in India highlighted seven of nine new 'frontline technologies' currently being engaged in teaching and learning. They are cloud computing, Internet of Things (IoT), artificial intelligence, quantum computing, mixed reality, blocked chain, and big data analytics. These technologies offer varying possibilities for teaching and learning.

Rodriguez and Pulido-Montes (2022) in their review of literature on the use and implementation of digital resources during the COVID-19 pandemic at the HE level found that video conferencing, educational videos, and virtual platforms were the key resources engaged by higher education institutions. Most institutions also used free and open access resources.

Thoring et al. (2017) conducted a qualitative pilot study on digitalization from the perspective of students, specifically, the areas of the student life cycle that were digitalized and those areas that needed improvement. The study found that student's expectations of a digitalized experience are pragmatic. They view digitalization as access to course resources in the online space and opportunities for interaction with the institutions' systems, staff and students. The study also reported some challenges with digitalization to include issues with systems being disconnected. This lack of integration challenges the students' expectations for an integrated system to support their learning to include access to resources and library support, administrative and technical needs. The students also expressed challenges with commercial services such as Google, Microsoft, Facebook and Dropbox.

As digitalization increases in teaching and learning there is the need to provide support to ensure both efficiency and effectiveness. These include academic support personnel for libraries and writing centers and student support to include registration, academic advising, study strategy, consultations with others (Martin & Xie, 2022). Other areas of support include technology support specialists for network and technology maintenance and instructional designers to support faculty in course design.

Digitalization of Institutional Administrative Systems and Processes

Digitized administration is considered the most important part of digitalization of higher education (Yureva, et al, 2020). Shrivastava and Shrivastava (2022) defined office automation in higher education as the coordination and control of all administrative functions in 'transparent ways' (p. 8). Major areas for office automation or the digitalization of administrative processes include general administration, finance processes: payroll and financial accounting, managing inventory, administration of student data, managing students and staff records, library services and examination systems. Benefits of office automation include the provision of information/data security, detection of academic misconduct, storage and management of information, cross campus collaboration and other administrative solutions. Listed among the activities involved in office automation are "digitalization of process at source, creating smart forms, creating workflows and document managements, automation of student service request and creating self-service platforms" (Shrivastava & Shrivastava, 2022, p. 8).

Effective plans and strategies and adequate funding are critical to the digitalization process. This provides some context on why some institutions are challenged in the digitalization process given issues with funding and adequate strategic planning. Among the main impact of digitalization on general administration is the use of college websites to display important information about the institution; emails to facilitate intra, inter and external communication, social media tools for groups, such as WhatsApp; the management of admission and registration through online platforms. Other areas of digitalization include course contents, timetable, lectures, results of exams and assessments, etc. Payment of tuition or other fees can be processed online avoiding long queues.

Research indicates that higher education institutions have digitalized their financial operations in many instances allowing for electronic and digital payment of fees and Cloud-based tools are being used to handle financial activities. Institutions are engaging accounting software to facilitate management of payroll functions, capital assets and funding (UNESCO, 2012). There is also a growing need for financial systems to be connected to human resource and student management systems.

Professional Development for Digitalization

Matveeva et al. (2020) defined digital competence as a concept with five components: information literacy, communication and collaboration, digital content creation, security and solution of problems. Digital competence is critical to the advancement of higher education given the affordances of digital technologies, to include the provision of novel opportunities to enhance the quality of teaching, learning, scientific research and organizational management. The researchers are of the view that investment in development of digital skills for both students and staff is highly beneficial for the individual and the organization. For faculty, digital competence is:

> necessary to transform approaches to the organization of the educational process in such a way that the educator has the opportunity to develop those skills that are, on the one hand, relevant for their professional development and, on the other hand, demanded by students (p.85).

Educators' digital competence comprises a number of skills sets that have been grouped to form seven elements (Gudmundsdottir & Hatlevik, 2018): *media literacy* which represents educators' "ability to perceive and creatively rethink academic and professional communications in various media"; *information literacy* which is described as "the ability to find, interpret, evaluate, manage, and share information"; *information and communication technology literacy*, being able to "accept, adapt, and use digital devices, applications, and services"; *communication and cooperation*, educators should be able to use digital networks to support training and research; *digital scholarship*, this digital competence element involves skills having to do with educators involvement in "new academic, professional and research practices" that require the use of digital systems; *learning skills*, which involves educators' ability to learn well using formal and informal technology-rich environments; and *career and management style*, this final element captures skills that allow educators to manage their "digital reputation and identification on the Internet". (p. 79)

Essentially, digital competence is the main ingredient of educators, and institutions of higher learning have to be cognizant of this reality and be willing to support the attainment of this target.

Methodology

In order to investigate the status of digitalization within Caribbean higher education institutions, a small-scale basic qualitative study was conducted among five institutions within the Caribbean. All the institutions are publicly funded and rely primarily on a mix of funding sources including government financing, tuition fees, donations, grants, and partnerships. Data were collected from five respondents, comprising one from each of the five institutions included in the study. The respondents included three faculty members, an e-learning support specialist, and an immediate past deputy principal. The participants were selected because of their expertise and availability. They were interviewed to answer three questions: i) what is the level of digitalization in the institution's systems? ii) what is the status of technology integration in the teaching-learning processes in the institutions? iii) what types of digital infrastructures are in place to support the institutional functions? The interviews were conducted synchronously via the Zoom Platform and were 45 mins to an hour in duration. A semi-structured interview protocol guided the process. Transcriptions were member-checked with the participants to ensure the integrity of the information captured.

Results

Level of Digitalization in the Institution's Systems

The level of digitalization across the Caribbean is not homogenous. The five institutions reviewed are at various levels of digitalization ranging from highly digitalized to minimal digitalization. Only one reported being fully digitalized. One respondent reported that "COVID-19 forced the institution into full digitalization from registration to graduation" (I4). Another reported that "the institution transitioned student processes into a cloud-based model, establishing an online process from application to registration and beyond, allowing the [institution] to adjust quickly to the global COVID-19 pandemic" (I3). However, the respondent from the same institution reported that post COVID-19 the teaching and learning process is back fully face-to-face at the institution.

In **Institution 1** many processes are digitalized but not connected while some are still manual or only partially digitalized. Application is online but processing of applications is manual. Tuition payments are done online but financial

clearance is manual. Registration is online but some processes are manual (e.g., independent study). An Integrative Student Management System (ISAS) is used for managing students' data from registration to graduation, including grade entry and validation. Graduation processing is mostly a manual process. Transcript requests are online, but the processing is manual. The library offers digital services but operates in blended format. Medical services require online registration. Internal and external communication is done via email and telephone but surface mail is also still utilized. Meetings are held using Zoom or Teams. The institution has also begun using an accounting software to facilitate the management of payroll functions and the aim is to link the financial system to human resources management for greater efficiency.

In **Institution 2** the level of digitalization in the institution has allowed flexibility in communication between students and lecturers (advisement, etc.) among members of faculty and staff, and among administrative units/departments. Emails are a common part of communication with each person being assigned a work email. Communication among staff is also facilitated via WhatsApp groups. Students have college emails to facilitate communique from the institution. In addition, the institution utilizes social media (Instagram and Facebook) to send out announcements and reminders to students. The institution is now a cashless environment where all payments are made via card. In terms of admissions individuals are able to apply to the institution online and submit all documents online and students can be tracked electronically throughout their tenure. Grade entry is accommodated electronically and grade verification and ratification are done online using the Academic management system - ISIMS. However, student advising is still manual.

Institution 3 had installed three interactive classrooms complete with (cameras, and speakers) and is able to connect students across the country for virtual sessions. However, across departments the laptops are generally aged. This institution has a number of off campus locations, and the main campus has a library with several computers. Being a teacher education institution some 20 new tablets have been sourced to support teaching practice supervisors in the school of education. The education majors also have a specially assigned technology lab.

Institution 4 has fully digitalized student services from registration to graduation. The selection process is not yet fully digitalized, but notifications are sent out online, and interviews and registration are done online. The Banner Student Information System, developed by Ellucian, a software and services company that specializes in solutions for higher education is used to manage student information and operations. It captures the list and description of courses, pre-requisites, class times and offerings, professors, and classrooms. Student orientation is hybrid, but student advising is done fully online. The library has digital resources, and a media research center is presently being planned. Users at this institution enjoy using tech tools to facilitate communication and prefer this to face to face. Devices are available for daily rental for students who have challenges accessing digital resources to participate in class.

In **Institution 5** most processes are now online including students' life cycle processes. Registration for most programs, transcript processing and all payments are online. Graduation ceremony is streamed online however, the registration process for graduation changes drastically and frequently and this creates complications for stakeholders, especially for administrators. Zoom or other web conference tools are used to facilitate meetings.

The Situation of Technology Integration in the Teaching-Learning Processes in the Institutions

In terms of the number of online courses, 100% of all modules are either online or have an online component. **Institution 1** had heavily relied on the Moodle Learning Management System (LMS) to support lesson delivery. The official web conferencing tool used in the institution is Zoom, however, lecturers also used Google Classroom, Google Hangouts and Teams.

At **Institution 2** the number of online modules varies because instructors have the flexibility of determining which sessions go online. The current status is predominantly traditional, with movement towards blended. This institution utilizes tools such as Web Ex, ISIMS and OpenSis to support technology integration.

At **institution 3** Moodle is the official Learning Management System that is being used but instructors use other applications as well. The Moodle LMS, whether engaged by teachers or not, serves as the platform for all courses and supports web assisted learning where all course material and assignments are accessible. For online conferencing Microsoft Teams, or Google Classroom is used by instructors. However, Zoom is the official web conferencing tool for the institution. Several instructional modalities are employed at this institution: complete online, face-to-face, blended - courses may have one section face-to-face, and the other online. Lecturers employ Interactive PowerPoint presentations, instructional videos - YouTube in their face-to-face classes. It is interesting to note that in this institution not everyone is allowed to teach

online. Instructors must undergo training in order to do so and courses have to be approved by the Academic Affairs Office and the Academic Senate, to be online.

At **institution 4** all courses have an online component. All theory classes are fully online. Some practical sessions are also online, nursing students for example, do their demonstrations online. This institution also reported that grades are accessible fully online, complete electronic application and responses are dispatched electronically, no paper. Payments are all done via electronic fund transfer (EFT) whether part time or full time. The institution uses Cloud Suite as its main platform. In terms of student assessment, the institution engaged Safe Exam Browser as the main tool.

At **Institution 5** prior to the pandemic, teaching and learning was offered both face-to-face and in a blended mode. During the pandemic emergency remote teaching was engaged however post the pandemic the institution has returned to face-to-face. Online and blended learning are still optional but there is now greater buy-in from faculty to deliver online than before. Additionally, post the pandemic and the current financial reality, the institution has added pressure on lecturers to convert programmes/courses online and or blended to remain competitive. Faculty members are using Zoom or other web conferencing tools to engage their students. Because of the poor internet connection there are problems with sessions that require video conferencing. However, from a teaching perspective the increased use of technology is welcomed. Web conferencing software helps relieve class size challenges and the increased access for students who are working is a benefit.

Some faculty are interested in AI and 3D integration but are limited by both their personal competence and the institution's infrastructure. Training and certification were offered in augmented reality, but no progress has been made as there is no or only little infrastructure or support system in place to ensure implementation after the training. A major hindrance for digitalization of teaching and learning is the lack of support for the learning management system. While members of faculty are desirous of using the technology, they do not pursue it due to lack of support.

In terms of managing and monitoring the integration of technology in the teaching and learning process, **all institutions** in the study reported having either a systems administrator or a designated unit to address technology integration.

All institutions identified a number of opportunities which have opened up with digitalization. These include increased access to students living outside of the country who would otherwise have to travel to another country, greater opportunities to increase student numbers, opportunities to improve services (student queries and requests). Further digitalization improves communication, provides opportunities for research, collaboration and sharing of resources across institutions, enables the introduction of new methodologies, provides opportunities for exploring and using technologies to improve the teaching and learning process, track students' progress and for record keeping.

On the negative side, the participants identified substandard equipment that are slow, and aging, inadequate technical support, the absence of computer labs, students not having their own personal computers, bandwidth problems, internet connection challenges - unstable, weak - that interfere with classes, inadequate levels of technology infrastructure and its management as challenges to digitalization.

Types of Digital Infrastructures in Place to Support the Institutional Functions

Looking more specifically at the digital infrastructure it appears that a variety of student management platforms, learning management systems and administrative management systems are used throughout. These include MOODLE, ISAS, ISIMS, Banner Student Information Management System, Colleague, a data management software and PeopleSoft, a human management system.

All except one institution identified internet connectivity and issues with broadband as a problem. Just one institution had upgraded their infrastructure and bandwidth is good. Building into the fee system a provision for IT resources helps enhance the purchase and use of new technologies. In some institutions students and staff experience problems with consistent access to Wi-Fi.

In most of the institutions, library services are digitized. Resources include CALCAT Library system, Online access to eBooks, eJournals and database management systems, such as EBSCOHost, ProQuest for dissertations and thesis, eChat with librarian, digital access to Collections which are arranged according to faculties and access to Turnitin.

Discussion

Like in other countries, COVID-19 has played a major role in pushing Higher Education institutions within the Caribbean to become more digitalized in their systems and processes both for teaching and learning and for administrative

functions. Our study shows that Caribbean higher education institutions are upgrading their offering with new digital technologies, they have been improving their business enterprise systems, and expanded their online and blended teaching. However, institutions continue to struggle with less than adequate infrastructure to enable a smooth transition and fulsome integration of technology.

Advanced Digitalization of Communication Processes

Much progress has been made among Caribbean higher education institutions in the digitalization of communication processes. Flexibility in communication has been greatly improved with most institutions making use of various technologies and social media platforms including emails, WhatsApp, Instagram, Facebook, Zoom and Teams to communicate among members of faculty, staff, various administrative units, students and other stakeholders within and outside the institutions.

Major Progress in the Digitalization of Financial Operations of the Institutions

Most institutions included in this study have become cashless in their financial operations. In this regard their financial operations have been digitalized enabling the electronic payment of fees for various kinds of services including application fees, tuition fees.

Continuous Improvement in Student Life Cycle Processes Through Digitalization

The student lifecycle processes are either fully or partially online from application to registration, orientation, student advisement, grade entry and validation to graduation. Among the technology tools utilized are Integrated Student Administration System (ISAS) and ITech Student Information Management System (ISIMS).

Digitalization of the Teaching and Learning Process

In terms of technology use in the teaching and learning process the institutions in this study are well advanced but to varying degrees. Institutions employ a variety of instructional modalities: face-to-face, blended and fully online. The most popular Learning Management System employed among the institutions is MOODLE. Among the web conferencing tools used for the delivery of lessons in these institutions are Zoom, the most used, Google Hangout, Teams, and Blackboard Collaborate. In keeping with students' expectations, institutions are quite advanced in making courses available online and expanding opportunity for students' interaction with the institutions' systems, staff and other students.

Varying levels of Technological Infrastructure

Supporting infrastructure varies across institutions, however, they are employing a variety of student data management platforms, learning management systems and administrative management systems to facilitate the various academic and administrative management processes within their institutions. A vital dimension of technology infrastructure is access to Wi-Fi; however, institutions continue to experience challenges in terms of internet stability which interferes with the smooth transition to fully online course offerings and full digitalization. Additionally, a critical enabling factor for technology integration is the availability of technical support to assist users. In this study all the institutions reported having relevant personnel in place, either individuals or whole units depending on the size of the institution.

Implications and Conclusion

The study shows that while higher education institutions in the Caribbean are moving forward with the business of digitalization there are a number of realities that impede the process. Among these are the institutions' reliance on external internet providers resulting in choppy and unstable supply; and cost related to infrastructure development and technology acquisition. Digitalization of education systems can be expensive, and funding is one of three critical elements for successful digitalization, the other two being plans and strategies. This issue of funding can explain why digitalization is not fulsome across the board. Therefore, one recommendation for addressing this challenge may be for institutions to partner with private sector organizations to build out the technological infrastructure. Additionally, as was done by one of the institutions in this study, consideration may be given to building into students fees a sum dedicated to the provision of technology resources.

Our study suggests that Caribbean higher education institutions still have some ways to go before they can integrate the new possibilities generated by emerging technologies such as artificial intelligence, blockchain technology, augmented

and virtual reality and other evolutions of digital technologies. Nevertheless, they continue to modernize and transform towards building robust and integrated systems within their institutions.

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Digital Learning and Higher Education in Brazil: A Multicultural Analysis

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Abstract

The present paper discusses higher education and the role of digital learning in the Brazilian context. Using a social justice, multicultural perspective, it argues that effective digital learning in higher education is likely to happen when digital curricular contents have been embedded with inclusionary strategies that foster plural students' critical thinking and empowerment. To develop the argument, it firstly discusses the multicultural nature of Brazilian society and the relevance of conceptualizing digital learning and multicultural perspectives in education. It then highlights the higher education system and structure in Brazil, discussing how remote digital learning has been taking place in that system. It also depicts how digital learning in higher education has been conceived in Brazilian educational policies, both before, and as a result of the COVID-19 pandemic.

Keywords: Brazil, comparative perspectives, digital era, higher education, multiculturalism

Introduction

Digital learning can be defined as a type of learning that takes place using digital technologies It has been at the center of discussions in higher education, both to provide distant learning and to develop advanced digital competence for all jobs and for all learners (Mutka & Redick, 2008). As argued by Ivenicki (2021a, 2021b), it also seems to be central that digital learning is not about technology on its own, but mostly about learning, including the important area of lifelong learning. Authors such as Milana and Nesbit (2015) hold that the process of lifelong learning builds on the idea that personal, social, and professional development and continual learning happen throughout life, higher education being a crucial part of it. As claimed by Slowey and Schuetze (2012), the complexity of the concept of lifelong learning masks a fundamental conflict between, on the one hand a model of lifelong learning derived from principles of social justice and equity and, on the other, a model imbued by market-oriented concerns and informed by a human capital perspective. Such a dual approach can arguably be extended to digital learning in higher education in general, including in Brazil, where privatization of higher education institutions (HEIs) and its use of digital learning has resulted in some private groups' hegemony, and in the demise of faculty. In the latter case, this has resulted huge virtual classes with one or two tutors.

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This paper analyzes higher education and the role of digital learning in the Brazilian context. First it discusses the multicultural nature of Brazilian society and the relevance of conceptualizing digital learning and multicultural perspectives in education. Second, it highlights the higher education system and structure in Brazil, discussing how remote digital learning has taken place. It also depicts how digital learning in higher education was conceived in Brazilian educational policies, both before, and because of the pandemic between 2020 and 2021. It contends that digital learning has been faced with two differing concepts by the public and the private sector of Brazilian higher education, either in a transformative, multicultural approach, or in a consumer, massified perspective. Based on a multicultural, intersectional approach, it argues that for higher education to have a strong impact in preparing future professionals for dealing with the challenges of globalized and multicultural societies, it should link digital learning with multicultural, intersectional concerns that value cultural diversity and fight against prejudices and exclusion. In that sense, the Brazilian case can be useful comparatively, by illustrating the potentials and the challenges of digital learning in a structurally unequal, multicultural countries.

Multicultural Digital Learning for a Multicultural Society: The Case of Brazil

From a social justice and multicultural perspective, we the present paper argues that effective digital learning in higher education is likely to happen when digital curricular contents have been embedded with inclusionary strategies that foster plural students' critical thinking and empowerment (Ivenicki, 2021a, 2021b). Digital learning should therefore provide both meaningful learning and the strengthening of cultural identities of learners, so that it be relevant for individual, professional, and personal growth, apart from yielding more flexible forms of higher education provision for lifelong learners.

Such an approach to digital learning should be relevant when discussing the context of multicultural countries, such as Brazil. To discuss digital learning and the role of higher education in Brazil, a cursory look at its contextual scenario is relevant. Brazil is a multicultural country, with considerable challenges in terms of educational and social inequality. It is the largest country in South America, with a population of more than 203 million people (IBGE, 2023). Racial and ethnic composition of the population as self-declared by the subjects in the survey carried out by the IBGE (2021) is as follows: 43 % self-declare as white, 9% as black, 47% as brown and 1% as indigenous. According to Neves and Eckert (2017), social and economic inequality is high, for instance, 1% of the Brazilian population belongs to upper social and economic classes, their income being 85% higher than that of the 50% poorer segments of the population.

The higher education system in Brazil is composed of a variety of HEIs. According to Neves and Eckert (2017), in administrative terms they can be either public (federal or state institutions, which charge no fees from students) or private (whose revenues are mostly from students' fees), the latter being either non-profit (mainly denominational, community-oriented institutions, such as the Pontifical Catholic University and its branches) or for-profit (mainly connected to a few large educational groups traded on the national stock market).

In academic terms, those HEIs can be universities (in which faculty holds Master and PhD degrees and the research component is present); university centers (mainly geared towards teaching, with practically no research component); and non-university institutions (which include independent faculties, technological centers and institutes, with little autonomy and subject to the National Council of Education). Neves and Eckert (2017) also point out that the growth of higher education in Brazil mostly resulted from a dynamic private sector, in such a way that in 2015 87.5% were private HEIs against 12.5% public HEIs. Teacher education courses, called "Licenciaturas" have been developed in higher education institutions, both public and private. However, it should be pointed out that quality also varies, inasmuch as public universities, and denominational ones (specially the Pontifical Catholic University) are generally well positioned in terms of higher education assessment carried out by government, particularly in terms of research papers and knowledge production in the several curriculum areas.

Access to higher education is made by the ENEM, which is the National Secondary Exam as public universities are highly sought after, the grades that students gain in the exam favor those students that had had higher educational opportunities in their school preparation. In that sense, ethnic and racial minorities used to be marginalized from those universities, and they have a high representation of upper, white social classes. As pointed out by Ivenicki (2021a), research by Almeida et al. (2018) in Brazil confirms the relevance of multicultural, intersectional approaches to education, by signaling ways in which the categories race and ethnicity are often intertwined with other social configurations, such as class, gender, and sexuality. Therefore, Almeida et al. (2018) emphasize the importance of recognizing such overlapping

for the formulation of teaching strategies and learning aimed at understanding and respecting cultural diversity and combatting inequality in Brazil.

The relevance of multicultural thinking that aims to address those inequalities can be gauged by government initiative to introduce the system of quotas in public, federal universities, by the Law 12.711/2012 (Brasil, 2012), geared towards fostering access of black, poor, and indigenous groups to those HEIs. The intersection of race and social class for the quotas seems to have been reinforced by research from Honorato and Zuccarelli, 2020. This research showed that both identity markers should be considered together so that inclusion should be efficient.

Based on a multicultural, intersectional approach, Ivenicki (2021a) argues that for higher education to have a strong impact in preparing future professionals for dealing with the challenges of globalized and multicultural societies, it should link digital learning with multicultural, intersectional concerns that value cultural diversity and fight against prejudices and exclusion. That multicultural, intersectional approach is reinforced by research developed by Honorato and Zuccarelli (2020) about students that had access to public, federal universities through social class and race quotas. The study showed that the intersection between both identity markers was present in a much larger number of students than those analyzed just in terms of their social class. That shows that the intersectional multicultural perspective has been effective by considering the intersection of race and social class to promote cultural diversity and inclusion in HEIs. Once catering for access, the support that those groups receive has still room for improvement (Honorato & Zuccarelli, 2020). Curriculum strategies that should be geared towards those students who still need reinforcement, to avoid evasion and dropouts.

Higher Education and Digital Learning: The Brazilian Case

Against the scenario of a vast multicultural society, it is important to note that the enrollment rate for higher education is 32.7% (Nitahara, 2019). This number is still very far from the universalization that a higher education system governed by lifelong learning principles requires, a situation similar to that described for Mexico by Álvarez-Mendiola (2012). Some attempts to expand the coverage/ enrollment rate and the participation of underrepresented social sectors in Brazilian higher education have included entry quotas in public universities for black and indigenous groups; government student financing programs aimed to place academically qualified low-income students into private higher education institutions; fostering the increase in night higher education courses and courses of shorter duration, among others.

As contended by Ivenicki (2021b), statistics should be relevant at this point, to ascertain the respective role of the public and the private higher education sectors in Brazil. Data before the pandemics showed that in 2017. participation of the private sector of higher education was 75% (Brazil, 2018, found in Ivenicki, 2021b), which means that for each four higher education students, three were attending private institutions. Also, data from the same source (Brazil, 2018) indicated that distant learning increased in 17.5% in that year, representing 21.2% of undergraduate Brazilian students. Focusing particularly on teacher education courses, 46.8% attended distant courses and 53.2% on on-site ones. It should be noted that such percentages drop when analyzing the public sector, where 81.7% of students attend on-site courses against 18.3% in long distance ones, compared to 64.1% that attend long distance courses in private higher education institutions against 35.9% in on-site ones (Brazil, 2018).

However, the percentage of those that got into the system and those that fell out of it also calls the attention, drop-out being high. Some hypotheses could be linked to what has been discussed in the previous section, namely: even though access has been improved to higher education through quotas and other initiatives, more multicultural curriculum should be thought of. In fact, for each 1000 inhabitants, 31.5% entered higher education institutions and 12.3% dropped out. In fact, according to higher education census, since 2003, Brazil has experienced a higher education boom, new courses being offered both in public and private universities (Brazil, 2018), and the number of e-learning students grew 30 times in a decade (from 2002 to 2013). There has been a leap in access to technology, with more people using the internet, which has caused an increase in enrolment rates in distance courses (e-learning) from 49,000 undergraduate students in 2003 to over 1.5 million ten years later (Brazil, 2018).

Against that background, distant higher education courses have been the focus of educational policies at federal, and at state and municipal levels. Before internet and digital learning, printed media, visual objects, and other technologies were used in extension/community educational projects by higher education institutions, as well as for distant higher teacher education courses. Ivenicki (2021b), argued that in 2003, a landmark in digital lifelong learning in Brazil was created, namely the Universidade Aberta do Brasil (Open University of Brazil) (Brazil, 2020a). It is a distance higher education program developed by a consortium of Brazilian public universities geared at offering online higher education courses, so far being focused on teacher initial and continuing education. Such a program aims to amplify and disseminate to far-off

regions in Brazil courses and programs of higher education, prioritizing teacher initial and continuing education, including the provision of higher education for those teachers who do not hold higher education certificates, and who already work in Brazilian school. The Brazilian Open University (Brazil, 2020a) allows students to get in touch with tutors and professors, as well as have access to libraries and laboratories of information technology, biology, chemistry, and physics. The policy document also discusses the development of a national distance online system of higher education in Brazil that values cultural diversity, including adult education, education for human rights, for ethnic and racial relations, gender identities and other themes, therefore within an equity and multicultural agenda, at the level of intentions. As posited by Ivenicki (2018, 2019), multicultural sensitivities in Brazilian educational policies tend to be present side by side with the need to situate Brazilian education positively in the global, technological world.

In terms of digital learning, the Brazilian Open University has been employing hybrid systems, normally requires that students to be present for end of year for exams, and that the parts newly developed online (it counts on 555 "poles", which generally are schools or educational centers in Brazilian municipalities, where computers are available for students). It is noteworthy that even though such a program can be considered a relevant point in digital learning, the fact that it mostly covers teacher education courses convey its limitations in that area. Also, higher education census supports the information related to high dropout rates (49%), due to financial constraints. Those financial constraints mostly referred to the need of students to work and their ensuing difficulties in attending virtual classes and comply with homework assignments. Also, the fact that complete teacher education courses (both for basic and secondary teachers) may be considered more feasible to be developed online to the detriment of other careers such as Medicine, Engineering and so forth may raise questions related to virtual higher education and its value in the Brazilian society.

In fact, polarizations have been present ever since, between those who have considered the possibility of high quality digital distant learning in higher education against those who have systematically shunned that idea in favor of the so-called "superiority" of on-site higher education courses. Such dichotomic and polarized perspectives have led to a failure to extend the scope of the Universidade Aberta do Brasil, (Brazil, 2020) as well as other means to boost digital learning higher education courses and experiences, in all areas, including lifelong learning. Lately, drop in economic investments in education have also impacted both on-site and distant-learning courses. Those drops in investment have happened in a political context in which the role of science and of HEIs was seriously undervalued by government, particularly between 2019 and 2023. Such drops attained public, government supported HEIs, both federal and state, with serious impacts to the day-to-day development of research and teaching, as well as to the very functioning of infra-structure, which has also had impact in the provision of both on-site and on-line modalities.

In fact, as Ivenicki (2021b) noted, digital learning as part of distance higher education learning has been object of different views up to now. On the one hand, it has been recognized as an important means to provide education and teacher education within contexts of large countries, such as Brazil. In those cases, it has been pointed as the main avenue for what has been called as the "interiorization" of university in the most remote Brazilian areas, meaning that students in cities and little towns away from the big centers could attend classes and become teachers by attending virtual classes. On the other hand, however, those online distance courses that build on digital learning have also been charged with deepening social inequalities insofar as a minority of students in peripheric countries have access to digital learning. Additionally, from the pedagogical perspective, digital learning has also been viewed as providing lesser possibilities for transformative education, being tantamount to exchange of ideas and to the exposure of differences that presence learning allows. Undoubtedly such views have been expressed more in the way of debates and conversations, but they were underlying thoughts that depends on everyday views about online and on-site HEIs classes.

Focusing on the adoption of digital leaning in higher education in general, Renda dos Santos and Okazaki (2015) point out that social networking sites have been useful tools among faculty members. They point out that the use of Facebook or Linked-in has become increasingly popular among higher education faculty in Brazil, nearly 85% having a Facebook account, in addition to sites that register research citations, nowadays some of which are Academia, Scopus, Researchgate, among others, which includes about 1.2 million registered users, organizing their research, creating personal profiles, and searching for people with similar scholarly interests.

On the other hand, Parreiras and Macedo (2020) hold that digital technologies used in Brazilian higher education needs to enhance faculty's expertise to make use of them in actual teaching experiences with students. They also point out that even though most Brazilian do have mobile devices, there are still difficulties in access to sites and difficulties to download programs of learning that need more modern computers, all of which compound educational inequality. Apart from that, Parreiras and Macedo (2020) claim that private and public higher education courses differ as related to digital

remote learning, the private sector making use of it to dismiss tutors and professors in favor of online classes with a high number of students guided by very few tutors and professors, therefore being problematic for the quality of education. In that area, according to Parreiras and Macedo (2020), distance education emerged as a promising and profitable bet for most private institutions, which have been using both textbooks produced by large company partners, and pre-recorded lessons.

Ivenicki (2021a,b) contends that those dichotomic ideas, the onset of the COVID-19 pandemic in Brazil brought to light digital learning and its challenges, as well as its potentials and contradictions, to which educational policies, as well as higher education institutions and actors, have been called to respond.

Digital Learning and Educational Policies in the Pandemic and (Post) Pandemic: Perspectives

The onset of the pandemic of COVID 19 in 2020 made an astounding mark for digital communication and digital learning worldwide, as claimed by Dias and Pinto (2020). In fact, as claimed by the referred authors, the Covid-19 crisis resulted in the end of classes in schools and universities, affecting more than 90% of the students in the world.

In multicultural and unequal countries such as Brazil, there were mixed effects related to multicultural and equity sensitive concerns. Those concerns related to both aspects referred to the challenges of access to digital artefacts, as well as to the articulation of digital learning and curriculum practices.

Brazilian news has consistently pointed out that most students in Brazil, including adult students, have not had access to digital learning to be able to attend on-line courses. On 20th May 2020, after strong pressure from academics and students, the Ministry of Education decided to postpone the National Exam for the Secondary System (ENEM), that was due to take place in November 2020, due to the inequality of access to on-line classes from most of the population. That was an important decision bearing in mind difficulty in admission into higher education in Brazil, which is very low compared to international standards.

Such an unequal access to online and digital artefacts has also been felt at the higher education level itself. The panacea by which digital learning has been perceived in educational policies suffered a reality check. The lack of access to digital technologies to be able to attend on-line higher education classes as claimed by Dias and Pinto (2020) also impinged on the decision of most of public Brazilian universities to suspend the academic calendar of 2020 rather than go on with it through on-line and digital learning strategies. Administrative implications regarding admission to HEIs was postponed even though calendars had to have an overhaul in order to compensate for that period, with classes having been given during holiday periods afterwards, in 2021, as soon as the vaccination started.

On the other hand, the Conselho Nacional de Educação (Brazilian National Council of Education -CNE), which is a counselling federal institution that advises the Ministry of Education about educational affairs, issued a directive to be taken in the pandemic, towards distant digital learning in Brazilian schools (Brazil, CNE, 2020), which suggests measures based on digital learning should be adopted during the pandemic period by schools and higher education institutions. Some of those measures included HEIs should replace on-site classes by remote, distant learning classes through digital technologies, including assessment practices, as well as organize teacher training in a way that could prepare teacher educators to deal with those. Also, it recommended that the entry selection of students should also be done in a digital way, and that HEI faculty should make use of social media such as Facebook, Instagram and so forth, in order to foster and supervise studies and projects from students. Such initiatives were efficient to the extent that academic activities could be developed, even though future research could gauge its results more precisely. In fact, the referred document acknowledged that the census carried out by the INEP, the National Institute for Studies and Educational Researcher Anisio Teixeira, cited by Brazil, CNE (2020), confirms that Brazil has 8,740,338 students in all areas and courses of higher education, and distant on-line courses covers 40% of the total of 3,445,935 of the students that entered both in the private and public sectors of higher education in 2018. The public sector of higher education being responsible for 60,000 registrations of students. The CNE document (National Council of Education, 2020) also states that registration of students in on-line distant higher education courses doubled since 2008, particularly emphasizing, once more, teacher education courses.

On the other hand, it states that even though 7,170,567 places were opened for higher education on-line distant courses, both in private and public higher education institutions, only 19% of them were filled. The possibility of all higher education courses providing 40% of their curricula on-line was suggested in another Ministry of Education document (Brazil, Ministry of Education, 2019b). However, the extent to which institutions have (or have not) adhered to that model has not been assessed so far.

It is important to note that even though distant learning has been central to protect lives during the pandemic time, the lack of conditions to use technological means has been a deterrent to the success of that mode of learning, both for the

public and the private sector. According to Parreiras and Macedo (2020), the census in 2018 showed that only 41.7% of Brazilian households had microcomputers, and that from the 79.1% of the other users, 99.2% used their cell phones, with unequal power of connection to the internet.

Another issue that was noticed was that the change of 40% of on-site courses to long distance ones in the private sector has resulted in the demise of higher education faculty and the ensuing increase of classes with overload for those remaining faculty, as well as the dropping out of students, as mentioned before. That way, even though distant on-line courses in Brazil apparently increased, it still lacks a more widespread coverage. The document of the Ministry of Education (Brazil, Ministry of Education, 2019) stressed the importance of widening the offer of distant on-line higher education courses, and to offer conditions so that the access to technological computer platforms might be successful (even though it was not stated how that could be done).

Concerning a previously mentioned document (Brazil, CNE, 2020), specifically stressed the importance of hybrid mechanisms (such as the Open University referred to in the last sections of this paper), and went on to refer to the COVID 19 pandemic and to the Portaria (Law) MEC (Ministry of Education) nº 345/2020 (Brazil, Ministry of Education, 2020b) that gave authorization, in an exceptional way, for higher education institutions to change on-site classes by others that use digital technologies, including theoretical disciplines of the course of Medicine, with the exception of laboratories and teaching practice disciplines. Also, the document suggests that extension higher education projects – which are those geared towards society at large, including lifelong learning projects - should benefit digital technologies in areas such as teacher continuing education; environmental education and sustainability; human development and social responsibility; supporting teachers and future teachers in creating digital curricular materials; and educational actions geared towards preventing the contamination by COVID-19 at the time.

Additionally, the referred document by the Ministry of Education (Brazil, CNE, 2020) recommended that higher education institutions should replace on-site classes by remote, distant learning classes through digital technologies, including assessment practices, as well as organize teacher training in a way that could prepare teacher educators to deal with those. Among those measures, there was the recommendation that the entry selection of students should also be done in a digital way, and that higher education institutions should make use of social media such as Facebook, Instagram etc., in order to foster and supervise studies and projects.

Reactions from higher education institutions were mixed (Ivenicki, 2021b). As public universities in Brazil have autonomy, their senates should decide about the academic year calendar and the extent to which government recommendations were feasible. A public university in Rio de Janeiro, (kept anonymous for the research ethics), for example issued some directives relative to digital learning in which concerns were expressed relative to both students' access to those technologies and to higher education professors' training to develop digital materials and deliver on-line classes.

On March 22, 2020, the office of the Rector of the high echelon of that university issued an internal memorandum (kept anonymous for the ethics of the research) to on-line digital education in times of the COVID-19 pandemic. The document stated that in spite of the new policy of the Ministry of Education that recommended the substitution of on-site classes to on-line digital ones, there should be a concern about equity educational issues. According to it, there were lots of students from lower economic strata, as well as those with special education needs, who would be unequally treated in such a curriculum due to the fact they would not be able to have access to digital technologies in an efficient way. Therefore, the document stated that while the pandemic lasted, virtual digital platforms should be employed only in those classes in which such technologies were already in use, stressing that digital technologies should not replace present, on-site classes at the university. It concluded by suspending the academic university calendar until the pandemic was under control. It should be stressed that on-site classes are on again, since the end of 2021, and the university calendar has been resumed. Those initiatives were taken by all federal universities, in favor of students' health in the face of the lockdown in the direst period of the pandemic.

Those two contradictory approaches from most of the private sector (which has been keen on digital learning for profit) and public universities (more imbued with equality and multicultural perspectives) have shown the complexity of digital learning in multicultural countries, as well as in neoliberal societies with high levels of unequal access to technologies. Additionally, other variables have attained digital education throughout the world, which have included the lack of personal interaction in classes, issues related to home challenges while in line, and so forth.

Such a narrative of the complexities of the use of digital technology during the pandemic may well illustrate the ambiguities and challenges that were already in place in higher education concerning the issue (Ivenicki, 2021a, 2021b). Against that backdrop, it is noteworthy that there remains significant disparity within countries in terms of access and equity

opportunities in higher education, including with respect to digital learning, which became even more apparent during the Covid-19 pandemic. In terms of digital learning, in culturally diverse and socially unequal countries, educational policies should arguably consider the extent to which digital learning should be fostered so that it could enhance learning not just for a few. In that sense, digital learning should not contribute to perpetuate educational inequality.

It is interesting to note that scholars such as Rafalow and Puckett (2022) contend that even in societies where educational level divides in access to digital technologies have shrunk (such as the USA), there still linger inequalities in that many HEIs categorize student digital footprints as part of an informal process to evaluate students. The authors claim that such educational institutions operate as sorting machines, as these tracks lead to "unequal economic outcomes and different life chances for students, predictably along lines of race-ethnicity, class, gender, and other social statuses" (p. 277). That idea links to our argument in that simply reinforcing access to technology is not enough to guarantee educational equity, but rather it is arguably crucial that internal HEI factors such as pedagogy, curriculum and methodologies be adapted to cultural diversity and inclusion.

The above contentions seem to reinforce the argument that digital learning should be dealt with in terms of learning itself, particularly geared towards promoting multicultural competence both in the Brazilian context of the challenges of inequality of plural identities, and in societies with more balanced access to digital technology, such as the USA. The extent to which digital learning exacerbate the divide begs for further research.

Conclusions

The present paper analyzed how digital learning has affected HEIs in the Brazilian context, particularly during the COVID 19 pandemic. It also highlighted structural inequality in the higher education system and how policies of quotas of black, poor, and indigenous groups have contributed to mitigate such inequality in the context of public universities in Brazil. Also, it highlighted differentiated institutional policies in public and private sectors, inequalities in access to technology by students and professors, policies of suspension of entrance exams and school calendar during the pandemic and its consequences on digitalization in Brazilian higher education.

The fact that teachers and higher education professors have been asked to develop digital materials during the pandemic without having been prepared for that should be seriously considered as well. Also, as argued by Araujo et. al. (2020), strategies such as increasing schooling time or the use of technologies should be unlikely to have impact on the achievement of students. They suggest measures such as making more efficient use of time, with intensive tutorship focused on marginalized students.

Two lessons may have been learned during the pandemic, concerning digital learning and higher education. First, that digital learning is foremost about learning itself. In that sense, it is pivotal to clarify what meaningful learning means in the context of higher education, and to what extent faculty are equipped familiar both with the digital technologies and with the curricular and pedagogical strategies aimed at fostering that kind of learning.-Second, equity and social justice educational policies should be considered within the local contexts where digital learning is developed. Within that framework, it is central to problematize the extent to which educational policies target heterogeneous access to technology, particularly in highly unequal societies.

Moreira et. al. (2017) illustrate that need, by expressing how adult learners' cultures and ways of life had a serious impact on the result of the digital on-line distant course they organized for higher education professors. They showed that one of the most relevant weaknesses was the lack of time to do the e-activities, especially when a balance was to be achieved between work, family responsibilities and other daily business and the course requirements, aspects that have been present during the COVID 19 pandemic in several homes where families have been kept in lockdown. Besides the time aspect, another weakness found was that some of the digital tools were perceived as difficult to use, even though the adult students were a group formed by higher education professors, which led the authors to consider cultural contexts and meanings for digital learning to be successful in lifelong learning – an aspect that has also been strongly felt during the COVID 19 pandemic worldwide.

In lifelong learning, Paulo Freire's (1982) approach to adult education and adult literacy has inspired multicultural thinking, in that it highlights the centrality of providing teaching based on generative themes linked to adults' lives for successful curriculum development and literacy competence. Such an approach to learning should be likely to empower students' identities of gender, class, race, ethnicity, and others. It should problematize hegemonic narratives and discourses that essentialize knowledges to the detriment of respecting and building upon plural adult learners' cultural contexts and backgrounds. Such ideas should arguably transform higher education curriculum so that it should be more flexible and

culturally relevant, being adapted both to on-site learning and digital on-line learning, in transformative approaches to lifelong learner.

Future research could develop important aspects such as data on the correlation between multicultural education and the way in which it supports graduates to face the challenges of society. Such research could, for example, examine possible data on the development of the agency of graduates in the social, cultural, and labor world of Brazil. That would certainly give a boost to the relevance of multicultural education. Also, beyond the analysis of the purposes and values of government documents, it is necessary for future research to look into the results of that educational policy. Such future research could try and glean the extent to which the purposes have (or have not) been fulfilled. It would be important to understand possible implementation and results problems.

The experience of the COVID 19 pandemic should give us the opportunity to think about transformative alternatives so that higher education could rethink curriculum and pedagogies, in Brazil and worldwide. Teacher education and lifelong learning should therefore not limit digital learning to a means, but also change curricular content and make it into a new way of learning. That should be done both in the case of on-site courses and distant, digital learning models, so that higher education and lifelong learning positively change towards facing a new digital world.

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Periods of Technological Change in Higher Education

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Abstract

This study identifies three fundamental historical moments related to the incorporation of information and communication technologies in higher education. To explore these phases, we acknowledge an initial period defined by the massive use of computers, mostly for accounting and office automation; a second period during which highly specialized software emerges and expands its coverage in academic disciplines; and a third period characterized by a widespread use of Learning Management Systems and communication software during the COVID-19 pandemic.

Keywords: Higher education, Information and Communication Technologies (ICT), pandemic, specialized software, Learning Management Systems, Mexico

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Resumen

El capítulo propone un ensayo de periodización que ubica tres momentos históricos fundamentales que se asocian con prácticas de uso de las TIC en las universidades: un periodo inicial que impulsa el uso masivo de las computadoras y se basa principalmente en el software para la contabilidad y para labores de oficina; un periodo más, representado por la explosión del software especializado; y un tercer momento de desarrollo caracterizado por la utilización generalizada de las plataformas de enseñanza y de comunicación durante la pandemia de la COVID-19.

Palabras clave: educación superior, México, plataformas de enseñanza, pandemia, plataformas de enseñanza software especializado, TIC

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Introduction

The technological change associated with the incorporation of information and communication technologies (ICT) in higher education (HE) has not been a continuous process nor is it made up of the same elements. We identify three

historical moments in which ICT has been incorporated by colleges and universities for educational purposes. We recognize an initial period that was defined by a massive use of computers, mainly for accounting and office automation; a second period during which highly specialized software emerges and expands to penetrate practically all academic disciplines; and a final period that was characterized by the widespread use of learning management systems (LMS) and communication software during the COVID-19 pandemic.

The evolution of technology among higher education institutions (HEI) has been studied from a historical point of view (Casillas & Ramirez, 2014) and currently research examines elements of technological change and the digital culture (Casillas & Ramirez, 2021). The evolution process includes the acquisition and massive use of computers and all sorts of digital devices that have not only become more accessible and multifunctional but have also been adapted for many professions. Technological change generated an enormous use of computers, smartphones, mobile applications, networks, information systems, and highly specialized software. In a digital culture, mobile devices lead the way when it comes to portability, ubiquity, and accessibility to information. A new digital culture also flourished within this technological change. This includes new ways of thinking about technology uses, practices, attitudes, social representations, and values that scholars promote around cyberspace, as well as the use of computers and the evolution of the workplace to digital environments.

Technological change moves across all social spheres. For instance, all economic processes and their branches have incorporated computers and the Internet into their workplace, transforming their operations, duties, and professions and denoting a wide domain of technological practices. Moreover, fundamental references for humankind have been modified in which ICT accelerates time, resizes the world, and expands reality to simulated experiences known as virtual and augmented reality. Additionally, the substantial use of social media establishes new consumption practices and domination of globally standardized ideologies and social dynamics. Therefore, human communication, access to information and everyday interactions have been altered and diversified (Castells, 1996; 2013).

It is precisely in educational environments where this modern digital culture unfolds leading to significant changes. For example, new strategies for reading, writing, teaching, and learning, or producing and distributing new knowledge are disclosed and schools, educational processes, student-educators' roles, and bureaucratic procedures have evolved. Old traditions have been overtaken by new practices. Online student-teacher interactions changed, assignments are turned in digitally, there is massive production and consumption of digital materials about different topics, documents are done collaboratively through the cloud, and academic discussions take place in virtual forums and face-to-face meetings have been relocated to virtual spaces. But above all one of the most radical changes is the open access to cultural goods that were previously only accessible to certain people (Cobo, 2016; Rama, 2021a; 2021b).

However, these changes also yield unequal distribution of academic resources. There are differences in access, use, and appropriation of ICT between social classes. For instance, during the Covid-19 pandemic, when academic activities migrated to digital spaces, socially excluded communities were affected in many ways. Teachers and students with poor Internet quality, computers, or an inappropriate workplace at home for online classes were left behind. The online learning for them was not as effective as for those with stable access to ICT. These educational inequalities end up separating those who have from those who are dispossessed of technological capital (Casillas & Ramirez, 2014).

Before technological change, universities were closed spaces for centuries. Their academic departments, even with some curricular flexibility, not only had definite processes of disciplinary affiliation, without an interdisciplinary perspective, but also a trend to be homogenous without recognizing students´ learning pace or the cultural differences that distinguish them. HE has long been using a rote learning approach in which professors are the main authorities and truth and knowledge bearers while the exams are the main assessment method. Nonetheless, the incorporation of ICT into HE represents the most important change in the progression of university systems since they appeared in the 12th century. Modern communication channels, the use of specialized software in academic disciplines and appropriation of LMS for academic continuity are creating unprecedented changes on this educational level (Gobierno de España, 2023).

Some clear changes are seen in the management of HEI, administration processes, their governance and in other institutional activities. Luckily, a boost is happening in the production of cultural and educational resources, information, research and in the development and use of diverse digital platforms including LMS and other means to share and access knowledge (EDUCASE, 2022).

Nevertheless, our research indicates that the incorporation of ICT has happened randomly without planning and needs assessment or well-designed policies based on the experienced. With few exceptions, spontaneity has prevailed as well as a poor critical reflection on behalf of educational institutions and policy makers. We have not even been able to determine what scholars should know about ICT in every academic discipline, nor have we agreed on what needs to be taught. HEI have not defined the digital knowledge set a students' needs to possess at graduation. Uncertainty prevails, and the disciplinary approach of ICT use is still pending. With the lack of clear and effective ICT policies to ensure quality and excellence in HEI strategies for incorporating ICT in disciplinary fashions a proper update of students' preparation will be out of hand (Bruner, 2003; Brunner, 2017; Brunner, 2022; Brunner & Tedesco, 2003; Rama, 2021a).

Literature Review

The Initial Incorporation of ICT into HE

The initial phase of incorporation of ICT in HEI started at the end of the 20th century and made its course until the dawn of the 21st. century. It began with a massive use of office automation software like Microsoft Word, MS Excel, and MS PowerPoint. At that time, electronic devices were not interconnected, the Internet was being developed and social media was nowhere in sight. Furthermore, computers and digital devices were high-maintenance, inaccessible and, to some extent, unaffordable.

It is fair to say that computers, software, and programming language have evolved since the 1950s, and since then programming computers and being proficient using information systems, has been considered as sophisticated knowledge. The dawn of desktop computers in different spheres of society brought out a different meaning to the use of computer software. Accounting and management areas received prominent attention since their work-related activities could benefit from the use of computers. The software for that area was widely used even before the graphic user interfaces (GUI) were adopted.

Computer sciences, accounting and management have enormously expanded. They are the reference for using software for special purposes with the greatest impact on the global economy and growth. Aside from military purposes and computing itself, another area of expansion was office automation by means of systems software suites. Microsoft software became the leading solution for modern office procedures. The accounting spreadsheet, a word processor that provided office workers with editorial functions, and a graphic presentation program, were sufficient elements to allow Microsoft to launch the first versions of Office, from the early versions of Windows Operating System, revolutionizing in the 1990 the users of computers.

The popularization of Office allowed new possibilities of computational usage and eventually it had an important impact in the curriculum design across all educational levels. Novel users, from elementary schools to college institutions, not only acquired knowledge for office software rooms, but also for operating desktop computers and their peripheral devices. Over the years, software for office automation was seen as the standard of computer usage, until specialized software for academic disciplines emerged and developed profusely. The HE user needed to expand their digital knowledge on office suites, to the digital process of medical images, computer-aided architectural design, virtual science lab simulation or employment of geographic information systems (GIS), as well as the use information ecosystem for the online education necessities made more evident during the coronavirus lockdown.

Microsoft Excel represents the legacy of the accounting software movement initiated in the 1970s that users who were neither computer scientists nor accountants had to learn. Besides this type of disciplinary software soon emerged other computers that required both basic proficient computer users and a given disciplinary knowledge.

With the development of personal computers, Office became more popular, and schools needed to design academic routes to promote their teaching and learning. A variety of courses appeared specifically to teach how to use personal computers and their office suites. Its practical use for authoring essays, processing information, and making graphic presentations in class became daily practices. Gradually, learning office automation software became the minimum requirement in the educational system and soon extended to other social areas. Although it is not officially evaluated at admissions to HEI, we have reason to believe that students nowadays start college with a considerable set of digital knowledge (Casillas & Ramirez, 2020). Academic texts, research reports and other pieces of text are created within a word

processor. Usually enhanced with images, references, hyperlinks, and tables, users create documents either locally or collaboratively.

An Era of Specialized Software

Once the use of office automation software in higher education became common and the use of computers and digital devices were accepted at colleges and universities, new challenges occurred. Specialized software became known, along with modern devices and sources of information that were specific to every profession or field of study. The technological change and digital culture not only imply a challenge for HEI but for the stakeholders of each academic discipline who need to adapt on various aspects such as knowledge production, disciplinary practices, digital rich interactions, and communication among academic communities. Academic disciplines in universities have a dominant position in science (Bourdieu, 1994) and the technological rapport of their members is high and changes rapidly (Casillas et al, 2016).

Without proper educational guidance or policies, most HEI have improvised on the incorporation of ICT into their educational practices, relying on engineers, computer experts or administrators who decide what needs to be done. This chain of command, although common and quick, leaves out academia, educational needs, and real opportunities to incorporate ICT into the fundamental functions of the educational institution. HEI should assume the responsibility to provide guidance for their technological decisions from an academic perspective, understanding the inherent differences in academic work (Clark, 1978; 1987; 1991). Academic disciplines are communities structured by epistemological differences (Becher, 2001) and social configurations where faculty members bring together social practices (Grediaga, 1999), and generate the academic stakeholders' identities (Biglan, 1973; Dubar, 2002). Academic disciplines form scientific fields (Bourdieu, 1994; 2000) and attempt to improve their positions to obtain social benefits and rewards.

The integration of ICT in all academic disciplines has not been so far a homogenous process, because of the nature of the tasks and activities needed to be performed (Clark, 1987), the multiple fields of study and professions found in HEI.

Some academic disciplines rely heavily on technology, while others show various degrees of technological appropriation. However, we would like to emphasize the considerable proportion in which electronic devices, specialized software, applications, resources, and appropriation of cyberspace is growing within academic disciplines. We have verified that the proposed indicators, in line with Becher (2001), are relevant to recognize the nature of work and examples of how different the incorporation of ICT is done in HE (Casillas, Ramirez, Luna and Marini, 2017; Ramirez and Casillas, 2015).

Academic disciplines are social systems with interactions, practices, and endeavors. By integrating their professionals, they generate an identity and define specific behaviors. Members of a scientific discipline establish an ethos around legitimate values and forms of action (Merton, 1938; 1942). In terms of Bourdieu (1980; 1994; 2000), academic disciplines in specific fields of study create a particular habitus that makes physicians, for example, think, act and value social situations different from what engineers or sociologists would do. As academic disciplines and professions intersect technological change, we can speak of a digital habitus (Casillas & Ramirez, 2018, 2019).

In HEI and the professional world, the digital habitus looks at how teachers and other professionals are using ICT in their line of work. Digital Proficiency mastering office suites, the expansion of websites, digital libraries, software programs, digital content, and blogs reinforce the idea of how deep information has specialized in line with disciplines, professions, and jobs. We identified this matter as the social dimension of academic disciplines (Morales & Ramirez, 2015; Morales et al., 2015; Ramirez et al., 2014). HEI teachers and other professionals play a position in the digital cultural system as consumers, producers, or administrators of digital content (Lévy, 2007).

The digital habitus, as a set of incorporated provisions, refers to the cognitive dimension of the digital knowledge set (theoretically and experientially) that represents a certain degree of knowledge beyond basic computer skills (Ramirez & Casillas 2015; Casillas et al., 2014). In a practical sense, the digital habitus includes knowing how to interact and use digital devices, and information in a practical way. Therefore, the digital habitus is a practical knowledge because it provides a sense of knowing how to use ICT efficiently and it is part of the digital culture because it includes attitudinal and behavioral dimensions for online environments, which in our terms we tend to study as digital citizenship and digital literacy (Casillas & Ramirez, 2019). Every academic discipline has a particular culture, which is a set of notions, practices, theoretical and methodological foundations that Kuhn conceived as scientific paradigms (Gonzalez, 2019; Remedi & Ramirez, 2016). Each academic discipline established sees itself as different from others by a particular set of uses and attitudes towards software

programs and digital devices. Those differences can be observed in the word clouds we have created for the six academic discipline areas that operate at Universidad Veracruzana.

The research hypothesis of the intervention is that we are experiencing a transition era characterized by an expansion of specialized software. The word clouds created with the information gathered from professors at Universidad Veracruzana demonstrate a prominent fluctuation of software. A deeper look at the information let us determine the most frequently used software and how big the variation of usage is. Furthermore, the data analysis also shows that Microsoft Office Suite is still a popular option among teachers even when its degree of specialization is shallow. The presence of Microsoft software in the disciplinary software clouds allows us to see whether the academic disciplines have evolved towards a more diverse incorporation of software, or they remain in a basic stage of Microsoft general purpose software usage.

When teachers were asked to provide the name of the specialized software they use frequently in their field of expertise, their answers revealed a considerable confusion about web pages, devices, applications, and general-purpose software. The initial inquiries allowed us to determine the type of software, web pages and mobile applications commonly used among all academic disciplines. This also helps explain how ICT have been incorporated in Mexico, particularly at Universidad Veracruzana, where teachers keep relying strongly on Microsoft software, now present by a campus agreement of using Office 365. Other popular family of information services were those of Google such as generic and academic search engines, translation services, email exchanging and the cloud-based office suite. Finally, Eminus, the institutional LMS at Universidad Veracruzana also appeared in the clouds due to its mandatory character for all university courses at the institution.

Distance Education Era

We are now experiencing a new phase of technological change, caused in part by the health measures applied during the COVID-19 lockdown. Specialized software is still being refined and expanding there is no doubt, but the dynamics of HEI changed when all activities were entirely suspended, and face-to-face learning was dramatically interrupted. The situation granted the opportunity to use video conferencing, LMS, and social media to enhance the learning experience for those participating remotely, but it also forced teachers and students to acquire computer equipment and gain access to Internet by their own means.

The steps taken to face the pandemic favored the use of ICT not only for academic purposes, but also for social and commercial ones. Digital enabled communication became essential to both relationships and businesses, so people needed to remotely stay in touch with family members, friends, colleagues, customers, partners, and even employees. The synchronous and asynchronous interactions enabled applications for productivity and communication to become popular, facilitating live streaming, online class recordings, personalized learning environments, a fast distribution of digital content through instant messaging and Internet-based chatrooms, thus enhancing learning processes, student engagement and collaborative work. What seemed impossible at the end of 2019 was quickly implemented during the lockdown. All students and teachers were forced to appeal to distance education as the only means possible to advance with school activities, especially instruction. Governments and educational authorities were slow to deal with the pandemic situation in a quick manner. Their first response involved closing schools' spaces and reducing teachers' and students´ mobility. Later, LMS were profusely used as well as software and applications for productivity, and synchronous and asynchronous communication such as Goggle Meet, Zoom, MS Teams.

HEI that, prior to the pandemic, had any type of LMS, were able to continue with instruction and learning processes, followed their own guidelines, and used whatever digital resources they had available. But those educational institutions that did not have any sort of LMS, had to react in many ways. In some cases, HEI improvised with some LMS, in others, educators used whichever platform they felt comfortable with and in other situations, it was social networking platforms or instant messaging services that were used for communication, teaching and learning.

It is worth acknowledging that difficulties resulting from the shutdown of campuses and face-to-face activities did not stop educational processes. Classes continued online on a regular basis, and students were able to advance in their learning. Although most educators were not ready for online education, they succeeded in providing instruction at home following their own intuitions and using whichever technologies they had previously employed, even on a smaller scale. We observed that during the coronavirus lockdown, online classes embraced four types of teaching strategies.

- Use of video conferencing applications for synchronous learning.

- Use of LMS for asynchronous learning and distribution of materials.
- Collaboration and communication fostering through various channels.
- Instruction through remote guided reading.

Videoconferencing aided teaching worked well for those students and instructors who had a proper space at home, high-speed Internet access, and electronic devices that supported video conferencing applications. Sessions were to be conducted synchronously, respecting schedules, as much as possible, and simple outlines, or agreements regarding the correct use of microphones or cameras were established for those attending. In online classes students had to listen to the teachers´ instruction conveyed through applications like Zoom, Microsoft Teams, or Google Meet. Regardless of the video conferencing system implemented, operating system or types of devices used, school activities were mostly accomplished on mobile apps or in LMS. Google Classroom, Microsoft Teams, Moodle, Eminus (at Universidad Veracruzana) and others, provided the space for the administration, automation and delivery of materials, videos, links, images, and all sorts of digital content. LMS permitted instructors to assign tasks, conduct assessments, and interact with students or colleagues in forums and chatrooms. Although LMS existed in the country and were moderately used before the pandemic started, they turned out to be the most beneficial resource for knowledge management and interactions in distance learning practices.

Opening proper communication channels for academic and other informational purposes was particularly useful during the pandemic. Academic communities appropriated social media or instant messaging applications which helped them to continue their academic activities. For instance, WhatsApp allowed teachers in all educational levels to continue working remotely by sending instructions, texts, audios, attachments, and monitoring students' questions. In some cases, WhatsApp was even used for socializing and entertaining teachers and students. Apps for instant messaging played a significant role during the lockdown.

Instruction through remote guided reading in HEI was as common as online classes through video conferencing. Reading assignments were established, and the materials were uploaded to LMS or shared through instant messaging, usually in a PDF format. Also, e-reading became accepted and common, and was just as efficient and dynamic as instruction through videoconferencing, although it is necessary to mention that this strategy is not a full representation of what online education is all about.

Theoretical Framework

We recognize that there is a digital divide that includes access, use and appropriation of technologies. To measure this multifactor phenomenon, we borrow from Pierre Bourdieu´s theory of Cultural Capital and brought it to the technological field. The Technological Capital has three states: the institutional, the objectified, and the embodied capital. The institutional state is given by diplomas and certifications, while the objectified capital can be observed on the brands and devices the users have got. The embodied technological capital is seen as a digital knowledge set.

To measure what academic stakeholders know about digital technology we developed and used a conceptual model called the digital knowledge set. The interviews, focus groups and the empirical result, for this text and other research findings have been previously discussed and published in other spaces (Casillas & Ramirez, 2015b; 2021a; 2021b; Casillas et al., 2014; 2016; Ramirez, 2012; Ramirez & Casillas, 2016, 2017b; 2021a; 2021b; Ramirez et al., 2014; Ramirez et al., 2015). What the HE stakeholders need to know with regards to ICT is organized in ten categories: digital files, digital devices, software and databases, text, data sets and multimedia, communication in digital platforms, collaboration in digital environments, digital citizenship, and digital literature. These ten sections describe what academic stakeholders should know about digital matters considering their disciplines and leave behind the general view of computer use for office automation purposes. Data analysis was handled in a database that is accessible at https://gat.aexiuv.com. It holds over 500 records of faculty members at Universidad Veracruzana in Mexico that participated in this series of interventions between January 2018 and May 2019. Data were filtered by academic disciplines through a data-mining processes considering the six areas the university considers: Arts, Humanities, Economic and Business Administration, Engineering, Biology and agrobusiness, and Health Sciences.

Methodology

Prior to this intervention, we developed and applied a focus group-based methodology to study academic communities that have similar uses of technology. Qualitative research allows us to voice stakeholders by asking them about

their values, preferences, and strategies when using digital technology. We arranged the findings as a set of digital knowledge with levels of digital fluency. The differences are evident among group given practices as well as the similarities within. That is, the use of digital technology from architects, for instance, is similar among them, and different to those of philosophers or physicians. The focus groups, analysis of discourses, the systematization of responses and the general opinions allow us to observe discussions, tensions, and trends.

In this study we present the results of a study we conducted between January 2018 and July 2019, in which we defined the digital knowledge set that academic communities have by means of the analyses of the academic discourses elicited in good 60 focus groups. With the idea that the use of digital solutions in HE is permeated by the culture of a given academic profession (Lund et al., 2021) we proceeded to explore what teachers and practitioners use with regards to specialized software and databases.

The main objective of the intervention was to help college departments define the digital knowledge set for their specific undergraduate degrees. The results allowed us to picture how different the digital knowledge sets are across academic disciplines in HE. We also observed an outbreak term in which the use of computer programs and access to specialized information from a wide variety of sources increase. This suggests a disciplinary culture linked to the appropriation of technology (Casillas and Ramirez 2021a, 2021b; Ramirez and Casillas 2021a, 2021b).

Participants

To explore the complex relationships between academic life and software use we organized 60 focus groups with about 500 University professors, from 60 different HE programs. The focus groups were held in 6 different appointments organized from January 2018 to July 2019. In each focus group the teachers discussed the software and databases that are commonly used in their discipline.

Findings

In this part we present the evolution of ICT adoption in HE, in six different sections. The way we have divided the views of the informants respond to the institutional organization of the University we intervened. Each of the six sections correspond to the academic division of the university. They are Arts, Humanities, Economics and Business Administration, Sciences Technology Engineering and Math Academic, Biology and Agrobusiness, and Health Sciences.

The Arts Academic Department

In this academic area formed by disciplines in music, contemporary dance, plastic arts, and theater there is a huge diversity of software programs, devices, and digital sources of information, whereas the use of office automation software such as Office 365 is less common. Sibelius, Transcribe, Finale, Audacity, Metronome and Garage Band were some of the most common programs mentioned by this community.

Figure 1

Word cloud of the software used in the arts academic department

The Humanities Academic Department

This academic area gathers undergraduate programs in sociology, anthropology, history, social work, philosophy, linguistics and languages, education, and law. The word cloud of this academic area shows an interesting diversity and dispersion of software being used. It is an area with the experimentation of software, but without an institutional agreement on what to use. Microsoft office suites is present in the cloud. Word and PowerPoint were indicated as extremely common among teachers in these disciplines. Part of the software mentioned by teachers in these disciplines are Atlas.ti, Babel, Bonjour de France, Cambridge & Oxford dictionaries, Cuadernia, Edmodo, Educaplay, Evernote, ExeLearning, Hot potatoes, Jclic, Kahoot, MaxQDA, Mendeley, Moodle, Padlet, SPSS, Statistica and Sways.

Figure 2

Word cloud of the software used in the humanities academic department

The Economics and Business Administration Academic Department

Universidad Veracruzana offers in this academic department degrees in economics, geography, statistics, accounting, and other business administration options. These disciplines use specialized software extensively such as Aspel, COI, NOI, SAE, SPSS, Geogebra and R. Although Word, Excel and PowerPoint also appeared.

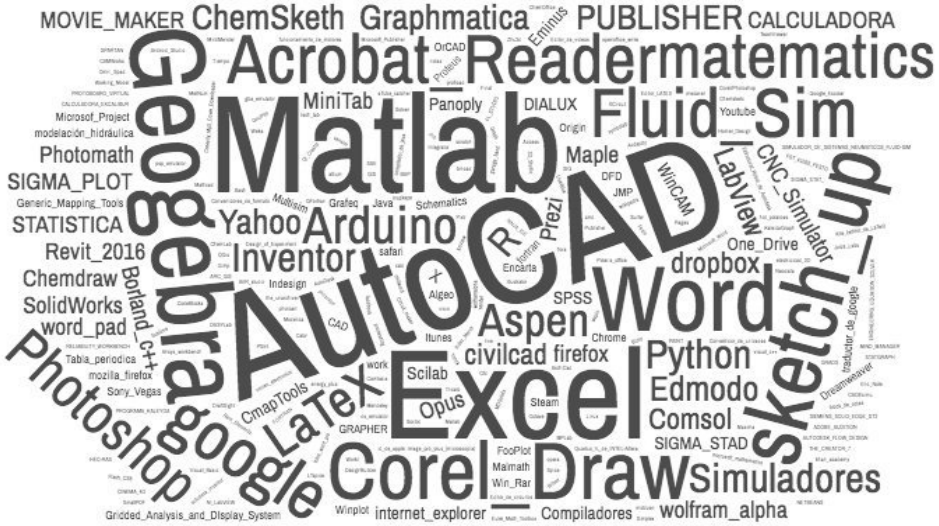
Figure 3

Word cloud of the software used in economics and business administration academic department

The Sch as chemical, civil, electrical, materials science, mechanical, architecture, chemical sciences, atmospheric sciences, electronic instrumentation, mathematics, and physics. These disciplines are strongly associated with the use of formal languages and mathematics. Even when the teachers of this department use a vast number of software programs such as Matlab, Geogebra, Statistica, ChemSketch, SigmaPlo, R and Python, MSExcel and MS Word still appeared in the word cloud.

Figure 4

Word cloud of the software used in the sciences academic department



The Biology and Agrobusiness Academic Department

In this academic area, Universidad Veracruzana offers degrees in biology, agronomy, agricultural economics, agricultural engineering and veterinary. The use of specialized software is less frequent than in other disciplines while the use of Microsoft Office suites like Office 365 is more common. Part of the software teachers mentioned are MS Excel, MS

PowerPoint, MS Word, Google Chrome, Explorer, Mozilla, WinRAR, Opera, Moviemaker, Corel Draw, Photoshop, MacAfee, Arc view, and others.

Figure 5

Word cloud of the software used in the biology and agrobusiness academic department

The Health Sciences Academic Department

In this academic area Universidad Veracruzana offers degrees in medicine, nursing, dentistry, nutrition, laboratory medicine, psychology, and physical education. There is a big dispersion in the use of software in these academic disciplines and multiple specialized software is being used. Part of that software is: Atlas, Astra Seneca, AutoCAD 360, Clinical Chemistry Control, ChemSketch, Clinical Lab QC, Epidat, Pharmacology, pharmacopoeia, GeoGebra, JMP, Latex, Matlab, Mendeley, Minitab, NeuroScan, Numbers, OmniGraff, OneNote, R, SuperLab, Tesi, Visible Body Atlas Anatomy, VisualStudio.

Figure 6

Word cloud of the software used in the health sciences academic department

Discussion

There are two essential aspects that the research identifies. Firstly, we are past the days of early onboarding and office software usage. Secondly, we are now installed in an era in which software is being developed for each disciplinary field. Specialized software tends to be diverse and accompanies the specialization of disciplines in an ongoing trend where there is no end in sight. Many HEIs have been oblivious to this process resulting in zero policies addressing purchase, usage, integration, and incorporation of technology in the classrooms. Also, didactic principles have not been established to attend a progression and a systematic approach for its teaching, although we must acknowledge that little discussion in HEI has been done on how this process needs to be addressed.

The Generative Artificial Intelligence (GenAI), because of machine learning development provides a new horizon of changes and technological innovations that still needs to be discussed in depth. Therefore, every institution must lay out important discussions and reach agreements on the use of software, specialized databases, and other technological issues. By not doing so, they are opening the door for new conditions of distinction, segmentation, and inequality among HEI.

There are two primary elements of the study: (1) We are past the time of initial onboarding and office software and (2) We are now in an era in which software is developed for each disciplinary field. Specialized software tends to diversify and accompanies the specialization of disciplines. This is a continuing trend.

There is a continuity towards the future and there is no end in sight.

a. The HEIs have not noticed this process. Until now this has been invisible to the HEI and there are no policies for incorporation, purchase, use, regulation in the classroom, integration.
b. Nor have teaching mechanisms been established that provide for a progression and a systematic approach to teaching.
c. Finally, we must recognize that there has not been a transversal discussion in the HEIs to give order to this process.
d. With the development of the Generative Artificial Intelligence, a new horizon is opened to change and differential usage that we still need to treat and discuss deeply.
e. It seems unavoidable that each institution holds a discussion and reaches an agreement on the use of software and specialized databases, however, this is not a generalized situation in all institutions, generating new processes of differentiation, segmentation, and inequality between HEIs.

Implications and Conclusion

Technological change has caused an abrupt transformation in HE, unfolding new dynamics. There are at least three major changes with specific characteristics indicating that it is so far an ongoing, unspecified, and inconclusive process.

We found out that the use of software has passed through three main periods one of naïve use with the purpose of solving office problems, a more specialized era with discipline sensitive uses and one more triggered in the lock down due to the pandemic that appoints to the virtualization or *hybridization* of the instruction in HE. The three-time cycles overlap as layers taking the very the best from the latest periods to incorporate it into new environments for constant development. However, there is a lack of HE policies in all three periods, which has created problems for HEI resulting in unnecessary spending, improvisation, insufficient experience acquired, and major difficulties regarding instructional learning practices. These three historical phases, the massive use of computers and office automation software, the increasing use of specialized software, and the widely extended use of LMS and communication software to cope with the pandemic restrictions that affected schools, all show a route that could be capitalized for institutional improvement.

The initial socialization and incorporation of ICT into HE brought with it multiple software to all academic disciplines. Meanwhile, distance and online education modalities became the best solution for coping with the pandemic lockdown boosting synchronous and asynchronous communication and learning through video conferencing system applications, guided reading, LMS, social media, collaboration, and communication software.

Particularly, the use of specialized software situates HE in a different position compared to other educational levels. Thus, using basic Office software remains a task for secondary education, meanwhile learning specialized software becomes a task for the HEI, where the digital knowledge set may correlate to the needs of an academic discipline. However, ICT for academic disciplines is a subject that has not been fully explored among university scholars. Teaching basic research tools and operative systems remains equivocally central, while specialized software needs to make it to the curriculum or

descriptions of study programs. This challenge remains unattended. In our study, we were able to identify a tendency towards the use of specialized software and its expansion at HE. A review of the data indicates that, in line with Becher's findings about different academic cultures under the common roof of universities, various faculties or departments have incorporated distinct types of specialized software. These variations in specialized disciplinary software are the result of a different "digital habitus." As academic communities automate processes, create digital resources, and optimize digital problem-solving protocols, their digital culture and appropriation of specialized software will grow.

The use of accounting, office automation and, more recently, computer-aided learning software, Generative Artificial Intelligence suggests new developments in specialized software for HE. The dynamics of change discussed here are not policy-oriented or dictated by a particular rational choice. There is therefore a great deal of uncertainty and a lack of guidance by policy as there are no specific plans of development that are scientific-oriented. As chaotic as it sounds, this is the present scenario of technological change in HEI. Therefore, we need to advocate for further discussions on how to fully incorporate ICT in HEI. The use of GenAI, specific software and other technological challenges opens a more specialized perspective that is sensitive to the disciplines and professions.

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Empirical Article

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The effects of ICT on Higher Education in Mexico

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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 article analyzes how information and communication technology (ICT) has changed higher education in Mexico. While ICT has modified operations and working conditions in almost all sectors of the economy, its impact on higher education remained limited until 2019. In 2020, however, the COVID-19 pandemic led to its rapid adoption in most higher education institutions. Our analysis looks at this phenomenon from three perspectives. Using an educational perspective, we analyze how universities use ICT for teaching and learning. Before 2020, few students and teachers had embraced these technologies. Relying on organizational theory, we analyzed how the structures and rules of the game changed when institutions adapt to outside demands. In this field, research on the effects of ICT in various institutions shows that organizations can become more efficient, competitive and provide better client services. However, there is little research on whether ICT has caused an organizational change in higher education. Lastly, we use an academic capitalism perspective to ascertain how higher education institutions are knowledge-producing organizations, and how incorporating ICT can change the mode of production from a pre-capitalist to a capitalist one. This allowed us to look at how change affects who owns, manages, commercializes, and profits from knowledge. Considering changes from these perspectives, we conclude that digitalization favors ICT providers, but this however hardly benefits academic staff. At the same time, the national government is unconvinced of online teaching and has cut the budget during the pandemic. As a result, Mexican higher education will probably de-digitalize and return to traditional forms of instruction.

Keywords: ICT, digital society, knowledge production, academic capitalism, organizational change, working conditions.

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Introduction

According to social forecasters, society and the economy are moving towards new forms of organization (Harari, 2018). This new stage has received the monikers of a digital, knowledge-based, or post-modern society (Bauman, 1992). These descriptions show that knowledge is increasingly important in the economy and society. If one considers universities as knowledge factories (Enarson, 1973), it is fundamental that they adjust to new societal and economic demands (Delanty, 2001). Information and communication technology (ICT) is vital in this transition (Mokyr, 2002). According to Fuchs (2017), "ICTs are means that humans use for creating, disseminating, and consuming information about the world. The computer and networked computer systems are particular technologies that, unlike traditional media (radio, television, newspapers, etc.), allow not just the consumption of information but its production, coproduction, and dissemination." (p. 2433).

With ICT, teaching and learning could become far more efficient, dynamic, and accessible using learning platforms, MOOCs, and others (Centre for Educational Research and Innovation, 2005). These expectations have led universities and governments to invest in these technologies since the 1980s (Cuban, 2001; Oppenheimer, 2003; Ramirez & Casillas, 2014). After decades of investment, the impact of ICT on the university seemed to be disappointing (Zemsky & Massey, 2004; Ramírez & Casillas, 2014). Some universities had embraced distance education or some form of blended learning, but most continued to teach in the traditional way (Allen & Seaman, 2017). In Mexico, by 2019, only 15% of higher education students had had some experience with online classes (Statista, 2023). The COVID-19 pandemic radically changed the situation. By March 2020, all universities were in lockdown; nearly all had moved their activities online and become fully digitalized. But are these fundamental changes or temporary adjustments to a passing crisis?

This article explores the impact of ICT in Mexican universities from three analytical perspectives: educational, organizational, and academic capitalism. Each perspective focuses on distinct aspects of academic work: the process of teaching and learning, organizational arrangements, and the ownership of knowledge. Thus, analyzing the impact from different perspectives allows for a broader view of possible changes. The use of ICT may affect not only teaching and learning but also organizational structures or labor conditions.

ICT and Higher Education

Around 1980, most higher education institutions were universities that continued to work as they had for centuries (Rashdall, 1987). According to Clark (1983), the universities' existential reason is to produce and disseminate knowledge. Knowledge is intangible, but only academics possess it and can assess whether others have it, which converts academics into the dominant actors. Tribes of academics, organized around their turf of specialized knowledge, defend their territory against outsiders (Becher, 1989; Trowler, et al., 2012). Individual scholars or tribes define the curriculum, course contents, teaching methods, research agendas, and evaluations of colleagues and students. Administrators play a secondary or auxiliary role in supporting academic work. As a result, the typical organizational hierarchy was flat, and decision-making slow. Collegiate bodies made most decisions. Faculty members temporarily occupied managerial posts, with the rector or president *primus inter pares*.

These descriptions mainly applied to research universities in the US and Europe. However, Mexican higher education had several peculiarities in the 1980s. Public universities comprised most of higher education, and funding was exclusively public. Tuition fees were minimal, and entrance requirements were virtually zero. Research and graduate programs were scarce; there were few publications in international journals. Research funding and patents were practically inexistent, and collaboration with private companies was rare and seen as inappropriate. About two-thirds of the academic staff were part-time, with only undergraduate qualifications, and public universities had only a rough estimation of the number of students or hired teachers (Galaz & Gil, 2009: 21; Kent, 1993).

Under the banner of raising quality, productivity, and competitiveness, Mexican higher education has undergone many reforms since 1990. The federal government introduced evaluations and new funding mechanisms. As a result, enrollments expanded, and universities created new programs and hired more full-time academic staff (Gil, 2012; De Vries & Álvarez, 2005). A crucial aspect of these reforms has been the gradual introduction of ICT. In this study we use three theoretical perspectives. The first perspective is educational and focuses on how higher education institutions use ICT in teaching and learning. The second one looks at higher education institutions as organizations and analyzes changes in structures and rules of the game. A third perspective concerns academic capitalism, which focuses on how the modes of knowledge production in universities are changing. Each approach asks different questions and finds distinct answers.

Theoretical Framework

The Educational Perspective

The educational perspective has produced extensive literature on how institutions use ICT in teaching and learning. From this point of view, academics increasingly use ICT, but its use remains limited: most continue to teach without the help of technologies inside a classroom, while others use technologies to support blended learning (Gaebel, et al., 2014). This resistance to ICT seems strange, considering that these technologies have invaded daily (academic) life. Most universities use the Internet and intranet, have institutional websites, proclaim electronic learning environments, have electronic libraries, and more (Ramírez & Casillas, 2014).

The use of ICT should, in theory, make higher education less costly for both governments and students. However, this gain is limited because the use of ICT implies continuous upgrading and investments (Deming, et al., 2015). At the same time, not all ICT applications lead to innovations and higher productivity (Fullan & Donnelly, 2013). Most literature concludes that governments should promote ICT through public policies and investments, while universities should provide more training and support facilities for academic staff and students (Bates, 2002; Herrera, 2009). In addition, technologies must be user-friendly, sustainable, and efficient, with the support of experts in online education. The benefits of ICT can be both educational and organizational and are considered necessary because of the heightened competition in the potential global market (CERI, 2005; de Freitas & Oliver, 2005). Mexico and other developing countries consider technology-mediated teaching essential to increase enrollment (Muñoz, 2020).

Other authors are far less convinced of the positive impacts of ICT in higher education. From their point of view, institutions tend to use ICT as an enabler for already planned adjustments while, at the same time, university culture inhibits innovation (Marshall, 2010). Others point out that ICT does not fundamentally change teaching and research (Zemsky & Massey, 2004). Some even observe that most institutions continue successfully without these technologies (Cuban, 2001; Oppenheimer, 2003). Still, others have pointed out that virtual education requires self-taught skills that less qualified students have not developed, whereas elite students are reluctant to substitute face-to-face teaching (Guri-Rosenblit, 2005). Overall, the literature indicates possible gains but also pitfalls for universities. New actors –private companies- could provide courses and award degrees at lesser costs and end higher education institutions' monopoly (The Economist, 2014). However, this perspective primarily focuses on teaching methods and student learning, paying scant attention to organizational change and implications for academic staff (Orlikowski & Iacono, 2001).

Organizational Theory

Organizations must adapt to new demands and contexts to survive, changing their structures, processes, and rules (Zell, 2003). To do so, they tend to incorporate changes mimicking structures or processes from others through isomorphism (DiMaggio & Powell, 1983). Organizational studies indicate that ICT is an essential driver for innovation and change in organizations in many sectors, such as banking, health facilities, retail services, and public administration (Scott Poole & Van de Ven, 2004; Soete, 2005). Driven by recent technologies, organizations underwent mergers and acquisitions, downsizing, and outsourcing in a constant process of innovation (Fay & Lührmann, 2004). The introduction of ICT can significantly change communication and power distribution, frequently "flattening" organizational structures and hierarchies (Baker, 2007; Bruns, 2013).

However, higher education has not changed much since the introduction of ICT. Most organizational reforms have only had a limited impact on existing structures and rules or the division of labor. Most organizational changes seem peripheral: universities have created new departments or units to respond to outside demands (Clark, 1998). Overall, ICT seems to have made traditional tasks more efficient and less labor-intensive (Marshall, 2010). This exceptionalism raises the question of whether higher education remains impervious to change or that something else might be changing.

Academic Capitalism

According to academic capitalism, universities produce and reproduce knowledge through research and teaching. Over the last four decades, the mode of production has changed from a pre-capitalist to a capitalist form, and knowledge has become a commodity that can be commercialized (Slaughter & Leslie, 2001; Slaughter & Rhoades, 2009). Initially, academic capitalism centered on the increasing commercialization of research produced in universities or by university-private business collaborations (Gibbons, et al., 1994). Over time, the analysis extended to teaching and management in a new context of knowledge production under market conditions for the knowledge society (Jessop, 2017; Slaughter & Rhoades, 2009).

From this optic, academics have become laborers who no longer own their products. Instead, organizations and their managers have become the new owners, as universities become corporate actors trading services in a competitive market (Shattock, 2010; Jarvis, 2012). In many cases, ICT plays a vital role in these new strategies: once academics have put all course content online, these courses can be offered to many clients inside and outside the institution (Mora & Vieira, 2009). In that way, the advance of academic capitalism would mean that teachers would stop owning their products (classes or courses) and sell their labor to owners of the means of production, who, as owners, can trade or sell commodified knowledge to obtain surplus value. Our analysis is based on a review of governmental documents and institutional responses from 1988 to date.

Changes From Three Perspectives

Since 1990, the Mexican federal government has promoted the use of ICT in various spheres of government action, the economy, and education (SCT, 2020). Higher education institutions have sought to expand their technological infrastructure and have promoted ICT in administration, teaching, and research to variable degrees. Individuals (managers, administrators, teachers, and students) have increased, although unevenly, their access to technologies and use them in numerous ways in their personal and professional lives. We will look at these changes from the three perspectives listed.

The Educational Perspective

From the educational perspective, by 2019, e-learning was on the rise but still involved a small part of enrollments in only a few institutions. Most universities continued to operate traditionally (Ortega & Casillas, 2014). Although ICTs have entered the private life of teachers and students, teaching has not changed significantly. It is not clear why ICT had made little progress before 2020. Some publications highlighted the digital divide between rich and emerging countries and the lack of access or experience with these technologies on behalf of students and teachers (ANUIES, 2019). Others point out that ICT perpetuates the traditional model and hinders innovation due to teachers' resistance, the lack of strong leadership to promote changes, and the absence of a systematic self-improvement culture (Pérez, 2018; Fernández, 2013; Marshall, 2010).

The events during the pandemic show that internet connectivity remains a national problem and that the existing infrastructure is only available on campus (Padilla, 2022). Before the pandemic, academic staff had computers, students had access to computer labs, optic fiber facilitated broadband access, and universities had virtual classrooms. However, access to ICT required the presence of academics, students, and administrators on campus. Thus, the lockdown meant faculty and students had to transition toward distance education by personal means, working from home through private, limited connections. It stands out that this transition received little institutional support and none from the federal government.

The federal government, even the President, repeatedly insisted that public universities return to face-to-face teaching as soon as possible (Domínguez, 2022). It did not offer any support but instead continued to cut back funding. Between 2015 and 2021, the public higher education budget fell by 10.7% in real terms (Moreno & Cedillo, 2022). At the same time, enrollment continued to grow, so funding per student dropped by 23.6% (Mendoza, 2022). By 2018, households covered 31% of the expenditure at the tertiary level (OECD average: 23%) (OECD, 2019). The lack of policies or financial support also meant that the transition toward digitalization has been minimal. Faced with the emergency, most faculty simply opted to replace their presentations in front of the classroom with online meetings without changing their courses' contents, schedules, or logic. From an educational perspective, very little changed during the pandemic.

The Organizational Perspective

The reforms enacted by the federal government after 1990 prioritized management reform and created several special funds to invest in improving infrastructure (Moreno, 2014). Institutional management started to gain administrative control over academic staff and students. Universities acquired administrative software for student and staff administration, planning, salary and tax payments, and accountability (Didriksson & Herrera, 2002). By 2019, most public universities had their administration completely automatized (ANUIES, 2019). ICT has been crucial in the federal government's evaluation programs since 1990. The first merit payment schemes, such as the National System of Researchers (SNI), created in 1984, relied on researchers submitting boxes full of photocopies, but researchers now report their activities online with scanned evidence. Similarly, all special federal programs, where public institutions submit funding proposals, moved from paper to digital, which allowed the federal government to construe national databases on courses, academic staff, students, and finances (Rubio, 2006).

By 2019, almost all administrative tasks had been automatized, digitalized, and dependent on ICT. Computers are everywhere and connected to the Internet. All personnel and most students had institutional email accounts, cell phones, and laptops or computers. However, from an organizational perspective, university structures have changed little. Current universities continue to have faculties, centers, institutes, and departments for teaching and research and a variety of administrative offices. While formal structures have changed little, the inner workings of most administrative offices have changed significantly. Departments such as student administration or human resources have moved from manual workers that receive and archive paper documents to personnel who design online formats, organize databases, and produce reports. This new type of personnel tends to have a university degree and, in many universities (public and private), receive higher wages than full professors (Muñoz, 2019a).

Additionally, most universities have set up special offices or units for e-learning and educational technology. These new offices employ administrators and experts in ICT or instructional design, not teachers. However, they tend to be small (10-20 employees) and fit within the existing structures and legislation as administrative units that provide services to academic departments or faculties (ANUIES, 2019). Regarding research, changes have occurred in how knowledge is produced and communicated. Internet searches replace consultation in physical libraries, and experimental and social sciences incorporate modern technologies and artificial intelligence. Publications circulate faster through Open Access and Creative Commons licenses, as pre-prints and post-prints. Knowledge is produced, distributed, and accumulated at an increasing speed, and competition and collaboration between research groups are greater. These are organizational changes at the bottom of the institutions.

On the contrary, teaching continues in its centuries-old mold, with professors dictating lectures in front of classrooms and students taking handwritten notes (De Garay, 2005). This dynamic did not change during the pandemic: teachers now dictate the same classes online. The organizational rules of the game have changed little. For example, most universities evaluate and pay academic staff based on their teaching load, expressed in the number of hours in front of a classroom. It is still common in many universities to check attendance with (now digital) time punch clocks. Student evaluations also stress physical presence –with checklists- and many rules and regulations still state that students must attend at least 80% of classes to be allowed to present exams. There has been a change in the balance of power: university bureaucracies oversee the different evaluation and rewarding systems, present proposals to the government, implement policies, and present accounting reports. The balance has changed from one where bureaucracy had an auxiliary function to one where bureaucracy administers and surveils academic staff using ICT (Muñoz, 2019b).

The Academic Capitalism Perspective

Regarding academic capitalism, Mexico has seen a different dynamic than other countries. As Slaughter and Leslie (1997) observed, research universities have primarily commodified research through projects collaborating with or for industry (Gibbons, et al., 1994), obtaining patents, licensing them, or directly selling products. However, very few Mexican universities have found commercial value in their research, although they have been able to distribute it by digitizing it and publishing it online. Since the 1980s, the Mexican government introduced merit-pay programs that reward researchers for the number of publications in indexed and refereed journals and books (Galaz & Gil, 2013). Public programs even offer to pay the fees publishers charge. In the process, most researchers must cede their property rights. Once published, the government, universities, or even researchers must pay subscription fees to access these publications. An essential part of the public research budget (always less than 1% of GDP) goes to payments to researchers and publishers.

So, more than true capitalism, where researchers sell their goods to consumers, it is a market where researchers, institutions, and the government pay for research publications in return for prestige and merit payments. In this market, researchers act as a peculiar type of "prosumers" (Fuchs, 2013): they produce what they later consume to gain academic relations, public visibility, more citations, and economic incentives. As Brunner et al. (2019) and Fernández (2009) have pointed out, research had never developed much in Latin American or Mexican higher education, leaving little opportunity to commodify and commercialize research findings. Most universities are dedicated primarily to teaching. As a result, the theory of academic capitalism did not seem to have much explicatory power and encountered little response from researchers in Latin America (Brunner et al., 2019).

Capitalism and Commodification

In many countries, universities are gradually discovering that digitization permits better surveillance of teachers, a nearly costless reproduction and circulation of online courses, and attending more students who will continue to pay full fees and tuition (Agasisti & Catalano, 2006; Agasisti & Johnes, 2010). Additionally, once a full-time professor has designed

and digitized a course, the university can hire a part-time teacher for the job. Finally, the university can continue to function online during a pandemic or thereafter. Crucial in this process is the commodification of teaching materials, courses and programs, scientific research and publications, and the new definition of intellectual property rights (Perelman 2002). ICT has contributed to the commodification of knowledge and put ownership in dispute. The COVID-19 pandemic rapidly moved towards online teaching, and universities contracted Learning Management Systems (LMS) and other software. LMS registers content, learning objectives, activities, readings, teaching and evaluation methods, interaction, student satisfaction surveys, grades, and the underlying evidence.

The process of converting knowledge into a commodity depends highly on ICT. Once knowledge is digitized and put on platforms, it ceases to be owned by the producer and becomes the employer's or the ICT developer's property (Jessop, 2017). The owner can reproduce it almost without additional cost and sell or trade it to clients or consumers. As to teaching, the first step toward academic capitalism in Mexico has been the rise of the private sector. Private institutions started to appear in the 1980s but expanded from the 1990s onward. By 1990, they attended 17% of enrollments; by 2019, 35% (OECD, 2019). Current legislation excludes private institutions from public funding, save for some research projects and scholarships for post-graduate programs. Therefore, their survival and success depend on attracting students willing and able to pay tuition fees and other services, such as parking fees, restaurants, shops, or on-campus housing. Likewise, several public universities own gas stations, pharmacies, and soccer clubs.

Academic capitalism advanced when private universities started to create campuses around the country and when (national and international) corporations began to buy up existing institutions. The fact that universities can freely buy others or be purchased indicates that these institutions operate in an almost unregulated market. Although legislation prohibits for-profit higher education, most private universities generate revenues for their stakeholders. Particularly in the private sector, universities adopt commercial criteria in decision-making and try to increase revenue by reducing costs or increasing sales and incurring financial risk management. Prominent private universities have successfully negotiated land grants from state governors to install branch campuses. Furthermore, branding has become a feature for several private universities, while some public universities seek to stand out in national and international rankings (Álvarez & González, 2017; De Garay, 2017).

The next step would be a capitalist market economy in education and research, raising capital from financial and commercial markets, not only from revenues such as tuition. This stage is not reached yet and is perhaps unlikely to occur, at least not in the public sector. According to Marginson (2013: 353): "… no country has established a bona fide economic market in the first-degree education of domestic students. No research university is driven by shareholders, profit, market share, allocative efficiency, or the commodity form." While Marginson may have a point regarding public or publicly funded universities, by 2019, many private universities had evolved into profit-maximizing enterprises or corporate universities (Waks, 2004; De Garay, 2017; Silas, 2013). These universities have shareholders (the Laureate Corporation owns a network of universities in Mexico), charge tuition fees that fully cover costs, permanently seek to increase their market share (by marketing or buying out the competition), and sell online courses, particularly at the graduate level. By 2018, private universities enrolled 69% of master's students (compared to 32% of undergraduate students) and offered 67% of distance education programs nationally (OECD, 2018). Moving courses online allows these universities to hire part-time faculty. The combination of corporatization and oligopolization has led to the second stage of academic capitalism (Álvarez & Morales, 2019).

The commodification of courses is also one of the ways to extract profits from private institutions. For example, Laureate International owns courses and educational models for which it charges high fees to its national affiliates to get earnings in countries where private institutions are not allowed to do that. Course content on learning platforms will enable owners to buy or sell it. It even makes buying or selling complete institutions with their operating licenses and course contents possible, as Laureate announced in Mexico in 2020. In the public sector, changes have been minor. Although universities charge tuition, the income from this source is less than 10%. Public institutions depend more than 90% on public revenues; salaries are federally controlled. In the public sector, student demand still exceeds institutional capacity. Previous federal governments introduced semi-market funds to encourage enrollment growth, but the current government has canceled these. Thus, most institutions do not seek to enroll more students, and given the recently legislated gratuity and austerity policies, public institutions lack incentives to grow. However, even in the public sector, government and universities look at what courses have demand or might spur additional (public) funding (Mendoza, 2018). As a result, university governance has become less collegial and more dependent on managers and financial professionals, combined with outsourcing and hiring consultants (López, 2003).

In the public sector, the commodification of teaching played a very marginal role until 2019. The digitization of lectures and teaching materials during the COVID pandemic has been only partial: most teachers started communicating with students online without using Learning Management Platforms. The public sector is subject to contradictory policies. On the one hand, as soon as the pandemic subdued, the national government and institutions discouraged online lectures and stressed the physical presence of academics and students (Domínguez, 2022). On the other, the evaluation of teaching online generates controversies in most public universities, especially in the case of merit pay policies (Piña & Bohn, 2014).

Even so, there are recent examples of commodification in the public sector in Mexico. For instance, in May 2019, Claudia Sheinbaum, governor of Mexico City, announced the opening of a new public higher education institution to attend students that existing public universities could not admit. The new institution offers undergraduate courses, which existing public universities such as the UNAM, the IPN, Colegio de México, and UAM have designed (Forbes, 2019). Likewise, by the end of the first semester of 2020, public university rectors announced that most courses would be online by the second semester of 2020 (PULSO, 2020) and encouraged teachers to migrate their courses to Learning Management Platforms. However, universities, like the Benemérita Universidad Autónoma de Puebla (BUAP), clearly stated that: "After elaborating the online content of the program, the teacher must sign a waiver that cedes all property rights of the course contents to the university." (BUAP, 2020).

These changes open the path to new university business models. Students can take their courses partially online with providers of Massive Open Online Courses (MOOCs) or with universities, and these courses are freely available online. The newly created public university in Mexico City allows students to take all or most of their courses online without tuition and obtain credits and a degree from two public universities. However, digitizing knowledge also means that intellectual or academic labor becomes a product with a new owner, subject to commercial considerations, and academics become knowledge workers.

ICT Dependency

In Mexico, universities have become dependent on outside ICT providers. All major Mexican universities now have licensing agreements with ICT providers, plus contracts for specific software products that support electronic databases and publications, communication platforms, LMS, entrance exams, human resources management, broadband connections, or power supply. It is hard to estimate the costs involved, as universities register these expenses in distinct parts of their budget. Before the pandemic (2015), US universities' data estimated IT costs on average around 4.2% of the total annual budget, of which 80% is spent on operational costs, about 13 percent on incremental changes, and about 5 percent on non-incremental changes. No institution type spends more than 8 percent of its technology budget on transformative projects (Kim, 2016). Only 10% of the IT budget goes to educational technology (Dahlstrom, 2015).

In the case of Mexican public universities, the costs were probably higher, at least while the special financing programs that the federal government introduced at the start of the 1990s lasted. Those special funding programs represented 10 to 20 percent of universities' budgets and were spent mainly on technological infrastructure (Tuirán, 2011). However, those special funds began to dwindle under the previous government and have disappeared under the current one. Recent reports by ANUIES show that the budget allocated to the units in charge of ICT in higher education institutions, without considering salaries, hardware, software, or infrastructure, drastically decreased by 48.91% between 2019 and 2021. This last year showed, in comparison with 2020, a short recovery due to spending on face-to-face teaching. But the percentage of the budget allocated to ICT is only 1.53% (ANUIES 2019; ANUIES 2021).

Nevertheless, recent developments, accelerated by the COVID-19 pandemic, suggest that these investments may have increased significantly since 2020. Most Mexican universities signed contracts with companies that sell learning platforms or offer Internet conferences (Casanova & González, 2022). The cost of these contracts can be considerable. "According to investment intelligence firm HolonIQ, the first half of 2020 was the second-largest half year for global edtech investment — at $4.5 billion — three times greater than the average 6-months of VC investment during the prior decade. Much of this investment is focused on higher education and its intersection with the workforce" (Gallagher & Palmer, 2020). Videoconferencing platforms saw an impressive rise in users and revenue. For example: "Zoom generated $2.6 billion in revenue in 2020, a 317% increase year-over-year" (Sadler, 2021). This amount suggests that most Mexican universities have invested considerably. Likewise, academic staff and students had to make personal investments. During the pandemic, they had to work from their personal computers or cellphone and pay for their internet connection.

This dependency creates a new form of academic capitalism. In its original conception, academic capitalism signaled that the academic staff at research universities started selling knowledge as commodities to society or industry, which allowed them and universities to profit. However, recently higher education has become a consumer of knowledge

and technology and has grown dependent on these technologies. As it seems, most universities currently buy more knowledge than they sell, and outside ICT providers make part of the profits. In practice, the users, or "prosumers" of ICT (institutions, academics, and students), are the ones that generate research and course content they later consume, which is gathered and commodified by ICT companies that charge high fees for their services.

Implications and Conclusions

The transition towards online education occurred without government policies and with little institutional support. The rapid transition depended on the individual initiatives of students and academic staff, who moved from the classroom to the Internet to communicate. From an educational point of view, this transition did not alter course content or organization. The transition relied almost entirely on individual efforts, with little institutional or government support. Online courses are cheaper and could improve through better training, equipment, and internet connection. However, most involved prefer in-class teaching and learning to regain social interaction. From this perspective, teaching and learning will probably de-digitalize.

From the organizational perspective, it stands out that university administration has become automized and that digital infrastructure has improved. During the pandemic, meetings and documentation continued online. However, most infrastructure is only accessible on campus, and as the pandemic subdues, administrators seem eager to return to deeply rooted bureaucratic procedures. Meetings require the physical presence of participants, paper has reappeared, and all documents need to be rubber-stamped and signed with a blue ballpoint. Academic capitalism offers a novel perspective. The move towards online education and the digitalization of teaching material raises the question of who owns course content. Before the pandemic, universities left course content to teachers' discretion, but during the pandemic, they started to claim online materials as their property. As a result, course content and entire (private) universities could now be bought and sold. However, it also implies that teachers lack any incentive to elaborate course content, digitalize it, and put it online.

Finally, the digitalization of teaching, research, and administration during the pandemic increased ICT dependency and reliance on for-profit ICT developers, the cost of which was borne by institutions and individuals. The federal government never offered financial support for digitalization and practically cut the infrastructure and operational costs budget. In turn, ICT providers started to make part of the profits. To conclude, ICT has penetrated all spheres of universities. The classroom was the last area of the university where ICT had not wholly entered, but the pandemic rapidly changed this. Although digitalization offers promises, it also entails critical costs, profits, and ownership pitfalls. Under current conditions in Mexico, academic staff would be the losing party. That might explain why almost all want to return to pre-pandemic times and de-digitalize higher education.

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