

## **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**

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### **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

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### **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 à 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 & Williams-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 learning 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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