

Digitalization of German Higher Education and the Role of Europe

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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).

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 Digitalisierung” (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 HFD 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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