DOI: 10.26650/B/SS46.2020.006.12

THE COVID-19 PANDEMIC AND THE DIGITAL TRANSFORMATION IN TURKISH HIGHER EDUCATION: AN EVALUATION FROM THE PERSPECTIVE OF INDUSTRY 4.0 AND SOCIETY 5.0

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Abstract

Due to the Covid-19 pandemic, all Turkish universities switched to an online education system in the spring semester of 2019–2020 following the decision of the Council of Higher Education (CoHE). With the participation of the President of the CoHE, the Interuniversity Board meeting was held on May 14, 2020, and following the discussions that took place, university senates decided that the 2020–2021 fall term could be continued online, as is happening in some universities in developed countries. In fact, distance education programs for associate, bachelor's, and master's degrees have already been provided at some universities in Turkey. In this study, a model compatible with the new generation digital university concept has been developed, the digital readiness of universities has been evaluated through web pages (4.1 out of 10 points), a digitalization index has been developed, and a digital university road map has been proposed.

Keywords: COVID-19 pandemic, digital transformation, turkey, higher education

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Introduction: University 4.0

Turkish universities, from March 16, 2020, took a break from education following the decision of the Council of Higher Education (CoHE) and then agreed to continue education online. For about a month, universities tried out different options such as uploading textbooks (notes) and presentations to learning management systems, uploading asynchronous videos, and giving live lectures. At the moment, a significant number of lectures are being held live in many universities. However, there are no statistics to date about how online education is being implemented across the country. It is likely that the spring semester 2019/2020 will proceed on a trial and error basis, and in the next academic year, online education will become significantly more stable across institutions.

In fact, continuing education centers (CECs) in some universities have been delivering certificate programs through online education for some time. There is a much longer history of CECs training online in developed countries. However, technological advances were not used in diploma education even at CECs level because university professors insisted on traditional methods of teaching in a classroom environment for various reasons.

Over the last 20 years in Turkish universities, although they have different release dates, various learning management systems such as Moodle, Blackboard, Microsoft Teams, Adobe Connect, Canvas, Google Classroom, Zoom, and TeamLink have been enabling online education at an institutional level as well as on an individual level (Elton, 1999; Moodle, 2020; Setzekorn, 2020). Again, Skype, WhatsApp, Viber, and similar programs have made not only university students but also people from all walks of life familiar with holding live conferences outside of telephone communication. Educated and uneducated people from all sectors of society use these technological facilities effectively and widely. This goes beyond simply creating awareness about using technology and looks specifically at outcomes related to technology.

If the application of new technologies in education is so easy and effective, why have universities and faculties not yet followed this trend? The answer to this question lies in the fact that national regulatory authorities such as MoNE and CoHE, institutional organizers such as senates, and main beneficiaries such as students prefer traditional ways of working for various reasons. And most importantly, faculty members prefer to use traditional classroom methods. It is possible to say that online education, which has been carried out in a mainly unsystematic way but has started to be conducted using hybrid methods in all universities since April, is much more transparent and accountable than the traditional methods in terms of providing corporate governance principles.

The impact of today's epidemic may be substantially lost if the opportunities provided by online education environments are abandoned and there is a return to traditional methods. If online education will not be embedded in traditional education, this will mean missing the digital age and being too late. In daily chats and findings, it is frequently mentioned that everyone can easily access everything via Google or YouTube and all information is available on the Internet. Today, it is important to provide the student with the ability to both access and acquire knowledge systematically, and to provide guidance and coaching to the student in this regard.

Learning outcomes according to the syllabus reflect the university's commitment to bring in students. However, it should be noted that more transparency and accountability are now required to ensure the quality of the lecturers, the course material, and the assessment methods and content. In terms of quality assurance and accreditation, it is possible to make adequate evaluations and judgments of the course and lecturers on the university website, program, and course without visiting the university in person.

The Development of the University as an Institution

According to the generally accepted view, the first university in the world was Karaviyyin University, which was founded in 859 in Morocco. Then, in 972, Al-Azhar University was established, in 1067, Nizamiye Madrasahs was formed, and then in 1088, Bologna University was established. The establishment of all other universities in Europe happened later (Toprak et al., 2020).

Today, Anglo-Saxon and Continental European models stand out in university education. The developed university model in Far-Eastern countries also has a significantly Anglo-Saxon character. In the Anglo-Saxon model, all stakeholders in the institution are actively involved in decision-making, implementation, and review processes. The Continental European tradition also follows this path along the lines of the Bologna Process. Turkey is trying to achieve higher education reform using mechanisms and tools developed as part of the Bologna Process. The aim of the European Union to achieve a knowledge society is the focus of university reform (Canton et al., 2001). Vocational education standards, quality assurance, recognition of prior learning, adult education, and establishing a lifelong learning paradigm (Toprak & Erdoğan, 2012) as part of an inclusive framework have important implications not just for vocational education but also for higher education. After the economic crises of previous years, we now face an increasingly strong need for reform in vocational education and university provision is also in the spotlight (Jordan & Picciano, 2020).

University institutions have undergone various transformations and diversifications since their inception. Depending on the conditions in the country or region where the university is located, functions are prioritized differently among institutions. The need to update the organizational structure as required by the university's targets is not often declared, but it is assumed that defining the mission and functions will generate an automatic organizational restructuring and functioning. According to different priorities, the institution of the university has evolved as follows (Schuller, 1995; Toprak et al., 2020).

It is possible to identify four different paradigms in the chronological development process. Firstly, the first-generation university that serves a limited number of elite people who perform a profession, where teaching is limited to certain areas, and where education is the main focus (e.g., the University of Bologna). Secondly, there is the second-generation university (for example, Humboldt University), where research is as prominent as education, teaching is performed using national languages, and the title of scientist is dominant. Thirdly, universities whose functions have started to include a social service dimension, educating and training in human resources for economic sectors, strengthening English as the language of education and research, forming the current classical university organs, and the participation of external stakeholders in the processes (e.g., the University of Cambridge) become essential.

Fourthly, there is a new governance model for universities, in which there is integration with industries. Here knowledge production is principally based on R&D and project management, digital networks are used effectively in education, research, and product development, and full-time single-workplace functioning is considered ineffective and flexible in this context. This university model is called university 4.0 or the digital university and applies to many leading universities in the USA, UK, and Continental Europe. University 4.0 aims at digitalization and the digital campus in terms of organization, where it aims for collaboration and coordination in education and training, research, and community services among external stakeholders (Loveless, 2017). Advanced analytics and cloud-based IT are widely used as part of this concept.

University 4.0 or the Digital University

Many institutions in Turkey, especially the Presidency of the country and the CoHE add the words "new" and "digital" at the beginning of their names, and in so doing, they imply that they have captured the era or even that they are leading the way. Indeed, the number of services accessed through e-government is increasing day by day. The typical dimensions of University 4.0 or the digital university can be listed as follows (PWC, 2018; M. Toprak et al., 2020):

- The university constructs its organization and governance model as an integral element of the environment in which it is located.
- Stakeholder consensus is assured as regards the inclusion of new jobs and new skills in the curriculum.
- Commercialization is the cornerstone of education, research, and implementation.
- Informal learning and both nonformal and formal education are recognized for those in receipt of a diploma or certificate to keep them up to date throughout their lives.
- The university is a resource for entrepreneurial and innovative human capital and research infrastructure as part of its ecosystem.
- Through applied education, entrepreneurship, innovation, and leadership skills are developed by integrating education, research, and practice.
- Thanks to applied education, graduates need less in-service training when they start their working life.
- Thanks to digitalization, transparency and accountability principles are applied more effectively.
- Prominent competencies in a digital university are design (innovative thinking, multi-dimensional thinking), algorithm and coding (information and communication technologies), cloud computing (database analysis), project/process design and management, product-based R&D: idea-to-product process (patents, trademarks, licenses), entrepreneurship (preparation for business), leadership and inclination to innovation, local/regional/national development (clusters/company analysis in industrial areas), digital media tool design and content production, and quality assurance.

Society 5.0 or the Digital Society

Society 5.0 can be defined as a human-centered society that finds balanced solutions to social problems and economic development through a system that integrates cyberspace and physical space. Society 5.0 is a concept with more synthetic and eclectic content that follows the previous four descriptions of society. Societies have been structured in the following way: hunter and gatherer society (Society 1.0), agricultural society (Society 2.0), industrial society (Society 3.0), and information society (Society 4.0) throughout history (Cabinet Office, 2020; M. Toprak, 2018).

The Industry 4.0 concept of the Germans has manifested as Society 5.0 in Japan. Maintaining its position as a democracy and a competitive financial champion of the Far East, Japan has, for a long time, been developing its standing under the Society 5.0 umbrella to correct the deterioration in the quality and level of its economic growth. In the period 1980–2019, Japan experienced a steadily lower average growth due to three global and regional economic crises, and economic growth increasingly fluctuated. Japan aims to put this trend in economic growth on a new footing with an overall program to meet its social and economic needs.

The economic growth trend of Japan has shown a continuous weakening in terms of both the Japanese Yen and the US Dollar since the 1980s to date. Between 1980-1991, 1992-2007 and 2008-2019 periods, economic growth decreased and fluctuation in growth increased. The growth and fluctuation indicators calculated in US Dollars are higher than the indicators in national currency. Therefore, it can be said that the economic performance of Japan after 1980 was ringing alarm bells and such a situation triggered Community 5.0 (Table 1).

Table 1. Economic growth level and volatility in Japan

	1980–1991			1992–2007			2008–2019		
	Average	Standard deviation	Coefficient of variation	**Average**	Standard deviation	Coefficient of variation	**Average**	Standard deviation	Coefficient of variation
In terms of Japanese Yen, constant prices, % change	**4.4**	1.0	22.6	**1.2**	1.2	101.8	**0.6**	2.2	380.4
In terms of USD, current prices, % change	**12.1**	14.2	117.1	**1.8**	8.9	481.6	**1.5**	8.4	570.5

Source: IMF database

Japan is aiming for a more radical transformation than the industrialized world has ever seen. Japan defines the "Society 5.0" initiative as a determined effort to create a new social contract and economic model by fully integrating the technological innovations of the fourth industrial revolution. It envisages these innovations to be at the heart of its aging society. Japan has the vision of creating a "super smart" society that will serve as a roadmap for the world.

Big data analysis, artificial intelligence applications, cybersecurity, Internet of things, robotics solutions, Industry 4.0, virtual reality, and augmented reality bring about radical changes in both economic and social life in the context of Society 5.0. To successfully carry

out this trend of structural change, the government, the private sector, and NGOs need to cooperate and work together in a coordinated way where necessary (NCPPHE, 2008; Weber, 2005). All actors and stakeholders in the ecosystem are expected to be effective in decision-making, implementation, and review processes. The motto of Society 5.0 is a "human-centered society." Advanced technology opportunities are expected to contribute to individual and social development and to economic growth.

In this regard, universities, the ministry for digital transformation, techno-centers, technology transfer offices, R&D and project funds, research infrastructures, research and project organizations outside the university, vocational high schools, and science high schools should all be designated as actors in the "science and technology research ecosystem" of Society 5.0. Currently, the Presidential Digital Transformation Office can act as an additional point of coordination at the country level.

Society 5.0 and University Education

Society 5.0 provides a high degree of convergence between cyberspace (virtual space) and physical space (real space). In Community 4.0, people access a cloud service (databases) in cyberspace over the Internet and analyze it by searching for information or data. However, in Industry 4.0, people, objects and systems are all interconnected in cyberspace. In Society 5.0, a lot of information accumulates in cyberspace from sensors in the physical space. In cyberspace, these big data are analyzed by artificial intelligence (AI), and the results of the analysis are transmitted to people in the physical space in various ways, for example through feedback. The collection and evaluation of AI are beyond human capacity. For example, stock market and financial education, medical education, and applied teaching and learning techniques in classroom teaching provide the most effective examples for the student and teacher through AI.

CO-OP Education or Collaborative Learning

In the university model required by Industry 4.0 or Society 5.0, concepts such as joint education, cooperative education, integrated learning, sandwich learning, internship, experience-based learning, and work-integrated learning come to the fore. From this perspective, the hierarchical structuring of the university, for example, the sub-discipline - major discipline - program (department) - deanery - rectorate, and the managerial decision-making bodies such as the program board - faculty board - university senate and the executive board need to be either redesigned or new parallel organizational and functional units and committees need to be incorporated into the existing architecture (Figure 1).

The concept of University 4.0 requires some new organizational and functional updating in the current structure. A new organizational and functional architectural design that does not require any changes to higher education law is presented below (Toprak et al., 2020; Yuan & Powel, 2013).

Figure 1. University 4.0: Organizational and functional architecture
Source: Toprak et al., 2019.
Note. In the case of a public university, there will be no board of trustees, and new generation offices and committees will be linked to the "University Ecosystem Consultation and Steering Committee."

Solution Partnerships

The university has an integrated approach with other elements of its ecosystem. Society 5.0 or Industry 4.0 approaches anticipate the active participation of related stakeholders in the routine functioning of the university as regards to the education, research, project, and implementation processes. It will not be possible for the university to operate in harmony with social structures as part of an integrated approach, just by its own means. Therefore, it will be necessary to establish the following partnerships with the relevant stakeholders: (i) Classroom, (ii) Laboratory, (iii) Multimedia laboratory, (iv) Foreign language, (v) Workshop, (vi) Application (workplace: "industry"), (vii) Skill development (workplace: university garage/hangar), (viii) Employment, (ix) Project development, (x) Product and service development, (xi) R&D and innovation, (xii) Curriculum update and program development, (xiii) Vocational Qualifications Authority standards and competencies, (xiv) 21st-century skills, (xv) National and global network design and management, (xvi) Entrepreneurship and

leadership, (xvii) Publishing development, (xviii) Equal opportunities and ethical issues, (xix) Disadvantaged persons and groups (xx) Digital agenda, (xxi) Quality assurance and accreditation, and (xxii) Internal controls and audits (Toprak et al., 2020).

The Difference in Initial Endowment and Institutional Level Policy Framework

With an increasing number of students in foundation (nonprofit private) universities in Turkey, a problem has become increasingly evident. Before the establishment of foundation universities, and then in the following years when there were only a few in existence, students who settled at university had a very homogeneous experience in terms of knowledge and competence levels required for university. However, after the increase in foundation universities and the opening of state universities in all provinces, as regards the programs that offer placements without a base score or ranking, the knowledge and competency levels of the students are mostly below the level sufficient to start education in those programs. Again, in foundation universities, there can be great differences in the levels of knowledge and competence between students studying through a scholarship and those paying a fee.

Currently, universities do not have an institutional policy to address this initial difference in ability among students who are placed in the same program and have large differences in settlement scores. The elimination of the difference in the initial endowment is left to the student and the lecturer individually. However, in the quality assurance and accreditation processes, inadequacies in the inadequacy of the endowment required to study on the program, and the institutional level policy framework designed to eliminate these shortcomings, should be examined to take into account those students who are placed in the same class but have great differences in terms of aptitude. The policy framework will have a supportive and a compensatory approach to addressing the deficiencies both before starting education and during the program.

Occupational standards are set by the Vocational Qualifications Authority (VQA) after extensive consultation with the active participation of stakeholders. Therefore, it will be an important step for education curricula to include VQA vocational standards and to take part in diploma programs on a certificate basis whenever possible. It can also be said that the inclusion of concept and branded courses in the curriculum will bring a new perspective in terms of important innovation and accreditation. For example, Microsoft Academy offers many courses in IT. Upon successful completion of these courses, students will succeed in the courses in the diploma program, and additionally, they will have an internationally valid Microsoft achievement certificate. The design and standards of the courses for those concepts

prioritized by the university can be seen as an innovation in terms of quality assurance and accreditation.

With the design and operation of the new generation university according to Industry 4.0 or Society 5.0 perspectives, a university can offer various graduate competencies, as well as general university education in terms of provision in line with international standards. In particular, it is vital in terms of the effective use of English as well as the national language in university education. Furthermore, access to resources, communication with the international community in relation to the profession, completing updates, and exhibiting competence in international labor markets are all equally important. It can be said that the main feature of the new generation university is the effective use of English. Although effective communication can be achieved through online translation, the direct use of English in undergraduate, and especially postgraduate level, education and research is critical to human capital being used effectively.

Due to the spread of quarantine and curfews as a result of Covid-19, jobs in both public and private businesses have started to be carried out substantially from home. This trend revealed that a model, which was mostly used in daily conversations, had a significant response in practice. Many online surveys conducted during the quarantine and curfew show that most office work and desk jobs (at least 50%) can be carried out remotely in line with the possibilities of technology.

Unfortunately, in many universities and programs, the instructor does not allow the course to be recorded by the students. Moreover, the students are not provided with the lecture notes and presentations, the lecturer reads line by line from the course material, and does not upload the course syllabus to the university's learning management system. Many lectures are in the form of monologues and the lecturers do not comply with the office hours. Even if they meet with students, they do not conduct effective interviews. Instead, of an accountable faculty member or institution, an approach that evaluates the student only in exams still predominates.

In practice, most of the institutional policies in the foundation universities that will help to eliminate the level differences among students have not been developed. Instead, the differences between students at admission continue until graduation, and the exams are far from being a proper measure. Additionally, it is not taken into consideration whether the student has reached key learning outcomes. Easing the levels for the issuing of diplomas guarantees future prospective students. It is now urgent to develop policy at a national level to tackle these problems (Staat, 2020).

Through online training, it may be possible for lecturers to guide those students who have not achieved the required level of knowledge and competence by allocating extra time. It can be said that the concept of customized education is more possible through online provision (Kang, Shin & Cimasko, 2020; Kyei-Blankson, Ntuli & Blankson, 2020). Again, with applied and group-based education models, the possibility of gaining competencies will increase, and the interactive learning of students in the group will also rise.

Quality Assurance and Accreditation

Online platforms are an indispensable component in the digital university. The student or participant (within the framework of lifelong learning) should have easy and efficient access to synchronous or asynchronous videos, presentations, syllabus forms, meetings with their instructors, and self-learning materials and guides outside the face-to-face classroom environment.

All of the existing quality assurance and accreditation standards and metrics can also be applied to the digital university. In addition, there is a need to assess whether digital platforms meet the standards of traditional provision (Milakovich & Wise, 2019). Active participation of stakeholders in the processes and interaction among stakeholders as required by Society 5.0 will also become a dimension of quality assurance and accreditation. Issues regarding the recognition of prior learning and the equivalence of qualifications will also be important as regards quality assurance and accreditation. The university will need to define and construct detailed and evidence-based mechanisms and tools in terms of recognition and equivalence.

Universities such as Stanford, Harvard, Michigan, California, Yale, Duke, UC San Diego, Princeton, UC Berkeley, MIT, Johns Hopkins, Washington, Virginia, Toronto, and virtual platforms and institutions such as LinkedIn, Coursera, Udemy, edX, Skillshare, Udacity, Creative Live, IBM, Microsoft Learn, Microsoft, Khan Academy, TedEd, and Alison offer certificates to those who have completed free courses related to 21st-century skills. New skills for new jobs are the most important agenda item in the human resources policy of many institutions (Acemoglu & Autor, 2010; Knyazeva, 2016; Tong, Standen & Sotiriou, 2018). The qualifications of students who have obtained a certificate of achievement from courses related to new skills should be recognized and the corresponding course should be replaced with this recognized qualification.

There are many professional and private organizations accrediting online diploma and certificate programs in developed countries, especially in the USA. At an institutional level, aspects such as the adequacy of the infrastructure of the campus, academic programs, financial

soundness, resource adequacy, and the adequacy of the governance model need to be evaluated. In program accreditation, traditional quality assurance and accreditation criteria need to be evaluated, and the adequacy and consistency of online resources and operating models have to be scored. For example, the Distance Education Accrediting Commission (DEAC) in the USA is a private, nonprofit accreditation organization established in 1926. DEAC can accredit all online programs from high school to professional doctoral level (DEAC, 2020).

Outbreaks such as Covid-19 will have negative consequences on the financial structures of universities in the medium term (Bothwell, 2020). The latest pandemic has made it compulsory for universities to consider online platforms as an integral part of their systems. Academics and academic administrators who are concerned about the need for change brought about by the pandemic need to recognize that they need to redesign the education system and implement an updated operating and governance model. This is not going to be a temporary situation.

The purpose of university buildings, classrooms, laboratories, and project workshops need to be reexamined. It is necessary to redesign the curriculum from the point of view of theoretical courses, laboratories, application, and projects and to reconstruct the concept of the applied course in terms of all courses. It is clear that this new setup will be practice-oriented and technology-intensive. This style of university education will increase the cost overall and enforce the concept of solution partnership with the relevant stakeholders. It will also reduce the cost of in-service training by enabling graduates to be ready for the labor market (Welsh Government, 2013; Rakovska, Pavlin & Melink, 2012).

Digitalization Index For Universities

The European Commission publishes the digital economy and society index (DESI). DESI has five dimensions: (i) Connection (fixed broadband, mobile broadband, fast and ultra-fast broadband, and prices); (ii) Human capital (Internet user skills and advanced skills); (iii) Internet use (citizens' use of Internet services and online transactions); (iv) Integration of digital technology (digitalization of the business world and e-commerce); (v) Digital public services (e-government and e-health). Finland, Sweden, the Netherlands, and Denmark are the highest performers, while Bulgaria, Romania, and Greece are the lowest. Turkey is not an EU member so there is no opportunity for comparison.

According to the study by BBVA Research organization, Turkey's digitization score is 50 points out of 100 in 99 countries (BBVA Research, 2019). Turkey's digitization rank is 61. It is clear that this rate is quite inadequate.

According to IMD, Turkey's 2019 score in digital competitiveness is 52, and it is at the same level as in 2015 (IMD, 2019). There are three dimensions in the IMD index: knowledge (talent, education and training, and scientific concentration), technology (regulatory framework, capital, and technological framework) and readiness for the future (adaptive attitudes, business agility, and IT integration).

In this study, while calculating the digitization index or digital readiness performance, a four-step approach was followed: digitization, digitalization, digital transformation, and digital readiness. From a digital readiness perspective, Industry 4.0 or Society 5.0 approaches can also be described as a digital revolution.

While digitization is the transfer of information from the physical environment to a digital environment, digitalization is the processing of the information in the digital environment and the strengthening of the business processes.

The fundamental and accelerated transformation of business activities, processes, competencies, and models is what is meant by digital transformation. Digital transformation aims to take full advantage of most of the changes and opportunities of digital technologies through a strategic and prioritized approach. For this to happen, current and future potential effects of digital technologies on society are taken into consideration. Digital readiness means the level of digital process and readiness at both institutional and personnel levels of an organization that is experiencing a technological or digital transformation (Burkett, 2017; Karatzogianni, Nguyen & Serafinelli, 2016; Woodsworth, 2010).

In the table below, a scale showing the level of a university's digitization has been developed. The evaluation is based on 20 indicators, and the score of a university that performs digitization at the highest level will be a maximum of 200 points, but in order to facilitate the interpretation, the scores are converted to a scale of 100. This scale will provide universities with significant help in determining their level of digitization (Table 2).

Table 2. Digitization index indicators

No	Digitization indicators at university
1	To what extent do the university's vision and purpose support digitalization?
2	To what extent is digitalization used in determining the graduate profile in accordance with the applied education model?
3	To what extent are digitalization possibilities inherent in the curriculum in terms of theory, practice, and competence?
4	To what extent is digitalization immanent in the way courses are taught?
5	In the Qualification Form, while evaluating the compatibility of applied education design with the vision and purpose of the University, to what extent are digital technology facilities used?
6	While evaluating the compatibility of physical, financial, and infrastructure facilities and academician/researcher capacity with the applied education model, to what extent are digital technology facilities used?
7	While evaluating to what extent the design of the Turkey Higher Education Qualifications Framework (TQF-HE) allows for a practice-based education model, what level of digital technology facilities are used?
8	While evaluating the extent to which the design of Program Key Learning Outcomes (PKLOs) allows for the applied education model, what level of digital technology facilities are used?
9	While evaluating the consistency of the PKLOs & TQF-HE relationship within the context of the applied education model, to what extent are digital technology facilities used?
10	While assessing how much the Course Learning Outcomes (CLOs) design allows for the applied education model, what level of digital technology facilities are used?
11	While evaluating the consistency of the relationship of CLOs & PKLOs in the context of an applied education model, to what extent are digital technology facilities used?
12	While evaluating the compatibility of compulsory and elective course ratios with the applied education model, to what extent are digital technology facilities used?
13	While evaluating the consistency of the relationship between compulsory & elective courses in the context of the applied education model, to what extent are digital technology facilities used?
14	While evaluating whether the design and feasibility of solution partnerships are appropriately established in the context of the applied education model in terms of scope and content, to what extent are digital technology facilities used?
15	While evaluating the ratio of concept and branded courses in the curriculum, to what extent are digital technology facilities used?
16	While evaluating how the solution partnerships of the university concept courses contribute to the applied education model, to what extent are digital technology facilities used?
17	While evaluating the contribution of branded courses and their solution partnerships design to the applied education model, to what extent are digital technology possibilities used?
18	While evaluating the level of contribution of the design of the boards and committees to the applied education model, to what extent are digital technology facilities used?
19	While evaluating how the policy development and implementation offices design contributes to the applied education model, to what extent are digital technology facilities used?
20	While evaluating how the university governance model (organization, coordination, and leadership) contributes to the operation of the applied education model, to what extent are digital technology facilities used?

Source: Adapted from Toprak (2019).
(1: Very low level; 10: Highest level)

Bologna Process compliance levels in state and foundation universities in Turkey are periodically assessed by the national higher education authority, i.e., CoHE. Also, the European Commission assessed Turkish universities when they applied for the ECTS label and the Diploma Supplement label up until the end of 2013. The evaluation was completed through the websites of the universities. For this study, using a similar method, websites were examined at the beginning of the university's transition to online education due to Covid-19, and digital readiness performances were calculated according to the digitalization scale as follows. It has now been over two months since the transition to online education. During this time, it has been observed that universities conduct their course processing operations on online platforms as synchronous, asynchronous, or hybrid.

In the figure below, the 20 indicators that make up the digitization are gathered under five dimensions (Table 3). A small number of the indicators are categorized under more than one dimension. This is intended to enable each indicator to be evaluated on its own, independent from other indicators. Therefore, the digital readiness performance of Turkish universities is an average of 4.1 out of 10 points. The highest scores in digital readiness, scored in five sub-dimensions, are the university's facilities and prospects (4.9), university governance model (4.8), curriculum (4.3), graduate profile (3.6), and solution partnerships (3.0), respectively (Figure 2).

The introduction of digital readiness as an independent dimension will accelerate transformation in universities. It will be an important motivation for the higher education authority to periodically monitor and evaluate universities by adding digital readiness to the traditional aspects of the Bologna Process and to more rapidly roll out international reforms in higher education to Turkish universities.

Table 3. Five dimensions of digital readiness at university		
	Dimensions/Items	**Weight (%)**
I. Dimension	**Curriculum**	**20**
	3, 4, 8, 9, 10, 11, 12, 13	
II. Dimension	**Graduate profile**	**20**
	2, 10	
III. Dimension	**University facilities and prospects**	**20**
	1,5, 6, 7	
IV. Dimension	**Solution partnerships**	**20**
	13, 14, 15, 16, 17, 18	
V. Dimension	**Governance model**	**20**
	18, 19, 20	
	Total (%)	**100**

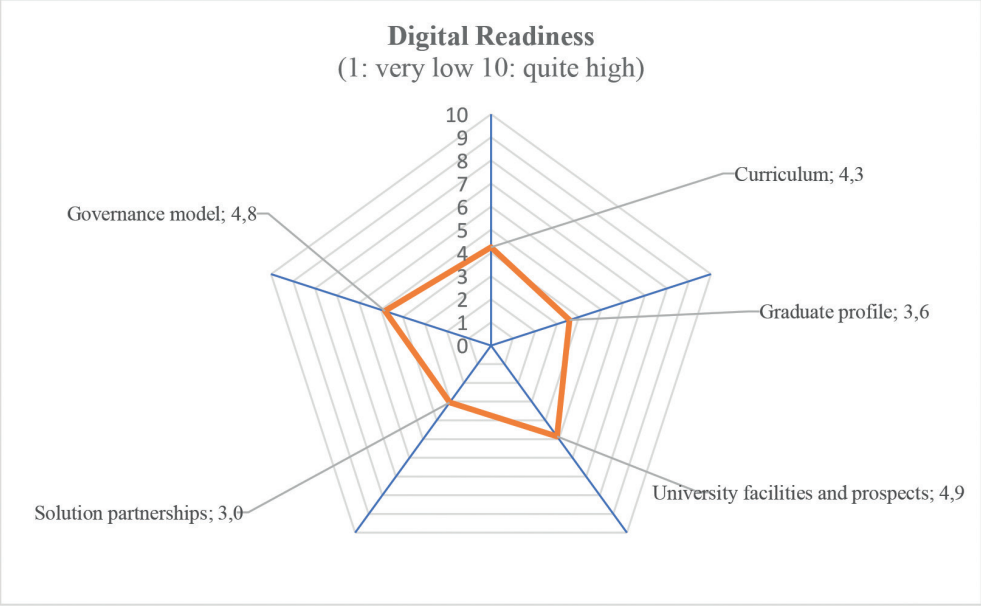

Figure 2. Digital readiness in Turkish universities
Source: Survey data on websites of Turkish universities.

Conclusion: Systematizing Technological Facilities with a Holistic Approach

Occupational and vocational standards, academic standards, and educational standards in Turkish universities are based on the reference framework of the European Union higher education agenda, i.e., the Bologna Process. Accordingly, the CoHE Quality Board (YOKAK), the VQA, and relevant ministries and professional organizations for regulated professions act

as national and professional authorities and co-regulators. Since program-based accreditation is quite expensive, YOKAK is increasingly assigning accreditation on an institution basis in parallel with trends in the rest of the world.

As of April 13, 2020, YOKAK has authorized 16 different professional organizations to authorize accreditation (YOKAK, 2020). YOKAK guidelines are compatible with standards and guidelines in the European Higher Education Area. Therefore, institutional evaluation and program accreditations in Turkey are in line with international practice. However, digitization is not yet included in institutional evaluation and program-based accreditation as an independent component. Instead, it is considered as a feature of the organizational and functional structure.

In this study, the digitalization index has been developed for a new generation practice-based university. Accordingly, 20 different indicators are grouped under five dimensions: curriculum, graduate profile, university facilities and perspective, solution partnerships, and governance model.

Two different metrics can be followed that give the same result based on 20 indicators or five dimensions. A university which receives a total of 100 points on 20 indicators will be assessed as a fully digitalized university. Or, it can be said that a university which gets 10 full points in five dimensions has fully realized its digitalization. In the evaluations made on university websites, the average digital readiness score of Turkish universities is 4.1 out of 10. This score is quite low. Following the Covid-19 outbreak, it can be said that the beginning of online education in Turkish universities has led to an improvement in the score, if not fully systematic. Currently, it is possible for social partners, especially decision-making and regulatory authorities, to evaluate universities according to the metric developed in this study.

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